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ASPECTS OF THE NEOLITHIC AND COPPER AGES IN THE BASINS OF THE RIVERS SEGURA AND VINALOPÓ, SOUTH-EAST SPAIN

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ABSTRACT

The origins of the neolithic in southeastern Spain are considered from the standpoint of the location of certain sites with respect to naturalistic rock paintings, and of the succession observed from aceramic to ceramic stratigraphical layers at sites which show a continuity of lithic tool-kits as between the various stages. The functional significance of such sites is interpreted in terms of a large mammal-depenent stage of the earliest pottery-using inhabitants of the region before 5,000 B.C.. It is proposed that agriculture developed relatively later in the southeastern ceramic neolithic. Factors concerning erosion and the availability of agricultural land are discussed. Within the neolithic the diversity of lithic forms and of ceramic types is considered. It is proposed that metallurgy occurred as early as 4,000 B.C. and that from then onwards the prehistory of the south-east diverges markedly from that of France or Italy, looking for inspiration to Egypt and the Eastern Mediterranean. Investigations into the ceramic constituents of pottery from various neolithic and early and middle copper age sites are discussed in terms of their functional rôles. It is proposed that geographical patterning may owe more to availability of resources and varying needs than to major cultural 'boundaries' . There are no very different changes in the mode of ceramic manufacture from the early to the middle copper age, by contrast with the marked difference of copper age from iron age wares. It is proposed that the 'Argaric' phenomenon developed indigenously from the early copper age of the region. Physical anthropologic-

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al data, whilst also showing some degree of geographical patterning within the south-east, nevertheless do not readily lead to an interpretation of markedly different origins for different population groups, and a simpler hypothesis is proposed which explains the bizarre tendencies sometimes observed in montane settlements north of the Vinalopó in terms of genetic drift away from more normal physical characteristics displayed by the copper age proto-urban inhabitants of the townships of northern Almería and southern Murcia who were perhaps more mobile.

CONTENTS

I. Introductory Remarks

II. Physical Characteristics of the Segura and Vinalopó Basins

III. A Sketch of the Palaeolithic Sequence

IV. Investigations into Assemblages and Environmental Factors of the Later Upper Palaeolithic and Early Neolithic : I

V. Investigations into Assemblages and Environmental Factors of the Later Upper Palaeolithic and Early Neolithic : II The Abrigo Grande Excavations

VI. Development of the Neolithic and Copper Ages in the Segura and Vinalopó Basins

VII. Investigations into Artefacts, Cereals, and a Discussion of some Socio-economic Considerations in the Copper Age of the Segura and Vinalopó Basins

VIII. Prehistoric Physical Anthropology

IX. Bibliography

I

INTRODUCTORY REMARKS

The research area comprises the basins of the Segura and Vinalopó (see Maps 1,2) and roughly corresponds to the provinces of Murcia and Alicante. The aim of the thesis is to present the origin and development of the neolithic and early copper age within that area in terms of new material and new ways of investigating some old material, especially human bones and prehistoric pottery. The area has been less studied than either Valencia to the north or Almería to the south, and in view of the possibility that each of the latter provinces may have had somewhat different cultural attributes during the neolithic and copper ages, it seemed interesting to direct attention to the intervening zone. Comparisons will be made principally with those two adjacent areas, and to a lesser extent Granada.

By neolithic and copper age material is meant material assemblages characterised by one or more of the following artefacts: geometric and bifacial flintwork, polished stone tools, pottery, copper. Since bronze made with copper and tin is relatively rare even in the 'Argaric' cultural phase of the south-east, the earlier part of that phase at least falls within the foregoing definition of copper age.

Following the lines proposed by Clarke (1968,1972) it seemed a worthwhile task to attempt to interpret the periods in terms of possible mechanisms of cultural change and variation in both time and space. However, it was also necessary to attempt to define fixed points both by means of excavation and absolute dating. A start has been made in that direction. Many collections have been reported upon/

upon which hitherto had only been inadequately studied. Space does not allow a detailed catalogue of material nor its detailed description. It is to be hoped that the line figures and photographs will serve to indicate the nature of the collections described. Inadequate excavation techniques in the past mean that most collections are quite unsuitable for statistical treatment in a multidimensional scale. This is unfortunate, but until more and better excavations are conducted, there the matter must rest.

Because of the typological variation noted by many archaeologists both in time and space in southeastern Spain, and given the impossibility of a useful and valid statistical analysis, alternative methods of investigating assemblages such as petrological examination and X-ray spectrography of prehistoric pottery, and metrical and non-metrical observations on human skulls have been used, as also have investigations into wheats and barleys. It is not yet possible to tie these together into a multidimensional model for the area. Only tentative speculations can be offered at this stage.

An interesting way of looking at the material seemed to be from the viewpoint of utilisation of the natural resources, and observations on the prehistoric physical geography of the region as well as on the fauna, especially that depicted in Levantine rock art, are given.

The aim has been to confine attention strictly to the research area and immediately proximate regions. Only if such comparisons fail does it become necessary to look wider afield. However, a functional and economic basis for explaining the neolithic origins, development, and the copper age evolution from the neolithic, is by and large considered to be of greater importance

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than are any exotic features.

A full list of all those who have offered ideas and suggestions, who have patiently conducted me to out-of-the-way sites and who have permitted me access to archaeological material, would be a chapter in itself. I wish to thank Professor J.D. Evans,Ph.D.,F.S.A., for his helpful supervision, and also Mr. Dennis Britton who assisted in the early stages of that onerous task. I thank my present Head of Department, Professor G.J. Romanes, C.B.E., the Provost and Fellows of the Queen's College,Oxford, where the initial work was carried out with a MacIver Studentship, the Royal Anthropological Institute, Carnegie Trust for the Universities of Scotland, the National Geographic Society, the Committee for Postgraduate Studies, the Committee for Travel and Research at Edinburgh University, the Faculty of Medicine Travelling Fellowships Committee, the Computer Allocations Committee of that Faculty, and all those who have helped to make this work possible. Special mention may be made of sr. Artemio Cuenca who has tirelessly conducted me to many stations, sr. Domingo Fletcher who hospitably received me at the Museo de Prehistoria in Valencia, sr. Enrique Llobregat, sr. J.Ma. Soler, sr. J. Molina, sr. Samuel de los Santos and sr. Francisco García Jiménez. I wish to thank Mrs. Rosalie de Méric, Mr. Patrick Morrissey Dr. R. L.Otlet, Mr. J.D. Wilcock, Mr. Thomas Paterson and Mr. Jeffrey Angell for their technical assistance.

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II

PHYSICAL CHARACTERISTICS OF THE SEGURA AND VINALOPÓ BASINS

Geography and Wild-Life

In which are outlined the effects of erosion on the patterns of wild-life and agriculture in the region.

Geology and Land-Forms

In which are outlined the sedimentary and tectonic geological features of the region, the development of Pleistocene river terraces, the subsequent redistribution of alluvia, and the consequences for prehistoric archaeological sites in the region.

Influence of the Physical Characteristics on Early Settlement

PHYSICAL CHARACTERISTICS OF THE SEGURA AND VINALOPÓ BASINS

Geography and Wild-Life

The countryside of Alicante, Murcia and Almería provinces is nowadays harsh and arid. Savory (1968) compares it with

"the arid landscapes of Asia and Africa" .

Rose Macaulay described it as

"a menacing landscape, a heave of burnt hills, quite dry and bare ..... shadowless, choked with dust, scorched with sun" .

This is 'dry' Spain, but its intensive erosion, it is often said,

"dates only from the late Middle Ages when the Moorish redoubt in the Baetic mountains became overcrowded"

(Houston, 1964).

The mean July temperature near the coast lies between 22^{o} - 26^{o} C., and there are fewer than two whole months out of the twelve when frost may be expected. Further inland, however, frost may occur in up to four months of the year, and in the high Segura mountains, up to six. South of the mouth of the Río Segura in the coastal belt, rainfall never exceeds 370 mm per annum, nor is it much higher in Alicante to the north. Indeed, for two months each year there is less than 5 mm of precipitation. Some parts of Almería receive less than 175 mm throughout the year. For four months the average temperature is above 21^{o} C., and for five months much of the south-east experiences drought conditions, a period which rises to seven months in the coastal belt that includes the major cities of Murcia, Cartagena, and Almería. Elsewhere, what rain there is falls in Autumn, except in the Segura mountains where Spring rainfall is greater.

Throughout/

Throughout the south-east Spring begins early, and almond blossom appears by mid-January near the coast. Winter floods may occur, especially in December or February, although at other times the rivers are sluggish or empty, flowing at rates of between 0.5 - 41.0 litres/km^2. Water deficits may reach 800 mm and supplementary irrigation is essential for agriculture.

The course of erosion is complicated. Agricultural land may revert to forest in the hinterland, but usually both agricultural land and forest have suffered the depredations of fire and grazing, and land turns into a scrub characterised by kermès oak, heath, Cistus, Euphorbia, and similar plants; and at later stages there appear herbaceous plants such as Brachypodium, bulbs (e.g. asphodels), and such like. The landscape takes on a 'ruined' aspect of rocky limestone garrigue which ultimately becomes leached of all finer soil particles and turns to desert. Siallitic soils undergo destruction as the evrgreen or holm oak (Quercus ilex) disappears. What Winter rain there is cannot be utilised by plants owing to their reduced metabolic activity, giving rise to a physiological drought. In Summer, drought and heat provide checks to growth. Thus what growth does take place is limited to Spring and Autumn, and the plants which grow best at those times are those whose water requirements are low, such as false esparto (Lygeum spartum), alfa (Stipa tenacissima) and many bulbs. Xeromorphic adaptations are common, and may take the forms of a reduced transpiration rate, a rise in tissue osmotic pressure, or deeply penetrating roots. Cistus species have thorns instead of leaves, pines have needles, and the transpiring surface is reduced also in lavender, thyme and rosemary. Quercus suber, cork oak, has a thick, protective covering of bark, and holm oak has a high osmotic pressure in drought conditions. The high oil content of myrtle reduces transpiration. Laurel and olive (Oliva europea) also can save water.

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The original climax landscape based on Quercus ilex is now much degraded, and regressive species such as kermès oak (Quercus coccifera) have often replaced it, a species previously excluded from the climax owing to lack of sunlight reaching the low plant, but whose rhizomes give it greater regenerative power. The original fire-resistant shrubs, privet and box (Viburnum), are replaced by the less resistant rosemary and Erica , and later on by even more vulnerable species such as rock roses (Cistus) and greenwood. The thinning of the deciduous tree cover leads to development of matorral or maquis scrub with tall, sclerophyllous plants. The scrub type is named after the leading species, e.g. Cistus scrub, juniper scrub, Spanish broom (Spartium junceum), wild olive (Oleaster), laurel, oleander, Euphorbia, or dwarf palm. On the limestone rock, which is widespread in the region, garrigue cover of kermès oak, rosemary, lavender, and asphodel is common. Repeated burning by pastoralists leads to intrusion by Erica, heather, box and rock roses. Such changes reduce symbiosis between plants and soil, and especially there takes place a loss of the fungus-rich soil horizon which eventually leads to disappearance of many species of shrubs. Solar heat can then play directly on a larger area of soil, with further deterioration of the humus, and the finer particles are lost, so that thin gravel and sand is the outcome.

That sorry picture describes what has happened to the hills around the Segura and Vinalopó valleys, now given over to a wretched agriculture of olives, vines and goats. The Moors, often credited with the development of irrigation channels in the area, devastated much of the original forest cover, perhaps to stoke the furnaces of Cartagena's smelt mills, as well as by the construction of houses, ships, and by accidental over-grazing by sheep and goats. Some deforestation may have begun earlier, in Roman times, since large-scale smelting

precedes/

precedes the Moorish domination. Ship-building under the Catholic Monarchs completed the devastation of the woodlands.

However, such emphasis on the dereliction of the landscape reflects an English preference for gentle, green countrysides. A Spaniard sees the south-east very differently, which is readily understood when its green valley bottoms are contrasted against the barren lands of Castile, thus

> "El sudeste español es la antítesis del noroeste peninsular: ni ambiente húmido, ni celajes, ni brumas, ni lluvias frecuentes, sino cielo despejado, azul intenso, por lo que se denominó a la region murciana el 'reino serenísimo'. Días de sol espléndido, noches estrelladas, firmamento diáfano .... Temperaturas suaves, inviernos templados, veranos cálidos ..... País árido y desolado, que transforma instantáneamente la pobreza en opulencia, donde las aguas se alumbran y se establecen los regadíos fructíferos, o donde se conducen las aguas lejanas, procedentes de embalses fluviales, para que se consuman en la huerta, no perdiéndose, estériles, en el mar, surgiendo el naranjal, los frutos apreciados y las verduras tempranas y abundantes, y las moreras, alimento del gusano fabricante de la fastuosa seda; como en la hoya de Murcia y Orihuela y en los valles de aguas subálveas del Almanzora con sus espléndidos parrales, sus maizales, pimentales y cultivos hortícolas múltiples. Densidad de población mínima en los secanos, donde la tierra apenas vale. Población densa en los parajes de regadío, donde el valor de la tierra se multiplica intensamente por lo mucho que supone el agua fecundizora de la tierra "
>
> (E. Hernández-Pacheco, 1947 pp50-52).

A remarkable contrast, indeed, impresses itself on the visitor between the arid hills and the lush, green valley bottoms, where market gardens (huerta) sustained by irrigation channels contain maize, barley, wheat, cotton, sugar cane, date palms, grapes, figs, lemons, quinces, oranges, apples, pears, tomatoes, artichokes, peppers, asparagus, cabbages, cauliflowers, melons, and the mulberries which from mediaeval times until quite recently supported the silk-worm and gave Murcia its fame as a centre of the European silk textile industry./

industry. The huerta stretches as a relatively narrow strip beside the rivers far into the hills, and supports such inland Murcian cities as Moratalla, Calasparra (famed for its rice), Cieza, Caravaca, Cehegín, Bullas, Lorca, and so on. Livestock rearing is an unimportant part of the agricultural economy, and the shortage of open pasture means that cattle must be kept in byres, though goats and sheep graze on the hills.

Later, the rôle of cereals in prehistoric economic terms and with regard to different morphological types will be discussed. It is likely that many wild non-cereal plants have contributed to the diet of prehistoric men in the region, however. Some of these which may have occurred wild in Spain have been listed by E. Hernández-Pacheco (pp. 541-545, 1959) and they include possible wild forms of asparagus, leek, turnip, watercress, purslane, sorrel, fennel, pennyroyal, mint, lettuce, artichoke, pea, lentil, chick-pea, bean, apple, quince, pear, vine, cherry, sloe, and the usual berries. The cultivation of many of these has been usually held to have begun with the Moors. Records from Classical authors seem somewhat sparse on horticulture in Spain, though apparently Strabo refers to the exploitation of Castor fiber. There is some evidence for flax and olive around 2,000 B.C., and also for Lathyrus spp. and Vicia faba, among the non-cereal plants used by the prehistoric people of the southern part of the Peninsula. Shortly afterwards, there seems to be exploitation of Prunus avium and vine or grape. This is of interest in connexion with the interest in the olive and vine in early Aegean agriculture (c.p. Renfrew, 1972, pp. 280 - 291).

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The pattern of rivers seems to have determined the location of most of the main centres of population, with the exception of the natural harbour of Cartagena (125,000 inhabitants), which owes its situation to the natural protected anchorage and surrounding mountains whose rich mineral ores have been worked since antiquity. Orihuela, near the mouth of the Segura, has some 50,000 inhabitants, Murcia, further upstream, about 250,000 , a figure which rises to around 400,000 if the adjacent townships of Alcantarilla, Espinardo, El Palmar, Beniaján and Molina del Segura are added in. Lorca on the Guadalentín (Sangonera) tributary of the Segura has 50,000 inhabitants, and it is on the natural route to both Almería and Granada in Andalusia. North of the Segura, Alicante has about 170,000 inhabitants and merges with Elche which itself has 100,000. Upstream in the Vinalopó valley from Elche are other urban areas which, like Elche, have long been famed for the footwear industry, and in particular the Elda-Petrel conurbation which probably numbers 100,000 inhabitants. Further north, isolated in the mountains, is the textile centre of Alcoy (100,000 inhabitants) which provides a difficult but important link between the coast and Valencia, avoiding a longer journey up the Vinalopó valley and then down the Júcar valley.

Owing to the mountains around the Murcian and Alicante coastline at its southern and northern extremities, communications with adjacent coastal districts, such as Valencia or Almería, are by inland routes. The well-known Mediterranean pattern of large coastal cities which give a lead in commerce and industry to their hinterlands (e.g. Valencia, Barcelona) is modified in the Segura basin, where Murcia is some fifty kilometres inland, though it is present in the Vinalopó valley (Alicante and Elche).

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The rich huertas of the valley bottoms have determined the locations of many smaller cities and towns of between 10,000 and 30,000 inhabitants, some of which have already been named. They provide an intermediate link between the civilisation of the large cities and the desolate hill country. This pattern of settlement is of considerable antiquity. Most of the cities and towns have yielded extensive Roman remains, though Alicante and Cartagena were Carthaginian foundations. Apart from the routes to Almería and Valencia, already mentioned, there are roads and railways which follow the Segura and Vinalopó until they reach the Meseta to lead via Albacete to Madrid. These were the routes chosen by the Castilian, Navarrese and Aragonese colonists who were imported after the Reconquest from the Moors. To this day, the towns of the Vinalopó valley and to its south are mainly Castilian-speaking, while those of the Alicante uplands to the north are Valencian-speaking (c.f. the Norman-English settlement of South Wales).

The disposition of the main sea currents and the ports is of interest. Jáuregui (1949) has examined the currents and their possible importance with reference to African sea links. Southerly winds predominate in the Gulf of Valencia, but in Summer a northeasterly blows from the Balearic Islands towards the mainland, and a south-easterly from North Africa towards the Peninsula. Along the Andalusian coast from Gibraltar eastwards, westerlies are common. However, westward-bound Mediterranean currents counteract their effect, since even when they are strong, the currents proceed at 1.5 nautical miles per hour in a westward direction. Whilst the westerlies interfere with sailing boats coming from North Africa, they impede such traffic less the further east embarkation is undertaken along the North African coast. This probably explains why advantage was

taken/

taken of the ports at Alicante and Cartagena by sailors from Carthage. However, Jáuregui points out that even when such a course is taken, sail must first be set towards Ibiza, and only later towards the mainland if the full advantage of the northeasterlies is to be obtained. He says that under sail the north-to-south voyage is faster than the reverse. There are clearly some difficulties facing sailors with light sailing craft who wish to make frequent crossings.

The land-locked lagoon of the Mar Menor on the Murcian coast south of the Segura is interesting. Large salt marshes near Torrevieja further north may once have been a similar lagoon. The large fresh-water Albufera lagoon near Valencia, however, is fed by fresh-water springs, and is due to restriction of drainage by dunes (Rosselló, 1970, 1969). The dunes which partly enclose the Mar Menor, on the other hand, are incomplete. The lagoon is always in contact with the sea, and its shallowness is the cause of a high rate of evaporation and thus a high salinity of the water. It is not fed by fresh-water sources. It gives good fishing for eel, shad, golden perch, mullet and bass. The deeper waters beyond the lagoon are fished for vertical migrants and shell-fish, especially sardines, anchovies, octopus, squid, lobsters, crabs, prawns and shrimps. Sea food probably played an important part in providing dietary protein for the earlier inhabitants of the littoral. Between Cartagena and Alicante the coastline offers some of the best land-falls of all the coast between Cabo de Gata (Almería) and Cabo de la Nao (Alicante), apart from sandy beaches near the mouths of the Río de Antas and the Río Almanzora (Almería).

The denudation of the hills, especially in the coastal area, has drastically reduced the numbers of larger wild mammals such as red deer, wild boar, and Spanish ibex. The last-mentioned is now

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restricted to the Sierra del Segura and Sierra de Jazorla. In the Sierra de Jazorla to-day there are mouflons, but these were imported to Spain in post-mediaeval times from Corsica and Sardinia for the chase. Nevertheless, it is possible that wild sheep were present in the Peninsula during the Palaeolithic. In the Middle Ages red deer, boar, and ibex were widespread. Boessneck (1969) quotes Manuel (1880)* that all three were hunted near Villena in the Vinalopó valley in the fourteenth century A.D.. Cattle, horses, pig or boar, and ovicaprines have been found at many archaeological sites going back to the Neolithic and Palaeolithic, but it is not certain when the change-over from wild to domesticated species occurred. For instance, at many later Bronze Age sites dating from around 1,000 B.C. horse bones are plentiful, but whether these were domesticated, partially domesticated, or completely wild is not known. Evidence from elsewhere in Europe suggests that the horse was not domesticated as a beast of burden until a somewhat later date. But whether tame or partially tame horses were bred for meat at an earlier date is a different problem, which must be kept separate. This may well have been the situation at the Spanish sites of Cerro del Real (Granada) and Jabezo Redondo (near Villena, Alicante) where Equus caballus seems to have been eaten often (Boessneck, 1969). This matter will be discussed further later on. Suffice it to say that in Classical times, Peninsular horses were much prized. With regard to the ass, feral asses (Equus asinus) were present in the mountains of eastern Spain in mediaeval times, and wild asses (E. hydruntinus) are known from Cerro del Real (Granada) (Boessneck, 1969) and the Cueva de Parpalló (Valencia) (Davidson, private communication), the latter being an Upper Palaeolithic occupation site. There is some evidence at the Cueva de les Mallaetes (Valencia) for the presence of sheep

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*El Libro de la Caza quoted by Boessneck (1969) q.v.

later palaeolithic times (Davidson, private communication). Prehistoric rock paintings from eastern Spain depict wild Equines, Bovines and Caprines of various kinds, frequently in some relation — often a close relation — to huntsmen and non-hunting men and women. Lagomorphs are indigenous, too, in the Quaternary fauna of the Peninsula, and are very commonly found. In addition to fishes and mammals, other constituents of the prehistoric protein diet doubtless included birds and amphibians, not to mention invertebrates (shell-fish and snails), which are still eaten by Spaniards in large amounts.

Geology and Land-forms

These are of considerable relevance to a study both of settlement patterns and also of the geological attributes of prehistoric artefacts. Both of these matters will be dealt with at length later on.

The most important land-form is the Baetic range of mountains (Cordillera Bética), which comprises the Sierra Nevada and the metamorphic rocks further east, especially those near to the Murcian coastline and the port of Cartagena. Those latter rarely rise above 600 metres from sea-level, but the Sierra Nevada contains the highest mountain in Spain, Mulhacén, over 3,500 metres in height. The Baetic range runs from north-east to south-west, and consists of Palaeozoic and Triassic rocks, although the crystalline massif of the Sierra Nevada rises above those earlier sediments, and, indeed, may never have been completely covered by the Mesozoic (Triassic) sediments at all. The range represents vestiges of the Hercynian orogeny, and is accompanied on the north side by the large

Andalusian/

Andalusian geosyncline across which formerly the waters of the Mediterranean made contact with the Ocean. Triassic sedimentation, which deposited thick beds of dolomitic limestone in southern Andalusia, laid down slates and sandstones in south-eastern Spain, and some of these are exposed in the Segura basin (e.g. near Archena and Totana, in Murcia). Marine regressions occurred with subsequent erosion of the sedimentary rocks and their redeposition, presumably during arid periods, as the gypsum-rich aggregates of Germano-Andalusian Trias (Solé, 1952). Jurassic marine sediments thus lie on that plastic substratum, which has contributed in no small measure to the tectonic chaos of the region. More gypsum-rich strata occur in the Upper Lias, especially in the area corresponding to the central zone of the geosyncline, but in peripheral areas the absence of those unstable beds means that the Mesozoic rocks are more massive and regularly folded, as can be seen around the edge of the Segura basin.

In the Lower Cretaceous, limestones, now schistose, were laid down peripherally, but towards the centre of the geosyncline white, red and green conglomerates were deposited. Further marine sedimentation continued until eradication of the geosyncline was completed in the Late Miocene orogenic phase. Intercalated gypsum-rich beds continued to be laid down throughout the Cretaceous and the Tertiary era. The late Tertiary orogeny (Late Miocene, Pliocene, and Early Pleistocene) was responsible for intrusive rocks along the coast from Cabo de Gata to Cartagena (trachytes, dolerites, rhyolites, andesites, liparites) and also inland around the middle region of the Segura basin where there occur the lamproitic intrusions sometimes known as jumillite, cancalite and fortunite rock-forming minerals (Fuster et al., 1967). These minerals play an interesting part in the prehistoric ceramic technology of the region. Intense tectonic movements have resulted in a complex relationship between structure and relief, manifested as a confusion of compact, folded and rigid blocks;

the anticlinical arrangement being enhanced by the plasticity of the earlier, gypsum-rich strata. Especially in the upper reaches of the Segura system, the terrain shows a high relief, with nappes and symmetrical folds, dipping steeply on one side, gently on the other.

The glaciations, notably Riss and Würm, left their traces in the Sierra Nevada, although the Würmian moraines are at high altitude, and it is unlikely that the glaciers descended below 2,000 metres except on north-facing slopes, where they may have reached as low as 1,800 metres (and see Obermaier & Carandell, 1915) (F. Hernández-Pacheco, 1947, p. 83). North of the Sierra Nevada, in the sub-Baetic zone, the mountains do not rise much above 2,000 metres, and moraines are not recorded from the Sierra del Segura or Sierra de Cazorla. The scant degree of peneplanation in the area has been interpreted on the basis of only slight post-glacial rise in the land-mass, although one might have expected that the proximity of the sea would have encouraged rejuvenation during the Pleistocene regressions. Perhaps the long Summer droughts impede chemical erosion, or perhaps conditions favoured aggradation. As is not uncommon in semi-arid lands, the pattern of erosion is lateral rather than linear , with pediment formation. The pediments are either bare, stony surfaces, or else are covered with alluvial gravels, indicative of pluvial conditions at some periods. Light coloured limon beds on river terraces point to recent aeolian action. In the valley bottoms, alluvial sediments are the basis of the rich, agricultural land of the huertas .

In Alicante province, the complicated picture of Mesozoic sedimentary rocks dissected into blocks and heavily folded during the Tertiary era, is further complicated by interaction with the southernmost extremity of the Iberian geological system, which, unlike the Baetic system, runs from north to south. Both north-south and N.E.-S.W. tendencies can be detected, therefore. Folding is sharp and scarps dominate valleys which are steeply dissected. Differential erosion has led to stark contrasts between Cretaceous limestones and Tertiary marls/

marls and clays, resulting in severe relief. The Vinalopó valley and mountains around Alcoy both manifest that ruggedness, though they are not so high as the sub-Baetic mountains. In particular, one may cite the mountain of El Cid which towers above Petrel, and has sheer cliffs, the result of a Miocene dislocation of some 1,500 metres (Sampelayo, 1934).

The present writer has collaborated with Sr. Artemio Cuenca Payá in investigations into the Vinalopó sediments of the Pleistocene, and has extended his work into parallel studies in the Segura basin. The Vinalopó valley was found to have three terraces, at 75, 35 and 10 metres above the present bed (Cuenca, 1971). The absence of a 100 metre terrace, found in other Spanish valley systems, was remarked on. Briefly, the sequence is as follows. Sands of the highest Vinalopó terrace were laid down in dry conditions, interrupted by occasional "pluvial" interludes. That was followed by down-cutting of the river. The sequence was repeated in the case of the middle terrace, though the vertical component of the rejuvenation was more pronounced. At some sites loess soils were found to be stratified above a microrhythmic varve-like sequence of lake or swamp deposits, which contain pebbles and signs of fluvio-glacial transport (perhaps from the Sierra de Maigmó). Finally, aeolian sands were deposited by wind once the new valley floor had been established, and the surface of these forms the 10 metre terrace, down from which the river has cut its present valley bed.

Originally, Cuenca felt the three phases of terracing and rejuvenation might correspond to a late Rissian (upper terrace) and Würmian stages. However, we are now of the opinion that all three represent relatively recent aggradations. A number of cave sites which have provided evidence of Mousterian and Upper Palaeolithic habitation, seem to have sediments which correlate with some of those of the river terraces.

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The work was undertaken initially in ignorance of similar studies by Vita-Finzi (1969), and in conflict with the view of many Spanish Quaternary geologists. It is interesting to note that our conclusions accord well with those of Vita-Finzi in other areas of the Mediterranean. The lack of faunal evidence from the upper and middle terraces hinders their precise allocation within the Middle and Late Pleistocene.

Recent erosion, responsible for the deposition in Classical and subsequent times of the soils of the huertas further down the valleys towards the coast, has in many places exposed a low terrace and its constituent strata. On average, this terrace is some +10 metres above the present river level. The aggradations are deepest behind certain natural rocky barriers which obstruct the valleys at various places, and were in former times the cause of extensive lagoon or swamp conditions behind them upstream. Light-coloured muds and clays with lenticular inclusions of gravels may account for the lowest 0.400 metres, followed by a like thickness of varved or microrhythmic clays (see Plates xiii, xiv). The photographs refer to the Rambla de Bateig in the Vinalopó system near Elda, and demonstrate clearly that in the upper part of the lower light-coloured muds and clays there are many fossilised plant remains. There is also a trace of dark colouration underlying the lowest part of this sequence. In a dammed-up situation, as at the Barranco de Murta, near San Vicente de Raspeig, (Alicante), the microrhythmic sequence is of quite enormous depth (8 - 10 metres) and lie directly above gravels (see Plates i, ii). In such situations they tend to be covered by gravels, too, (Plate ii), indicative of a later, wetter phase. The Murta microrhythmic sequence is being studied by Cuenca who has currently only investigated one-fifth of their thickness, but has been able to demonstrate 11-year and 300-year periodicity in the sequence (Cuenca, in press). Granulometry is also being carried out by Cuenca on the alluvia. The thickness of the overlying gravels

in less obstructed situations (e.g. the Rambla de Bateig, Plates xiii, xiv) is 2.0 - 4.0 metres, and all degrees of grain-size up to large pebbles 300 mm in diameter or more are encountered. A thick layer of aeolian sand lies above these gravels, and is frequently sealed by a further layer of pebbles. In those parts of the valleys which may have been obstructed, such gravels may be of considerable thickness. In other situations, the nature of the gravels varies from round pebbles to more angular solifluction débris.

The gravels beneath the microrhythmic sequence of the Barranco de Murta seem to represent a more angular, cryoturbated scree, only partly rolled, and one might postulate cold conditions. A -20 metres deep borehole in the Vinalopó flood-plain at Villena (Cuenca, in press) found 8 metres of aeolian sands overlying 3 metres of clays, followed by three metres of peaty soil, six metres of clays and finally a layer of travertine of unknown thickness and extent. Regrettably, most of the material was accidentally thrown away, so that palynology and granulometry could not be done. One small sample from the peaty soil layer has been investigated for the present writer and sr. Cuenca by the radiocarbon dating unit under Dr R.L. Otlet at the A.E.R.E., Harwell, and a private communication dated 13th February 1973 indicates that the sample, S-193 yielded 80 cms of CO_2 (from 196 g peat) giving an age of greater than 32,000 B.P. (half-life of 5570 assumed). A date between the Middle and Late Pleniglacials of Würm (c.p. van der Hammeren et al., 1967) and equivalent to the Paudorf loess of Central Europe seems acceptable. It is in good agreement with the age postulated by Vita-Finzi (1969) for the onset of the most recent Quaternary terraces around the Mediterranean.

The tantalising problems posed by the date retrieved from the bore sample have much to do with the local problems of the Vinalopó

aggradation

aggradations in the ancient Villena riverine swamp. Possibly the subsequent muds and clays represent deposition during the equivalent of the Würm Late Pleniglacial. There are other difficulties, notably that the aeolian sands are to-day exposed and appear not to have received (or to have received and subsequently lost owing to erosion) any later mantle of gravels. Neolithic and copper age artefacts occur in the sands. However, the swamps were active as recently as the middle ages (Boessneck, 1969, quoting Manuel, 1880). The travertine below muds and clays deep to the peat is likewise problematical, owing to its discovery at the end-point of the bore, so that neither its thickness nor extent are known. Cuenca (in press) proposes that this phase of calcification might correspond to calcified flowstone layers at several caves, broken through by Mousterian and Upper Palaeolithic occupations (see below).

Before correlations with cave sediments are discussed, however, a number of recent observations made by the present writer in the Segura basin can be added, as well as an observation by Jiménez de Cisneros (1929) on sediments of gravels overlying sands in the upper reaches of the Guadalentín part of the Segura basin, and his comments on loess soils in various regions of Murcia and Alicante provinces. The 10 metre, as well as higher, terraces, are clearly visible near Abanilla (Murcia : Plate iv) in the Chicano valley (a tributary of the Segura), and also in the valley of the Río de Mula near Baños de Mula and Albudeite, (Murcia: Plates iii, v, vii, ix), as well as above the rocky obstruction of El Tabayá in the Vinalopó valley to the north of Elche (Plate viii). More specifically, the network of small canyons and barrancos which feeds the Mula valley part of the Segura basin is invariably characterised by 2 or more metres of gravels overlying the sands. Near the abandonned railway

station/

station of Baños de Mula, and likewise near Chaparral in the Quipar tributary valley of the Segura further north, the barrancos on the tablelands at high altitude which eventually feed the rivers below indicate that the present soils comprise the following sequence of about 2 metres in total thickness: (1) top soil, (2) a layer of pebbles 0.150 metres thick, (3) sand about 1.000 metres thick, (4) a thin band of pebbles 0.050 - 0.070 metres thick at the foot of the sections. Since there are the very thick pebble beds overlying the aeolian sands nearer to the rivers, these soils are of more recent aggradation. Their granulometry has not been studied. In other sections, however, equivalent overall depths comprise merely interbedded microrhythmic sequences of small pebbles and coarse gravelly sands, each only 0.020 - 0.050 metres thick, (particularly well exposed in the barrancos cut into by the Mula - Bullas road just north of Niño de Mula. The hillsides in this region also show exposed sections of steeply inclined angular soliflucted scree breccias. These contrast against the flat tableland soil aggradations just described. Possibly one might speculate that the stony or pebble layers represent the climatic phase of the past millennium, whereas the underlying sands might represent a period during the first millennium A.D.. Firm evidence for such speculation is lacking. It was reported by Vita-Finzi (1969), however, that Roman and other material lies in the modern alluvia of the Sangonera flood-plain (another tributary of the Segura), indicating some degree of relatively recent erosion. In the Taibilla valley near Vizcaible, (Albacete), the present writer has observed what are either Moorish or Roman cist graves exposed by the erosive action of the river and about 1.5 - 2 metres above the present water level, due to undercutting of the bank by a meander channel, and at the Rambla de Bolbax near Cieza,(Murcia), Iberian iron age painted pottery is liberally scattered over the sides of the gully and the nearby flood-plain of the Segura. It is clear that fluvial erosion has been a conspicuous feature of quite recent times. Flash floods have probably played a part in the

redistribution.

It is reasonable to suppose that the processes responsible for the erosion of the 10 metre terrace also attacked the hills and mountains, and brought down on to the ancient peneplain tablelands detritus from higher altitude. The rocky obstructions such as occur in the Vinalopó valley at Tabayá, north of Elche, and Monastil, north of Elda, and also near Cieza in the Segura valley, seem to have been favourite places for copper age, iron age and later settlement, probably on account of the ephemeral swamps with consequent possibilities for agriculture owing to seasonal flooding. Dams, perhaps going back to Roman times, are found at those locations in the Vinalopó valley, and also in tributaries of the Segura system, such as the Rambla de Lébor, Totana, (Murcia). In this connection, similar dams in North Africa have been described by Vita-Finzi (1969). These dams would not just conserve water, but more importantly sediments brought down by torrential storms. Many of the dams are in a state of decay, but those which were until lately in use, such as a small dam at Petrel, (Alicante), in a tributary of the Vinalopó, permit the development of agriculture and horticulture upstream, in an otherwise degraded and arid landscape.

The lower reaches of the river systems are in-filled with the alluvial deposits of the huertas around Almería, Murcia and Orihuela, Elche, Gandía, Valencia, etc.. Coastal dunes and ancient raised beaches were long ago recognised (Jiménez de Cisneros, 1929). The Albufera lagoon of Valencia, fed by fresh-water springs, is separated from encorachment by the sea on account of dunes (Rossellό, 1970, 1969) left behind as vestiges of the Würm-age regression (Butzer & Cuerda, 1962) and was once considerably larger than it is to-day (Davidson, 1972). The dunes of the Mar Menor, despite their being breached by the sea, may be a similar phenomenon. The land behind

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it was once salt marsh, much as it is still behind the Torrevieja dunes further north in Alicante (of disputed, but probably Lower or Middle Pleistocene age). Nonetheless, Roman and Carthaginian settlements abound close to the inner margins of the present-day lagoon shorelines (e.g. Los Nietos on the Mar Menor; Sueca on the Albufera). It is unlikely that the coastline has advanced much in the last two or three thousand years, although Houston (1969) states that the coastline of Valencia has advanced three kilometres since Roman times. One might rather have anticipated a retreat than an advance during the neothermal period, since an advance would involve deltic alluvial fans, whereas in many instances such fans could not form owing to the dunes and marshes behind them.

The deposition of the huerta of Elche behind the Guardamar dunes has been proposed by Cuenca (in press) owing to reduced transport capability on the part of the Vinalopó and obstruction of its outlet by the Early or Middle Pleistocene dunes. Subsequent irrigation canals, largely due to Moorish engineering, would have further reduced transport capacity and led to ever-increasing alluvial deposition, aided and abetted by flash floods, often very severe even within living memory such as the 1958 flood at Valencia, which furthe redistributed and redeposited the sediments. The mixing prevents the recent soil history from being revealed in the huertas, but the soil of the peneplain tablelands, deposited doubtless by the same climatic conditions, allowas some reconstruction, as has been tentatively propose Palynology cannot help us, since there are no analyses from the Segura or Vinalopó basins whatsoever. The nearest are from Granada province (Padul: Menéndez Amor & Florschütz, 1964) and from further north in Valencia province (Ereta del Pedregal: Menéndez Amor & Florschütz, 1961). Further north still, there is the sequence from the Cueva del Toll in Catalonia, but here there are some problems in defining the

vegetative/

vegetative cover and relating it to the faunal remains in constructing a satisfactory palaeoecological picture (Butzer & Freeman, 1968). Ecological variation may vary within a few kilometres; each of the three sites mentioned is over two hundred kilometres from the next !

The reconstruction from the recent stratigraphical observations of soil deposits is hindered by the ferocity of the erosive processes which in many locations have removed whatever may or may not have been temporarily deposited above the aeolian sands or overlying gravels. It is now convenient to return to these aspects of the 10 metre terrace in order to relate them to archaeological material and to clearly dated sites. The sand-gravel sequence has been identified by the present writer in the lowest terrace of the Rio de Torrealbilla near Lorca. In the Mula valley the gravels seem to be bedded directly above the microrhythmic sequence, however, and the same is true at the Cortijo de los Villares in the Quipar valley near Chaparral, Bullas, (Murcia). As at the Barranco de Murta these late Würm-age or early Holocene varved deposits seem to lack overlying sands, perhaps because they were rapidly removed, or perhaps because local conditions prevented their forming a sedimentary deposit of consolidate wind-deposited sands owing to the active nature of the swamps, unlike the situation at Villena (see above). They do appear again in the higher reaches of the Segura system, notably in the Barranco del Caño , a tributary of the Río de Moratalla, to the north of Moratalla (Murcia), overlain by the usual bed of pebbles, and perhaps in the 10 metre terrace of that river also. Of greater interest are sands at Fuente de la Zarza in the Sierra de Quibas, precisely where the three municipal districts of Jumilla, Fortuna and Abanilla meet, in the side of a stream valley draining towards Jumilla. These sands, of aeolian type, contain an assemblage of flints including débitage and pyramidal core pieces/scrapers of typically later upper palaeolith-

ic/

ic and early neolithic type. In the enclosed basin around the town of Jumilla into which the streams and flood torrents drain, there is today an extensive agricultural complex, and the soils have been much disturbed, as is testified to by the presence of large quantities of copper age, Iberian iron age and Classical artefacts on the surface of the ground at El Prado (see below).

The later upper palaeolithic - early neolithic chronology of the aeolian sands can be substantiated by the fact that in north-facing caves with archaeological deposits such sediments are invariably present in the Segura and Vinalopó region, due to their receiving northerly winds from the Meseta and uplands. Apart from the presence of pottery in such sands on the Villena Vinalopó flood-plain, they usually contain non-ceramic lithic assemblages, as at the Abrigo Grande, Cieza,(Murcia) (see Walker, 1972). At this site, the overlying thermoclastic angular scree deposit and the surface soil provided material giving a radiocarbon date for these ceramic layers as follows:-

Sample S-179-III 650 g bone (62.7 cm CO_2) (5570 $\frac{1}{2}$-life)

7200 ± 160 B.P. or 5250 B.C. (subtracting 1950) or if multiplied by x1.03 to adjust to the 5730 $\frac{1}{2}$-life of C^{14}

5470 B.C.

Since this date is beyond the Bristlecone Pine curve, the real date is probably pre-5,500 B.C. in absolute terms. (Courtesy of Dr R.L.Otlet, A.E.R.E., Harwell, private communication, February 1973 .)

This suggests that the preceramic layers, which include the aeolian sand layer, are of earlier age. However, a very inadequate mixed bone and charcoal sample of 160 g (13 cm CO_2 only) from the sand layer and deeper thermoclastic deposit gave a <u>later</u> date, though the large standard deviation, due to the small sample, suggests

that/

no reliance can be placed on it:

Sample S-180 160 g of sample (13 cm CO_2) (5570 $\frac{1}{2}$-life) 5120 ± 620 B.P. or 3170 B.C. (subtracting 1950), or with adjustment to Bristlecone Pine curve 3960 ± 630 B.C..(Courtesy of Dr R.L. Otlet.)

At the Còva Emparetá in the Bocairente valley in Valencia, not far from Alcoy, Cuenca (in press) described a stratigraphy of superficial organic soils, small angular and corroded gravels in a dark limon soil, and a deep layer of similar features but with granulometric characteristics continuing down to sand-size particles not in a limon soil but in a calcified, ferric-rich matrix. Copper age material came from this and the middle layer. Cuenca holds that the humidity of the cave led to the gravels of the middle layer being attacked by humic acids from above, whilst the cementation of the lower layer ensued owing to impeded drainage through the limestone cave floor. It is not clear that the lower layer is to be regarded as equivalent to the aeolian sands, however, and the archaeological evidence would suggest that it ought to be of later date.

At the Cueva Santa, Caudete, (Albacete), at the head of the Vinalopó valley, Cuenca describes an upper layer similar in composition to the middle layer at the preceding cave lying over aeolian sand, and he claims that the preservation of the sand layer owes to the better drainage of the cave floor. This site provided much copper age or advanc neolithic material, including cardial wares (see below).

The nearby Cueva del Cochino, Villena, (Alicante), also contained an upper layer with mediaeval, copper age and possibly neolithic remains in altered thermoclastic deposits of clayey-limon aspect with rock fragments (layers I and II: Soler, 1956a). Below this there were found Mousterian artefacts in a cemented palaeosol (Cuenca, in press)

press) formed by saturation with calcium-rich water. Small fragments of limestone from a maximum of 15 mm in size down to sand-size particles make up this layer. There are also broken breccia fragments from the underlying stalagmite breccia which was broken and shows corrosive features.

Traces of smashed calcite flows occur at all three sites, and seem to have been caused by the later occupations. Cuenca tentatively proposes a correlation between these and the travertine encountered in the Villena Vinalopó flood-plain bore-hole. A broken calcite layer was reported by the Sirets at the Cueva de los Toyos, near Ramonete, Lorca, (Murcia), (Siret & Siret, 1887, p. 18) where the fill contained 'neolithic' material (see below).

The aceramic assemblage from the Cueva de la Pelica, Antas, (Almería), (Fortea, 1970), suggests a later upper palaeolithic attribution (see below), and occurred largely in what seem to have been thermoclastic deposits stratified above a greater thickness of looser calcifying soils which only provided two flint pieces. At the Cueva del Gato near Moratalla, (Murcia), an aceramic lithic assemblage was found stratified below the major part of the sand layer in a 'burnt' layer, stratified in turn above sand and above a darker sandy layer with 'ashes', respectively (Cuadrado,1947). Aceramic assemblages from the two caves at the Huesa Tacaña, Villena, (Alicante each of different facies, (Soler, 1956a, 1968-1969) are of interest. One of backed bladelet type occurred in a deposit of thermoclastic nature with large blocks, the other, of geometric facies, occurred in a nearby rock shelter in loose, grey soil with occasional small stones.

At the Cueva de las Perneras, near Ramonete, (Murcia), later

terial occurred in stratified

positions/

positions, and again there was a broken stalagmite flow, presumably disrupted by the earliest occupation.,(Siret, 1893,p. 491).

At the Còva d'En Pardo, Vall de Gallinera, (Alicante), a copper age burial and other late neolithic or copper age material, including cardial ware, was stratified above a sterile deposit. Below this in a sandy deposit there was an aceramic backed bladelet assemblage followed by more sterile layers, and finally an assemblage of animal bones, indicating a predominance of caprines over cervines in the lowest level (Vicente Pascual, personal communication, 1972).

At many other stations the present writer has confirmed that copper age material is stratified mainly in thermoclastic deposits or in open site situations in a context of rounded pebbles, but always above or near the top of sand deposits which lie deeper. Below these in turn there may be screes or pebble deposits, often of massive stones. A copper age collection from a hill without a name near Beniaján, (Murcia comes from such a superficial layer. The large copper age Argaric site at the Laderas de San Antón, Orihuela, (Alicante), which has been cut into by gullies suggests that the material came from a surface layer of angular limestone scree in a calcium-rich ferric soil, lying here above a thick deposit of massive rounded pebbles, in turn lying on a calcified breccia of similar boulders on the surface of which the present-day stream runs due to its impermeable cemented nature.

Special features seem to have pertained in northern Almería, in contrast to the Segura and Vinalopó basins with regard to the late Würm-age and Holocene aggradations, and these are of archaeological interest. In the Almanzora valley terraces at + 10 metres and also at +25-30 metres above the present river level may be observed. Copper age settlements such as Tres Cabezos and Campos near Cuevas

de/

de Almanzora, lie on the edge of the +25m terrace (Plate x). Nearer the sea, a rocky barrier at Herrerias seems to have led to alluviation upstream, and the 10 metre terrace disappears. On its sea-ward side lies the copper age tell site of Almizaraque (Plate xi, xii) which has thus been protected from being covered by a depth of alluvia. It lies on a small knoll, though this cannot be more than +8 metres at most above the level of the sea, which at this point is 1.5 - 2.0 kms distant. The site has been dated by radiocarbon to the late third millennium B.C.. The absence of coastal dunes, moreover, permits the Almanzora to form a deltic fan, and this, too, would reduce alluviation in the river valley.

In the next river valley, that of the Antas river, there are many important sites, such as El Argar, on the edge of the +25m terrac These are now undercut by the terrace, and could not have been establishe later than the beginning of the most recent erosive phase, which also caused the rejuvenated trenching of the river in the flood-plain to produce the present-day low terrace. It is unlikely that the most recent phase of rejuvenation commenced earlier than 1,000 B.C..

In the Almanzora valley, only two river terraces are visible. Why this should be so is not obvious, since it is an important drainage system. The Antas valley, however, manifests terraces at about + 10 m, +25-30 m, and + 40-50 m above the present base-level. This is the genera situation in the Segura and Vinalopo basins. The Vinalopó terraces have been studied by Cuenca (in press, and Cuenca, 1972) where terrace at +10, +35, and +75 metres were reported (these figures vary, of course from station to station). The absence of palaeontological material from the middle and higher terrace presents difficulties in allocating them to particular Pleistocene phases. The gravels of the upper terrace are being studied currently by Cuenca. The middle terrace from below

upwards/

upwards comprises clays, gravels, calcite, and limon beds. Above these are another calcite layer, followed by more limon beds, and more gravels of a massive nature. These are interpreted by Cuenca as indicating a transition from drier to more humid climates, followed by a phase of severe erosion, presumably initiating the rejuvenation of the valley. This might have been instigated by a fall in base-level, perhaps during the Würmian Middle Pleniglacial. Perhaps intermittent swampy conditions are indicated by the limon beds and also by a microrhythmic sequence which the present writer has noted in the middle terrace near Baños de Mula in the Segura river system (at this station the lower terrace is not present , though it reappears 1 kilometre downstream to the east of the village). The massive limestone rounded pebbles and boulders of the middle and upper terraces are prominent features of many of the Segura system tributaries, e.g. the Chicano at Abanilla, the Torrealbilla (middle terrace only) near Lorca, the Mula near Albudeite, the Quipar near Calasparra, the Argos, near Caravaca, etc.. In some places, e.g. by the side of the Santomera - Fortuna and the Moratalla - Caravaca roads, folding of the gravels is clearly evident. Above Lorca, at Los Pilones, some + 120 metres above the river, and on the side of the hill of Los Villares above the Quipar, near Chaparral, Bullas, as well as at high points by the Moratalla-Caravaca road, there are traces of an earlier still aggradation. The characteristic feature of this is a red earth matrix with rolled and angular stones comprising metamorphic and igneous rocks (diabase, quartzites, granite, micaschists, slate, etc.), contrasting with the limestone pebbles of the later aggradations. These rocks are also found in the mountains of the Murcian coastal belt, where they occur in aggradations of more recent age. But in the hinterland zone to which reference is here specifically directed, they must have come from outside the region, either from the mountains of northern Almería and/or from the more distant crystalline and metamorphic rocks of the Sierra Nevada, either earlier in the

Pleistocene/

Pleistocene, or else in the Pliocene. Exposure of these deposits by later erosion seems to have offered excellent opportunities for prehistoric man to take advantage of the stones both for fillers for pottery and for the manufacture of polished stone tools, and a number of sites of the later neolithic and copper age so situated will be mentioned later. Metamorphic and igneous intrusions in the limestone region were also so utilised, of course.

It is convenient at this point to summarise the recent Quaternary geology of the Segura and Vinalopó basins: -

(1) the most recent aggradation had commenced by 30,000 B.C..

(2) the phase of aeolian deposition during the latter part of this aggradation was over by the fifth millennium B.C. or perhaps earlier

(3) more humid conditions, probably leading to the subsequent rejuvenation phase then followed, but the rejuvenation of the riverine system is unlikely to have commenced before 1,000 B.C., and conceivably not until Classical times. Copper age material is not a feature of the dry phase, nor, indeed, is the ceramic neolithic. The copper age began in the late fifth millennium, however, as is revealed by a sample for Terrera Ventruas, Tabernas, (Almería) collected by the present writer:-
S-155 (18 g charcoal; 29 cm CO_2) (5570 $\frac{1}{2}$-life)
5370 ± 350 B.P. or 3420 B.C. (subtracting 1950), or with Bristlecone Pine correction, 4220 ± 360 B.C.
(Courtesy of Dr R.L.Otlet). Probably the prevailing conditions were flash-floods and seasonal torrents, interspersed with arid periods, not dissimilar to present-day conditions.

~~The following~~ table summarises the sequence:-

Label/ Line

Level	Caves	Valleys	Climate ?	Fluvial Erosion	Fluvial Swamps
AD					
A	Rendsina soils	Gleys. Eroded surfaces. Occasional sandy and pebble layers.	Cooler, wetter; winter precipitation.	Active. Rejuvenation of valleys: 10 m trench.	Less frequent, owing to fluvial drainage.
B_1	Thermoclastic angular scree.	Thermoclastic scree and soliflucted débris.	Hot summers, cold winters. Low rainfall.	Inactive.	Present where drainage was obstructed.
B_2	Aeolian sands.	Aeolian sands. Loess.	Very arid.	Inactive	Ephemeral
B_3	Large angular scree.	Incipient alluviation.	Rising temperature.	Intermittent torrents	Tending to become less frequent
C_1	?	Sandy clays, palaeosols.	Cooler, wetter.	Slight.	Abundant.
C_2	?	Peat, palaeosols.	Slight rise in temperature, wetter	Inactive.	Abundant.
D_1		Clays, gravels.	Cold, wet.	Inactive.	Abundant.
D_2	Corrosion	Gravels. Erosion surface.	Falling temperatures, wet	Rejuvenation of valleys.	Less frequent, owing to fluvial drainage.

E_1/

E_1	Calcification	Travertine	Warmer, wetter.	Incipient	Occasional swamps due to floods
E_2	Thermoclastic scree	Palaeosol ? Limons.	Hot, dry summers, cold winters.	Inactive	Present where drainage was obstructed
F_1	Erosion features	Gravels	Cold ? Wet.		
F_2		Calcification	Warmer?		
F_3		Limons	Hot, dry summers, cold winters?	Inactive	Present where drainage was obstructed
F_4		Gravels	Cooler, wetter ?	Slight	
F_5		Calcite	Warmer ?	Inactive	
F_6		Clays	Colder, wetter	Inactive	Frequent
F_7		Gravels	Colder, wetter	Inactive	
G_1				Active, rejuvenation of valley by excavation of 70 m terrace.	
G_2			Aggradation of 70 m terrace gravels		

One/

One might tentatively speculate that phases C_1 - F_7 correspond to the period of the Upper Pleistocene equivalent to the time-span of the Würm glaciation. There are some difficulties yet to be resolved. Various caves in south-eastern Spain contain calcite layers due to stalagmitisation. At the Cueva de la Carigüela in Granada province Mousterian artefacts were found both above and below a layer of stalagmite flow (Almagro et al., 1970). There are also various phases of stalagmitisation or of calcification in the middle terraces of the Segura and Vinalopo, as well as the travertine (if that is what indeed it is) from Villena and the calcified breccia from Orihuela. There is no necessity for a cave stalagmite layer to only be capable of chronological correlation with the most recent Upper Pleistocene phase of calcification. The process of stalagmitisation and of clastic cave sedimentation seems likely to have followed obstruction to the drainage of waters inside caves such that their power do dissolve the limestone rock (their speleogenetic capability) is in excess of the provision of suitable egress for the water and its argillaceous solution products.

The conditions for this in northern Spain have been discussed elsewhere by the present writer (Walker, 1966) in terms of caves whose present-day geography is known to have been largely evolved in later or post-Würm times. Their formation must be attributed to periglacial melt-waters highly charged with carbonic acid. A fall in base-level, combined with drier conditions, gave rise in that area to many caves in a state of 'suspended animation', characterised by a lack of dry-season streams and consequent inability for the removal of clastic sediments resulting from winter snow melt-waters and their speleogenetic solutional activity. Other features such as 'inverse erosion' (Walker, loc. cit.) demonstrate that this is what happened. Reversals of drainage of tarns behind moraines following the fall of base-level demonstrate the recent age of some caves, at least, in northern Spain.

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It is not suggested that all caves in northern Spain were of recent speleogenesis — clearly, some contain upper or middle palaeolithic deposits. The same is true of caves in southeastern Spain, though some again could be of recent speleogenesis. Rather, the point which is being made is that the conditions for stalagmitisation and clastic processes depend on such factors as a reduction in melt-waters, a warmer climate, and perhaps some characteristics of the geomorphology which temporarily prevent removal of dissolved calcium carbonate. In other words, the periods of time are likely to be correlated with the warmer or post-incipient phases of interstadials or interglacials.

The Cueva de la Sierra del Puerto, Cieza, (Murcia), shows just such features, and has intense stalagmitisation and large deposits of other detritus (e.g. guano). The Cueva del Agua, Ramonete, Lorca, (Murcia), shows similar stalagmitisation (Walker, 1972a). There also more than one phases of cave development at the extensive Cueva de los Chorros, Riopar, (Albacete), and nearby smaller caves. One, the Sima de los Tiestos, from which copper age material was retrieved, seems to be a typical shaft left in 'suspended animation' following rejuvenation of the Río Mundo (a tributary of the Segura), and other similar shafts are known from the Calar del Río Mundo, the limestone plateau above the valley.

It is possible that such stalagmitisation occurred extensively between the Middle and Late Pleniglacials of Würm, say 38,000 - 30,000 B.C.. This would be in accord with the Mousterian destruction of such stalagmite flows, and with the Villena peat sample estimation. This does not mean that some could not have been earlier, however, nor that in other instances calcite flows might not have been post-glacial. It must be borne in mind, too, that the vagaries of peats, loesses, and stalagmitisation might result in some crucial one or more of these being absent at any given station.

For/

For instance, the peat from Villena might belong to an earlier period than the palaeosol at the base of the 10 metre sequence in the Rambla de Bateig, Elda, (Alicante), referred to earlier on. Only further investigations will resolve this matter. However, it seems a priori unlikely that all the phases of aggradation from C_2 to B_2 inclusive can belong to a narrow period of time commencing no earlier than a time equivalent to Allerød or Younger Dryas in northern Europe. Original Cuenca and the present writer did hold such a view, but this was based upon an archaeological interpretation of the aeolian sands which accepted their neolithic and copper age artefacts as non-intrusive, and which might therefore have continued to be formed until as late as perhaps 2,500 B.C.. The radiocarbon dates from the Abrigo Grande suggest that under no circumstance might a date later than 4,000 B.C. for the commencement of the next, thermoclastic phase of deposition be acceptable, and that conceivably the date of 5,500 B.C. might mark such commencement. It is rather unlikely that all the aggradation could occur in a period 9,000 - 4,000 B.C., and an upper palaeolithic age for the commencement of the 10 metre aggradation of the lowest terrace is more in tune with those very early dates for the termination of the aeolian sand depositional phase., (5,500 - 4,000 B.C.). The clays above and below the turf layer from the Villena bore-hole might suggest that the Late Pleniglacial of Würm was not so marked in southeastern Spain as in other regions of Europe. It might also be remarked that the Rambla de Murta, Agost, (Alicante), sequence mentioned earlier terminates in a layer of loess which Cuenca (1971) equates with the aeolian sands elsewhere. Perhaps this, too, might support the earlier dating of the post-Würmian phase of aeolian aggradations, since other stations, with neolithic and copper age material, are all singularly lacking in loess deposits. Rather, such artefacts where they occur are found in thermoclastic scree soils.

Influence

Influence of Physical Characteristics on Early Settlement

(1) Early Palaeolithic

Next to nothing is known about Early Palaeolithic settlement in the region. That is not surprising considering the extreme nature of Middle and Late Pleistocene erosion which the present writer believes has taken place.

(2) Middle Palaeolithic

A number of Levalloiso-Mousterian industries, sometimes with hand-axes, are known at both open and cave sites. Some of those may be associated with the middle terrace aggradation which the present writer and Cuenca believe to have taken place during a short Würmian interstadial about 40,000 - 30,000 years ago, and with contemporary cave deposits. Hand-axes seem to be a late feature of French Mousterian assemblages, incidentally (Mellaars, 1969). The limestone gravels of this aggradation indicate that local fluvial processes were principally involved.

(3) Upper Palaeolithic

From within the research region, little is known about Upper Palaeolithic settlement patterns. A crude industry including flake-blades with facetted platforms in some cases and signs of use has been found by the present writer at the Rambla de Agua Amarga or Rambla de Agua Salada between Santomera and Fortuna (Murcia). Here, late Tertiary gypsums have been eroded to a depth of 18 - 20 metres. Terraces at + 5 - 10 metres and + 2 metres above the present base-level indicate subsequent aggradations and corresponding erosive phases. The industry lies on the surface of the upper of these two terraces. It is hard to see why settlement should have been chosen by the side of a saline stream, unless the hunting of animals was the aim of those manufacturing the flints. The industry is most uncharacteristic of any named Upper (or Middle) Palaeolithic cultural stage.

From/

A number of possibly Gravettian and Solutrean sites are known both from the coastal dry valleys, and also from the Sangonera-Guadalentín tributary of the Segura system and its tributary streams and canyons. The most famous of these is the Cueva Ambrosio site near Vélez Blanco (Almería) which is a large cave or rock shelter overlooking an active stream which feeds the headwaters of the Sangonera-Guadalentín.

(4) Final Palaeolithic/Early Neolithic

Sites with battered back bladelets and sites of naturalistic animal and anthropomorphic rock paintings are frequently located close to fresh water springs and streams around the upper and middle reaches of very many of the tributaries of the Segura, and a few are known from the Vinalopó basin. Many, but not all, of the sites are caves or rock shelters. Large mammalian fauna inhabited the inland areas. The phase of the occupation sites seems to span particularly the climatic optimum, and to correlate with aggradations of aeolian sands, both in north-facing caves and rock shelters, and also in the valleys.

(5) Advanced Neolithic/Early Copper Age

Evidence about settlement patterns within the research area for this period is not abundant. There is some reason to believe that some cave deposits in thermoclastic scree sediments represents either this phase or subsequent assemblages which were deposited intrusively in them (or both). Possibly subsequent erosion due to rejuvenative trenching in the valley bottoms has removed a considerable amount of archaeological evidence. Some early copper age settlements, however, may be represented on middle terraces before the trenching began. Others may have been removed and their assemblages incorporated into the deposits of phase B_1 , so that artefacts corresponding to the

Neolithic/

neolithic and early copper ages may have been removed by erosion and redeposited on the lower lying flood-plain. This may well have occurred at the El Prado site near Jumilla (Murcia), and perhaps at the Casa de Lara site near Villena (Alicante). Here the matter is complicated by the occurrence of backed bladelets and bifacial flint tools, and pottery, including cardial impressed sherds, in a layer of aeolian sand at Casa de Lara, suggestive of a somewhat earlier date. However, a recent radiocarbon date from the early copper age proto-urban site of Terra Venturas near Tabernas (Almería) determined for the present writer by the Atomic Energy Research Establishment at Harwell (Dr. R.L. Otlet, private communication) indicates that the phase must have begun by 3,420 ± 350 B.C. (Libby half-life), which has been corrected by applying Suess Bristlecone Pine correction to an absolute date of around 4,350 B.C.. Throughout the neolithic and copper ages continuing interest seems to have been manifested towards more inland sites, including rock shelters with cave art, as shown by sherds and flints at many sites.

(6) Later Copper/ Earlier Bronze Ages

By the later third millennium B.C. a considerable number of settlement sites are known from coastal and lower riverine regions. The sites of Almizaraque and El Argar have been mentioned earlier. Some of them are situated on the middle terraces, although subsequent erosion has often eaten into the sites, as at El Argar and La Bastida. The sites were established when the surface of the present lower terrace formed the valley floors, and before the recent trenching to a further depth of -10 metres relative to that surface. In many areas pediments and hill-tops at higher altitudes were inhabited, often with defensive walls. The inland settlement is often of that type. Caves seem to have been used for burials. Rock shelters with paintings manifest a more

schematic/

schematic form of representation, though the fauna seems unchanged. This kind of schematic representation is known from painted and incised ceramics datable to the period 2,500 - 1,750 B.C.. The first finds of wheat, barley, flax, olive, vine, bean and plum cultivation belong to this period. Perhaps that indicates the drying out and suitability for agriculture of the alluvial soils in the valleys.

It is tempting to speculate that from the upper palaeolithic onwards, over-burning and over-grazing of the hinterland may have exacerbated the tendency for a dust-bowl to develop by the fifth millennium B.C., with deposition of aeolian sands and the aggradations which constitute the 10 metre terraces, in phase B_2. In phase B_1 the effects of flash storms and long, drier summers were to superimpose stonier detritus upon the sands in the valley floors and to help to consolidate the valley soils. Thus human agency might have unwittingly been responsible for so changing the ecological conditions that a dependence upon large mammals predominantly was no longer possible, and that a new possibility - agriculture - was now open to exploitation in a way not previously available (because of lack of suitable soils) during the earlier neolithic and copper ages .

The changes in local ecological conditions may have commenced earlier in Almería than further north in Murcia and Alicante, and they may have led to the earlier agricultural exploitation of the valley floors in northern Almería. One reason why that could have happened is that it is the region which seems to have been most exploited from the standpoint of metal ore extractions from earliest times, and deforestation would have been a concomitant of metal-smelting over and above deforestation due to over-stocking the pastureland with cattle and allowing wild herds to overbreed. Native silver, copper, argentiferous lead, tin and iron were all extracted from the Sierra de Almagrera

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in antiquity (E. Hernández-Pacheco, 1947, pp. 40, 45). Timber would have been much in demand for smelting, buildings, ship-building, and so on. The Phoenicians and Iberians exploited the ores around Herrerias, and it is more than likely that the tell of Almizaraque represents an even earlier exploitation in the later copper age.

In fact, throughout the metamorphic and igneous hills that extend from near Cartagena westwards as far as Granada province, argentiferous lead, tin and copper were extensively mined in antiquity. Gold was extracted from the rivers Darro and Genil (Granada) and they may have been the source of gold objects found in later copper age and earlier bronze age assemblages. The coastal hills of Murcia and northern Almería, now denuded and barren, may once have been well stocked with timber. It is known that over-population of southeastern Spain in the final phase of the Moorish domination at the end of the Middle Ages led to over-grazing and deforestation for construction and smelting, continuing a tendency which had been going on through Roman and earlier times. Following the Moorish expulsion, new farmers from northern Spain colonised the lands. Tree-felling was a cheap source of making the lands pay their way, and of providing ships for the Catholic monarchs and Habsburg kings whose American possessions provided the gold with which the timber was bought for the ships which those possessions demanded. The present barrenness of the hills has been exacerbated by mining into recent times, by perhaps over-cropping alfa, hemp and esparto grasses and over-grazing by sheep, both of which provide but a miserable livelihood for the small farmers in the hills which will support little else, except olives and almonds. The present ruined garrigue landscape of the hills is thus the consequence of thousands of years of human folly and myopia. The hills can only be made fruitful to-day by inland reservoirs and deep artesian wells, and the vine, olive and fruit-trees are beginning to appear once more in response to modern agricultural technology.

The/

The huertas of the valleys represent the consequences of erosion, too, aided by suitable geomorphological factors, as described earlier. Their presence is a recent phenomenon, and follows the recent rejuvenation from the 10 metre terrace with corresponding redistribution of alluvia. This may largely correspond to post-Roman activity of the river systems and Moorish irrigation canals. But there may have been an earlier, smaller huerta available for agriculture from the late third millennium onwards, as has been mentioned.

However, many of the later copper age and earlier bronze age settlements are related to hill-tops and pediments, as has been said. Often, these are either intrusive metamorphic or igneous outcrops, or the red gravels of the very early aggradation which contain metamorphic and igneous rocks. Sometimes these seem to have been redistributed at later times, for instance, at the time of aggradation of the middle terraces. Sometimes, too, in coastal areas, the terraces are of these rock pebbles, rather than limestone pebbles, reflecting the local petrology. Now the occurrence of settlements at many sites of metamorphic and igneous rocks is interesting because of the utilisation of those rocks for polished stone implements until well into the bronze age in considerable numbers. Also, some of these intrusions were favoured for ceramic fillers, especially the jumellite minerals from near Jumilla, (Murcia). The occurrence of extensive signs of occupation on the Monte del Castillo, Lorca (Murcia) close to the ancient red gravels, or at the igneous outcrop of Monteagudo (Murcia) can hardly be unrelated to the geological characteristics of those sites, for example. The plentifulness of rocks for making polished stone implements may well explain why, despite the presence of mineral ores, it might not have been considered worth the expenditure of energy and time to exploit the latter as fully and exclusively as might have been anticipated. Flint, too, is commonly used into the bronze age, and is plentiful in the Cretaceous limestones of southeastern Spain. If, with the

exception/

exception of the northern Almería copper age settlements perhaps, most of the copper age settlements of the Segura and Vinalopó basins were inland and away from the coast, engaged in hunting and/or herding large mammals as the basis of their economy, then it is only to be expected that most of the major sites are away from the coast and that local and plentiful mineral sources of stone should be used for tool-making rather than metal, which had to be brought from over 50 kilometres away and would have occupied too many people exclusively for too many days a year in metal-obtaining, and non-agricultural, 'wasteful' activity. There is evidence for urban specialists in some places, as can be seen from the techniques of potting and implement manufacture, especially metal implements. These points may be borne in mind for future discussion about the development of the neolithic and copper ages, and ceramic technology.

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III

A SKETCH OF THE PALAEOLITHIC SEQUENCE

Relevance to Neolithic Origins

Early and Middle Palaeolithic

In which are outlined the earliest stations in the region, mainly Mousterian sites, with a note on the possible age of the Mousterian in the area.

Upper Palaeolithic : Early and Solutreo- Gravettian

In which an attempt is made to resolve a confusion, to point out the possibility of some mistaken Solutrean attributions, thereby indicating the flimsy nature of the grounds for identifying Levantine rock paintings as being of Solutrean age, to discuss the possible absolute date of the Solutreo-Gravettian of southeastern Spain, and to sort out those sites which might belong to the Solutreo-Gravettian proper, from others which might belong to either the Gravettian or to the earliest neolithic cultures within the research area.

Upper Palaeolithic : Magdalenian and Artistic Plaques

In which a slight digression is made into painted and engraved stone plaques in the eastern Spanish Magdalenian.

Ibero-Mauritanian, Capsian and the Peninsula

In which an attempt is made to clarify terms, and refute the view of North African contacts in the closing stages of the Upper Palaeolithic.

The Later Upper Palaeolithic : An Essay in Diversity

In which the Epigravettian and geometric flint assemblages are discussed and a Neothermal Period date in the sixth millennium B.C. is proposed as appropriate for most sites on the grounds of parsimony

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This is divided as follows:-

(1) Later/Upper Palaeolithic Assemblages of Early Date

Cueva del Parpalló; Hoyo de la Mina; Cueva de les Mallaetes; Barranc Blanc; Cueva de les Meravelles; Cueva de las Perneras; ~~Cueva de la Tazona~~; Balma de Sant Gregorí; Cueva del Filador.

(2) Later/Upper Palaeolithic Assemblages of Pre-Neolithic Age

Hoyo de la Mina; Cueva de les Mallaetes; Cueva de les Meravelles; Balma de Sant Gregorí; Cueva de la Cocina; Covacha de Llatas; Cueva d' En Pardo.

A SKETCH OF THE PALAEOLITHIC SEQUENCE

Relevance to Neolithic Origins

Dogmatic opinions, which will be criticised later, implicating extra-Peninsular origins for the neolithic, have given rise to beliefs about later palaeolithic ('epipalaeolithic' or 'mesolithic') assemblages, which, however, sometimes contain artefacts that one might on other considerations desire to classify as neolithic — ceramic artefacts, for instance. Furthermore, some artefact types occur from upper palaeolithic times down to copper age times (e.g. geometric flint blade artefacts), and these do not seem really very specific for any special phase of early prehistory despite their having been claimed frequently as identifying a 'mesolithic' . The present writer's own excavations, to be described in the next chapter, at a later palaeolithic - earlier neolithic transitional site, have produced backed flint bladelets. It is essential, therefore, to devote some time to Gravettian, 'Epigravettian' and later palaeolithic backed bladelet assemblages in south-east Spain in order to assess that aspect of the earlier neolithic. Finally, a striking resemblance between bifacially worked flint points of upper palaeolithic age and similar neolithic and copper age flint points has been noticed by many authorities. Some of the upper palaeolithic sites must be discussed, not so much from the point of view of possibly continuing traditions through to the neolithic, but rather because some so-called upper palaeolithic sites may in fact have been wrongly thus attributed, being indeed of neolithic age. It is important, therefore, to consider many of the upper palaeolithic sites in the first place, to consider the firmness or otherwise of their attribution, and then to present an account of the earlier neolithic, when it will be proposed that there was a considerable indigenous element capable of being related to later palaeolithic assemblages.

Early/

Early and Middle Palaeolithic

Almost nothing is known of the early palaeolithic in the Segura and Vinalopó river basins. An implement said to have been a 'discoidal biface' or maybe a 'pebble tool' was found in gravels in the Rambla de Lébor, Totana (Murcia) (Martínez Santa-Olalla et al., 1947, p. 19), but no illustrations were given, and its present whereabouts is unknown. There are no clear indications of particularly ancient Quaternary alluviation in the vicinity, and in any case bifacial tools seem to have been used quite late in Mousterian, middle palaeolithic times (Mellaars, 1969, and see below). Near the Segura headwaters, in the Guadalimar valley (Jaén) various sites have yielded up respectively (a) a Mousterian assemblage with disc cores, (b) a collection of hand-axes, (c) an assemblage of facetted platform flakes, of which some were worked into hand-axes (Breuil & Obermaier, 1914, pp. 243 - 247 Bru 1961, 23). A small ovate hand-axe was illustrated by the same workers from the Cueva de las Calaveras (Còva de les Calaveres), Benidoleig, (Alicante) (ibidem, p. 251), and an upper palaeolithic assemblage was found in the same cave. The implements in the Museo Arqueológico at the Diputación, Alicante are a nondescript collection, though they have been described as 'evolved Mousterian' (Jordá, 1951, p. 65) and as containing Mousterian and Solutrean artefacts (Almagro, 1947a, p. 276, p. 316). At the Cueva Negra (Còva Negra), Játiva, (Valencia), evolved Acheulian hand-axes were stratified below Mousterian layers (La Labor de SIP ... 1951, 1952, pp. 39 - 41; Fletcher, 1956, pp. 67 - 74, 1956a, pp. 846 - 853).

Mousterian artefacts were found at the Cueva del Cuervo, Ondara,(Alicante)(Breuil & Obermaier, 1914, p. 252). Near Alcoy, (Alicante), Mousterian artefacts were found at various stations. One of these is the Cueva del Salt (Còva del Salt) (Tarradell, 1963, p. 16). The present writer has visited this site, which is an open

site/

site, not a cave site, below a cirque of limestone cliffs over 50 metres in height. The excavations, which were never published, encountered Mousterian material at over -5 metres below ground level according to the curator of the Museo Visedo Molto, sr. V. Pascual . Back-filling prevents the section from being studied, but more recent deposits, including what may be a thick layer of aeolian sand, can be seen at higher levels above the back-filling in the cuttings. At another open station near Alcoy, known as Els Dubots, hand-axes, 'Clactonian' chopping tools, and Mousterian implements which included 'Audi' knives on both blades and flakes of 'Aurignacian' type (? c.p. so-called 'Chatelperronian knives ?), as well as copper age artefacts, were collected (Pericot, 1946, pp. 355 - 356; Taracena, 1951, p. 43). At the Cueva del Pastor, Alcoy, a Mousterian assemblage in transition to the 'Aurignacian' was reported (Jordá, 1956, p. 224).

A rich Levalloiso-Mousterian assemblage was excavated at the Cueva del Cochino, Villena (Alicante) in the Vinalopó valley (Soler, 1956). The assemblage was sealed below a calcite layer and was in thermoclastic sediments. It has been proposed that this belongs to a Würm age interstadial, with Mousterian habitation during phase E_2 of the schema outlined in the previous section (Cuenca, in press). An open site with Mousterian material is mentioned from Aspe in the Vinalopó valley, but little of this is known (Obermaier, 1924, p. 195; 1934). Equally little is known of a Mousterian site at the Cueva del Ciervo, probably in the same vicinity (Explicación .... Elda, 1950, p. 95). It is said to be 'typical' Mousterian.

From the Segura basin, a Mousterian collection with disc cores was made by Breuil at the Rinconada del Canalizo de El Rayo, Minateda, Hellín, (Albacete) and was compared by him with assemblages found elsewhere in southeastern Spain by L. Siret (Breuil, 1928, pp. 15 - 17). Some of the artefacts are displayed at the Museo de Prehistoria,

Prehistoria, Valencia.

The Grupo Espeleológico de Cieza of Cieza, (Murcia) possesses a collection of Mousterian artefacts (plate LXXXVIII) made by the late Dr. Gregorio Parra of Cieza. It is unclear exactly where they were found, but one view is that they came from gravels at the foot of the Sierra de Azoy where small hillocks which rise to between 280 - 300 metres above sea-level represent the high +75 metre terrace of the Segura. The middle terrace gravels represent a bench at about 200 - 220 metres above sea-level and the +10 metre terrace rises at the margins of the huerta in the present valley floor.

It is interesting that just south of Cieza, the Segura passes through a geological barrier, and it is likely that temporary swamps built up in the region of the present city. Similar phenomena seem to have been likely at Villena and in the region around Aspe - Novelda in the Vinalopó valley, where other Mousterian sites have been earlier mentioned.

The present writer visited the supposed site of collection of the Cieza Mousterian implements on the north-west bank of the Barranco de la Serrana, a dry water course, but found no artefacts. Examination of the collection suggests it may be mixed, and it is possible that some of the pieces illustrated here came from Minateda, further upstream. Ninety-six pieces are on poor quality flint, often calcareous, as at Minateda, or on quartzite. One group of twenty-four artefacts is characterised by maximal dimensions exceeding 100 millimetres. Another group of artefacts has dimensions in the range 40 - 80 millimetres. Thus there is a discontinuity in the maximal dimensional distribution of the collection. The larger tools consist of chopping tools and scrapers on both plane platform and on facetted platform plakes. There are also crude picks. The eleven scrapers of this group have retouch along one, two, or three edges. The group of smaller implements comprises flint flakes and flake-blades, of which forty-three are rectangular, subrectangular or convex scrapers, with retouch around three sides or the convex margin. There are also two crescentic

eutic pieces, eight retouched flake-blades, and fourteen flake-blades worked to awl-like points. One retouched flake-blade is shaped into a regular elliptical shape. The retouch is moderate, never invasive. It is suggested that the larger implements are Levalloiso-Mousterian with a chopping tool element. The collection is similar to other Spanish Mousterian assemblages (c.p. Freeman, 1966).

An assemblage of bluish and reddish quartzite Mousterian implements was said to occur near the Fuente de la Zarza in the mountains between Jumilla and Fortuna, (Murcia) (Explicación .... Fortuna, 1953, section VII no. 1). Investigations by the present writer revealed no Mousterian artefacts, but an interesting later palaeolithic or earlier neolithic flint bladelet industry (see below) .

At the Cueva de las Perneras in the Mazarrón - Lorca area of Murcia, L. Siret excavated Mousterian assemblages stratified below upper palaeolithic assemblages. The section shows seven layers, with the lowest five containing Mousterian and 'Chellean' artefacts (Siret, 1893, p. 491, fig. 1). A disc core is shown (ibidem, p. 498, fig. 19), and such characteristically Mousterian forms on flint and quartz as side-scrapers, transverse scrapers, points, denticulate pieces, etc.(ibidem, p. 498, fig. 20, p. 499, figs. 21 - 23). By 'Chellean', Siret seems to have understood any large flint or quartz artefact, not necessarily primitive bifaces. Siret called the upper layers Solutrean and Magdalenian, respectively (see below).

A deeps stratigraphy has allowed a Mousterian sequence to be demonstrated at the Cueva Negra (Còva Negra), Játiva, (Valencia). As has been said, the lowest layer contained two bifaces. Above this there was a non-characteristic flake assemblage, said to be 'Levalloisian' or 'Tayacian' (Jordá, 1946, pp. 11 - 29). The next layer contained a chopping tool, but was otherwise sterile during Fletcher's

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campaign (La Labor del SIP ..... 1951, 1952, pp. 39-41), but in Jordá's excavations it was followed by an archaic Mousterian with chopping tools, according to that worker. Next there was a described a 'Typical' Mousterian with Audi or Chatelperronian backed knives on flakes and flake-blades. Jordá states that two layers of facetted plat- form Mousterian (Levalloiso-Mousterian) artefacts completed the sequence, and contain so-called African elements of proto-Solutrean type The first of these layers had triangular points, one with a pedunculate tang (Jordá, 1946, p. 26, fig. 9) and Chatelperronian knives are also illustrated. Above these were stubby points with only a hint of shoulder or tang, and blades with unifacial invasive retouch (ibidem, fig. 10, p. 27) which could perhaps be 'proto-Solutrean', although not conforming to known types. Other Mousterian assemblages investigated by Jordá included a cave near Bellús, Játiva, (Valencia) and the Cueva de la Pechina (Jordá, 1947).

Siret (1931) refers to Mousterian material from the uppermost terrace of the Almanzora river. The Cueva de la Zájara I, Cuevas de Almanzora, gave four levels and a total depth of deposits of -4 m (Siret, 1931, p. 288). The assemblage comprised 7,500 pieces of flint including 200 points, 600 racloirs, 70 notched pieces, 40 burins, 70 bifaces, 100 disc cores, and 150 other cores. Almagro (1947a, p. 276) compared the points to those from the Abri Audi in France. It is interesting that the second cave, Cueva de la Zájara II, also contained some disc cores, although the remainder of its assemblage seems to have been Upper Palaeolithic (see below).

From Granada province the Mousterian is represented at the Cuevas de la Carigüela, Piñar, but Spahni's excavations there in 1954-5 have still not been fully published (Pelliger, 1964, pp. 15-17). Further work is being carried out by Professor H.T. Irwin and Professor Almagro currently (Almagro et al., 1970).

An analysis of the Mousterian implements using the French cumulative graph 3:8

graphical method suggests a Levalloiso-Mousterian industry (de Lumley, 1969), although it is not stated whether or not that industry was evenly distributed throughout the seven Mousterian layers apparently identified by Spaard (Pellicer, 1964, pp. 15-17). Both the Cueva Negra and the Carigüela sites have given Neanderthal bony remains. The Carigüela has important neolithic remains also (see below). Other Granada palaeolithic sites are known in less detail: an open site at Fuente de la Zarza, Piñar (Obermaier, 1924, p. 192; 1934), and three sites near Moreda, of which the first two are caves, the third an open site, called respectively Puntal, Horá, and Llano de Huélago (ibidem), and four sites near Iznalloz, namely, Loma del Rubio, Llano de la Venta de las Navas, Venta de las Navas, and Haza de la Cabeña (ibidem). It has been claimed that those sites represent a Mousterian-Aurignacian transition, but Jordá (1951, p. 65) states that they lack convincing Chatelperronian knives, and are really an 'evolved' Mousterian.

It has been proposed that Mousterian assemblages with hand-axes in France represent a late development of Mousterian traditions (Mellaars, 1969). The Mousterian in Western Europe is usually held to have lasted until the end of the Middle Pleniglacial of the Würm ice-age. The Middle Pleniglacial, as defined by Dutch geologists, was followed by a brief interstadial (Denekamp interstadial) around 28,000 years B.P. according to radiocarbon determinations (van der Hammeren et al., 1967), though the accuracy for such determinations in the later Pleistocene is open to much speculation. There was also a warmer event within the Middle Pleniglacial (Hengelo event) around 38,000 years B.P. (ibidem). It is possible that the calcite layer at the Cueva del Cochino, Villena, (Alicante) of phase E_1 attribution might have been formed during an interstadial at or towards the end of the Middle Pleniglacial (see previous section), and that therefore the underlying Mousterian assemblage might also be roughly contemporary with the later part or termination even of the Middle Pleniglacial of Würm. Whilst ~~rather speculative~~, it has the merit of being an economic chronological

hypothesis. A calcite layer occurred in the fifth of the eleven layers identified by Spahni at the Cueva de la Carigüela, and sealing the Mousterian layers. More recent work has subdivided further these lower layers (Almagro et al., 1970). There seem to be at least two phases of intensive thermoclastic activity represented in these lower layers.

Upper Palaeolithic : Early and Solutreo- Gravettian

It is very difficult to make a case for continued occupation from Mousterian to upper palaeolithic times at any southeastern site. The upper palaeolithic is important from the point of view of neolithic origins, as will be argued in this and subsequent chapters. Throughout the upper palaeolithic the nomenclature of sites, cultures and periods is extremely confused in south-east Spain. Thus "Capsian" has been used by some (e.g. Obermaier, 1924; Pericot, 1942, 1942a, 1947) to refer to assemblages which have nothing in common with the Tunisian Capsian (Balout, 1955; and see below). Aurignacian is often used sensu lato (e.g. Obermaier, 1924; Almagro, 1947), in contrast to the modern, narrower usage (de Sonneville-Bordes, 1960, pp. 44 - 60).

There is no southeastern site which is comparable with the Aurignacian as defined by the Aurignacian I - IV at La Ferrassie in France. If Chatelperronian backed knives on blades may be interpreted as developments of Mousterian Audi-type backed knives on flakes (Lynch, 1967; Movius, 1969), and if the French "lower Perigordian" is discounted as a cultural entity, then the Cueva Negra, (Valencia), backed knives might be considered as representing a transition from Mousterian tool-kits to possibly Aurignacian tool-kits, as also might the implements from Haza de la Cabaña in Granada. Possible backed knives have also been reported from the open site of Els

Dubots/

Dubots, Alcoy, (Alicante) (Pericot, 1956, pp. 355-356) and the Cueva del Pastor (Alicante) (Jordá, 1956, p. 224). Possibly the only testimony to true Aurignacian traditions in southeastern Spain, however, is a bone point from the Cueva de les Mallaetes, Barig, (Valencia) (Jordá 1954, p. 16). Otherwise, one must look towards Catalonia or the Cantabrian area to encounter the Aurignacian in the Peninsula.

The Gravettian, and at a later stage, the Solutreo-Gravettian are well represented and of greatest importance to a consideration of neolithic origins, as will be demonstrated later on. Basically, microlithic artefacts of Gravettoid aspect may be found in neolithic assemblages. Moreover, some Solutrean bifacial points strongly resemble later bifacial flint points, and it is likely that there has taken place not a little misattribution of particular artefacts and sites as between Solutrean on the one hand, and neolithic/copper age on the other. Finally, the way in which the Solutrean and Gravettian traditions become mixed in southeastern Spain is itself a curious matter.

The characteristically Gravettian flint implement is a backed blade with retouch along the straight edge (unlike the so-called Chatelperronian knife, where it is along the convex edge). It has been suggested that the Gravettian implement is a point whereas the Chatelperronian form is a knife (Lynch, 1967, p. 183). The flèchette is also described as a characteristic Gravettian form, being a blade which is pointed at both ends, made by blunting retouch on various parts of the blade, not necessarily just one margin . Some writers use the word Aurignacian in a broad sense to include the Gravettian (thus Almagro, 1947a, p. 309) though a glance at the accompanying illustrations usually reveals when this is the case, as in the example quoted.

It is hard to argue for an independent Solutrean in southeast Spain. Further north, the Solutrean appears to be more clearly differentiated. But even at the Cueva del Reclau Viver,(Gerona), in Catalonia, backed blades are a feature of all the upper palaeolithic

complexes, Aurignacian, Gravettian and Solutrean, and, indeed, the Solutrean there includes quite acceptable Perigordian IV Gravette points (Corominas, 1956). At the nearby Cueva de Bora Gran d'En Carreres the Magdalenian also contained backed blades. It has been proposed that the Solutrean developed from the Gravettian, despite the differences of flint-working techniques. Other views relate the Solutrean to the North African Aterian complex, which has barbed and tanged points (thus Fletcher, 1956a, p. 865 ff., and implied by Jordá, 1946). Certainly, the resemblance of these to points to those of the Solutrean at the Cueva del Parpalló, (Valencia), continues to receive comment (thus Howe, 1967, pp. 171-172), despite severe chronological difficulties. The Aterian ends at the Haua Fteah, (Libya), before 40,000 B.C. (McBurney, 1967), and even allowing for a longer duration of the Maghreb Aterian, it is hard to see how it could have overlapped with a European Solutrean dated to 20,000 - 15,000 B.C.. Moreover, the radiocarbon determination for the Solutrean level at the Reclau cave in Catalonia is lower still (ca. 11,000 B.C., see below). Within the European Solutrean, the appearance of barbed and tanged points is held to be a late phenomenon, and those from the Cueva del Parpalló can hardly be earlier than 15,000 B.C.. The lack of ship-building technology is generally believed to have been an obstacle to trans-Mediterranean upper palaeolithic contacts. Even if primitive canoes or rafts had been constructed, and information is quite lacking on that score, there are severe navigational problems for light sailing craft between North Africa and Spain, as has been stated earlier (and see Jáuregui, 1949). A European or an indigenous origin for the Spanish Solutrean seem to be simpler hypotheses for the moment.

A Gravettian assemblage which could well be early was found in the Cueva de la Zájara II, Cuevas de Almanzora, (Almería), excavated by L. Siret (1931, p. 289). The site is called Aurignacian (*sensu lato*) by Almagro who illustrates a backed blade, and also assumes that

the 'II' means layer II, when in fact it refers to the second of two caves (Almagro, 1947a, p. 309). Breuil (1913, p. 172, fig. 5 no. 4) also illustrates a backed blade from the site. Siret states that the deposits were -2.5 m in depth and contained 180 blades (some microlithic, some large), 20 end-scrapers on blades, 8 scrapers on flakes (some microlithic), 25 burins, 10 chisel-like spalls (one of quartz or rock crystal), 5 Gravette points, 28 disc cores, 500 unretouched flakes, some Dentalium shell beads, and various perforated shells of Pecten and other kinds. The disc cores are curious, and suggest at once links with the Mousterian. However, other aspects of the assemblage apart from those might well allow it to be situated anywhere within the upper palaeolithic down to the onset of the neolithic. The disc cores are unfortunately not illustrated by Siret, though he seems to have been clearly acquainted with disc cores as a Mousterian phenomenon having illustrated one from his Cueva de las Perneras Mousterian excavation (see above) and found no less than 150 at the adjacent Cueva de la Zájara I Mousterian site. If, however, the two caves at La Zájara were very close together, it is possible that an earlier Mousterian occupation might have been raided for flint by a later cultural group using a different, more microlithic tool-kit. The status of Cueva de la Zájara II, therefore, is extremely difficult to evaluate.

In the upper levels at the Cueva de las Perneras, (Murcia), above the Mousterian deposits, Siret found upper palaeolithic artefacts which he called Solutrean and Magdalenian. His published section shows only two, or possible three, stratigraphic layers, though he described seven, presumably arbitrary spits. The section further seems to suggest that all the layers were sealed by a thermoclastic talus with large boulders embedded in it, and possibly by a calcite layer. Perhaps a calcite layer formed in climatic phase C_2 was followed by talus formation in phase B_3. If this were, indeed, the case, it would suggest that the deposits were undisturbed palaeolithic layers. Over 100,000

pieces/

pieces were said to have come from the excavations, of which the majority were on quartz, and of which about one thousand pieces were of various artefact types. Unfortunately, the excavations never received full publication, the whereabouts of the lithic assemblage is unknown, and, indeed, so also is the location of the cave itself. Apparently it was situated in the hills between Lorca and Mazarrón (Murcia), perhaps near the Rambla de Ramonete where Siret had a house and where the two municipal districts are contiguous close to the sea. (However, at an earlier time the present municipal district of Águilas, where Siret lived also, formed a part of the Lorca district, so the site might be anywhere between Águilas and Mazarrón.)

The upper part of the Mousterian levels was apparently said to show "tendances solutréennes", though these were clearer in layer 2 above. Three "Solutrean" pieces were illustrated, a scraper, a foliate flake with steep marginal retouch, and an unretouched blade (Siret, 1893, figs. 29, 33, 34, p. 501). If the foliate flake is the laurel-leaf blade referred to from the cave by Almagro (1947a, p. 316), then the latter description is quite wrong. The implement illustrated by Siret quite lacks invasive retouch and might almost be Aurignacian (sensu stricto) . Breuil illustrates a doubly truncated blade with two supposedly burin blows at two corners (Breuil, 1913, p. 178, fig. 10 no. 2), but this looks suspiciously like a trapeziform arrow-point. It is now quite impossible to say what the assemblage(s) present at this site may have been, but one may safely say that the published accounts do not clearly illustrate their Solutrean nature. Breuil went so far as to comment,

> "Dans le sud de l'Éspagne M. Louis Siret a signalé une très petite feuille de laurier cassée à las Perneras, mais malgré le soin mis à ses fouilles, on peut craindre que dans ce gisement, en partie remanié, quelque erreur bien excusable n'ait été commise, ou que l'objet, à aspect prèsque néolithique, ait pénétré accidentellement dans une assise sous-jacente de caractère différent. En tout cas le solutréen manque entièrement .... dans la péninsule Ibérique ... "
>
> (Breuil, 1913, pp. 191-192).

Two points arise from the fore-going. One is that in the absence of comparable Spanish Solutrean assemblages capable of reference to the French Solutrean at the time Breuil was writing, he felt unable to accept as Solutrean a number of artefacts purported to be Solutrean from south-east Spain. The subsequent discovery of good Solutrean assemblages at the Cueva del Parpalló, (Valencia), and the Cueva del Reclau Viver, (Gerona), in eastern Spain, is beside the point when it comes to considering isolated, sporadic flint pieces at other sites. To-day, as sixty years ago, the possibility that some bifacially worked pieces may equally well be Solutrean on the one hand, or neolithic/copper age on the other, must not be neglected, as Breuil properly recognised. Secondly, the point illustrated by Siret (1893, fig. 33, p. 501) is hardly "très petite" (Breuil's description), being about 60 millimetres long. One may wonder if Breuil had not confused it with the much smaller point , which does indeed show invasive retouch, illustrated immediately above the implement from Perneras (Siret, 1893, fig. 31, p. 501) which is only 22 millimetres long, but which, in fact, did not come from Perneras, but apparently from another cave in the vicinity, the Cueva de la Vermeja or Cueva de la Bermeja. Nowhere does Siret qualify the Perneras implement as especially laurel-leaf in shape, rather he refers to it as leaf-shaped ("en forme de feuille"). However, the point from the Cueva de la Vermeja is described as laurel-leaf in shape. Apparently there were three cultural layers at that cave , Mousterian, Solutrean and Magdalenian (Siret, op. cit.), and other artefacts described are "bec de flute" burins, and blades. Perhaps Almagro was following Breuil in ascribing the laurel leaf point to Perneras, therefore. However, the confusion does not end there. To make matters worse, Siret illustrated the point with invasive retouch in a second publication (Siret, 1931, p. 292) but stated that it came from the Cueva del Serrón, Antas, (Almería). In this article, a crude, larger, roughly triangular piece with invasive retouch is illustrated as the laurel leaf point from the Cueva de la Vermeja (ibidem, fig. 20, p. 291). The actual provenance of the laurel leaf point with invasive

retouch/

retouch is not only unclear, but cannot definitely be said to be any of the caves where Siret referred to a "Solutrean" layer (Perneras or Bermeja).

It follows that the Cueva de las Perneras can at best only be considered as a transition from Mousterian to uncertain upper palaeolithic layers, and that there is a possibility that the so-called laurel leaf point came from a cave which was in another province (Almería — the Cueva del Serrón). The status of the "Solutrean" at Perneras and Bermeja must be regarded as questionable.

The Cueva del Serrón, Antas, (Almería), is of interest. Here a stratigraphy, uniform at all depths 1.5 m thick was excavated in spits (Siret, 1931, p. 290), the uppermost of which contained small discoidal bifaces (perhaps discoidal scrapers), a number of irregular small bladelets, various flint cores, and some microlithic backed bladelets of Gravettoid type. There were also found during the excavations two nucleiform worked pieces (pyramidal scrapers ?), four burins on the corners of blades (two blades each showing two burin blows; Noailles burins ?), other burins on the angular margins of flakes, several so-called chisel-like burins, two bec de flute burins, one shouldered "Solutrean" point, the illustration of which shows it to be a crudely shouldered blade with some trimming retouch also at the point so that it looks more Gravettoid than Solutrean (ibidem, p. 291, fig. 1a), one rather crude barbed and tanged point with retouch on one surface only which might be of Parpalló Solutrean type (ibidem, p. 291, fig. 2a) and similar patina to the rest of the assemblage, and some 26 leaf-shaped points with invasive retouch on one surface (ibidem, p. 291, fig. 2b), which, from the illustration, would seem to be pointes à face plane . Subsequent excavations (Fortea, 1970) do not seem to have yielded the same identifiably Solutrean forms, but a Gravettoid and generalised upper palaeolithic.

The results of these recent excavations will be discussed in an appropriate section on later upper palaeolithic backed bladelet assemblages. It is admitted by Fortea that the Cueva de la Palica, Serrón, Antas, (Almería), where he excavated may not have been the Cueva del Serrón excavated by Siret, though he also points out that at the Cueva del Serrón, as at other southeastern Spanish sites, identifications of Solutrean artefacts may be incorrect. Fortea also mentions two other sites on the hill of Serrón, the Cueva de los Tollos and the Cueva de las Palomericas. Siret refers to sites of similar names (see below) but is always specific that they are in the Lorca-Mazarrón region of Murcia province. Since the Sirets spent their childhood and working life in that very area, it is hard to accept that these two sites are in fact located on the Serrón hill, Antas, (Almería province). Some of the flint débitage from the Siret's excavations is in the Almería Museum, but not the worked pieces.

At the Cueva del Serrón Siret's earlier article (1893, p. 503, fig. 48) illustrates clearly a so-called Noailles burin, as also a discoidal scraper (ibidem, fig. 51) and a backed bladelet (ibidem, fig. 48). The burin and the scraper are said to have come from the middle level or spit, the backed bladelet from the upper one. In Fortea's excavations, too, the smaller implements and backed bladelets were found in higher situations in the deposits. Siret referred to such microlithic artefacts often as "Magdalenian" (which they are not, of course), as he did in his earlier paper. In his 1931 article he only mentions the Solutrean upper palaeolithic implements. Two backed bladelets and a backed, truncated rod are also illustrated from the site by Breuil (1913 p. 172, fig. 5, nos. 7,8,9). The retouch is along the straight edge of the blades whose convex edge is not retouched, a typically Gravettian flint-working technique.

The Cueva del Serrón demonstrates the Solutreo-Gravettian typological mix which is found at other eastern Spanish sites outside the research region, and the more generalised microlithic Gravettoid assemblages which often followed it. The latter will be dealt with in detail later on.

The Cueva de los Palomaricos or Cueva del Palomarico (or Palo Marico, sic, Siret, 1931, p. 291, fig. 2b legend) , was also in the Lorca-Mazarrón(-Águilas ?) region of Murcia. Siret described as characteristically Solutrean a shouldered point from that cave (Siret, 1893, p. 501, fig. 35; 1931, p. 291, fig. 2b),which is also illustrated by Breuil along with another backed point (Breuil, 1913, p. 172, fig. 5 nos.1,2), but without comment on their cultural typology. There was also a truncated blade (Noailles burin ?) and a Dentalium shell from the cave (Siret, 1893, p. 503, figs. 42, 54), and Breuil illustrates two Noailles burins (1913, p. 178, fig. 10, nos. 1,3). It is interesting/

esting in view of the possibly Solutrean shouldered points to comment that in the Périgord such Noailles burins characterise the Perigordian V_3 at La Ferrassie level L, which, by analogy with the radiocarbon dates from the Abri Pataud, should give a date of around 20,000 B.C. for that phase of the Gravettian. However, both shouldered points and perhaps similar burins may be much later in southeastern Spain (see below).

Other possibly Solutrean flints from Murcia include two pieces with flat flaking from the Cueva de los Tollos (Siret, 1893, p. 501, figs. 30, 32), but as the site also had neolithic remains, the flints could be later (Siret, 1931, p. 292).

There is considerable difficulty in distinguishing between Solutrean and Gravettian on the one hand, and also between Solutrean and neolithic/copper age, on the other, in certain cases. Nevertheless, there are established Solutrean sites in the south-east, such as the Cueva del Parpalló, (Valencia) (Pericot, 1942a), Cueva de Covalta (Còva de Covalta), Covacha de Barranc Blanc, (Valencia) (La Labor del SIP .... 1953, 1954, pp. 37-39), and further north in Catalonia at the Cueva del Reclau Viver (Còva del Reclau Viver), (Gerona), (Corominas, 1946; 1956), the Cau de les Goges, and Sant Julià de Ramis, (Gerona). (Wernert, 1923). Nonetheless, the presence of Solutrean assemblages in Valencia and Catalonia does not demand that they be present further south. If a Solutreo-Gravettian, indeed, is present at the Cueva de la Vermeja, the Cueva de los Palomaricos, and the Cueva del Serrón, then it seems reasonable to propose an early date by analogy with the Périgord Gravettian. Yet such an early date would be several thousand years earlier than at the Reclau cave (see below).

In addition to the Cueva del Serrón, there are two other sites in Almería which have Solutreo-Gravettian assemblages. At the Cueva de los Murciélagos, near Lubrin, there were deposits 1.5 m thick. The excavations provided three shouldered points described as "solutréennes

absolument/

absolument caractèristiques" (Siret, 1931, p. 289, p. 291, fig. 1, nos. c,d,e), along with many blades, scrapers, large burins, three or four Gravette points, various quartz crystals, and three pieces of obsidian, possibly water-worn and perhaps picked up from the sea shore some kilometres distant. It is a convincing assemblage of Solutreo-Gravettian type (Almagro, 1947a, p. 316, and p. 308 fig. 35; Jordá, 1954, p. 18), though Pericot refers to the site as Gravettian (Pericot, 1950a, p. 61).

The other Almerian site is the Cueva Ambrosio, near Vélez Blanco, which comprises two large rock shelters in an impressive situation overlooking a small stream in the headwaters of the Guadalentin-Sangonera part of the Segura basin. The site also has important early neolithic and copper age remains (see below) including abundant beaker pottery. Excavations in the main cave were undertaken sixty years ago by Breuil and de Motos. These were never fully published. Two pieces from de Motos' collection may be seen at the Museo de Prehistoria in Valencia on display, and are convincingly Solutrean. A shouldered point is illustrated by Breuil (1913, p. 172, fig. 5, no. 3) and also by Siret (1931, p. 291, fig. 1, no. f). Later excavations by Jiménez conducted into the upper layers, of neolithic and copper age typology, did yield a shouldered point however during investigation of earlier spoil heaps (Jiménez Navarro, 1962, p. 38, fig. 19, no. 19) and three bifacially worked laurel leaf points (ibidem, p. 44, fig. 24). It is important to emphasise that the neolithic and copper age layers were remarkable for their total lack of bifacially worked arrow-points (see below). The crater that various excavations have made in the main cave is some 4 - 5 deep, and no obvious stratigraphy can be distinguished in the sections (though these are in very bad shape). What is clear is that the upper palaeolithic layers contain enormous fallen blocks, indicating fierce thermoclastic erosion. Recent excavations by Ripoll (1960-1961) seem to confirm the Solutrean and Solutreo-Gravettian nature of the artefacts, although the upper layers are said to be "epipalaeolithic", and unpublished radiocarbon dates ranging from 12,000-6,000 BC are said by Almagro Gorbea (1971) to bear no relation to the stratigraphy observed by Ripoll.

320

However, a certain amount of caution has always been shown with regard to the designation of the upper palaeolithic at the Cueva Ambrosio as Solutrean. Almagro (1947a, p. 313)refers to a rhomboidal point with incipient barbs. Breuil with his customary reluctance to identify any of the southeastern Spanish sites as Solutrean, merely refers to the cave as containing material "d'aspect paléolithique supérieur" (Breuil & Obermaier, 1914, p. 241). The shouldered point which Breuil illustrated from the cave was not considered by him to be particularly Solutrean, but an example of

> "évolution de la pointe à un tranchet rabattu dans le paléolithique de l'Éspagne méridional .... ce n'est pas une soie d'emmanchement, mais une barbeture qui prolonge la pièce vers la base en forme de pédoncle"
>
> (Breuil, 1913, p. 172, fig.5, no. 3)

In the same article Breuil comments,

> "En tout cas le solutréen manque entièrement ... dans la péninsule ibérique" (ibidem, p. 192).

The unwillingness by Breuil to admit specifically Solutrean features at the Cueva Ambrosio does not prevent Almagro from referring to both of the aforementioned articles in support of his own Solutrean designation of the assemblage, however. Thus,

> "Entre las estaciones solutrenses del Sudeste merece especial mención la Cueva Ambrosio (Vélez Blanco, Almería), a la que Breuil calificó como solutrense en sus estudios sobre aquella región"
>
> (Almagro, 1947a, p. 319).

Nor was Jiménez particularly convinced about the Solutrean attribution (His unpublished work is also referred to by Almagro, incidentally.) He compares one of the points at the Museo de Prehistoria in Valencia with a shouldered point which he found, but states that neither artefact, nor yet those retained at the Institut de Paléontologie Humaine in Paris, permits a more secure description than "un premagdaleniense poco definido" (Jiménez Navarro, 1962, p. 15). Elsewhere, he compares the shouldered point and laurel leaf point which he found with Aurignacio-Solutrean or

Solutreo-/

Solutreo-Aurignacian complexes however (ibidem, p. 45), by which term may be understood perhaps Solutreo-Gravettian.

Breuil's reticence, incidentally, is rather strange considering the proximity upstream of the Lavaderos de Tello rock painting of Levantine type, and Breuil's own view that such art was of upper palaeolithic and specifically Solutrean attribution. The whole matter of the rock art will be dealt with in a separate chapter.

Another site of disputed Solutrean attribution is that at the Cejo del Pantano, Totana, (Murcia) (Pericot & Cuadrado, 1952; Pericot, 1950; Almagro, 1947a, p. 316). The discoverer, Cuadrado, and the other authorities quoted above, believe the site to have been Solutrean. It was a rock shelter with a disturbed fill containing bifacial points. The exact circumstances of the discovery and excavation have never been published. Martínez Santa-Olalla rejected the Solutrean attribution, saying that the points were indistinguishable from neolithic points (Martínez Santa-Olalla et al., 1947, pp. 18 - 19). His distribution map (ibidem, p. 16, fig. B) shows that the cave was some 40 m above the floor of the present rambla, which therefore does not rule out the possibility of an upper palaeolithic attribution. However, the assemblage might just as easily be neolithic. There are several rock shelters in the region of the dam in the Rambla de Lébor, and the one containing the assemblage is not known to the present writer. Nor is the material displayed in the Cuadrado collection displayed at the Almería Provincial Museum (Museo L. Siret). In the same vicinity another Solutrean site was mentioned by Pericot and Cuadrado (1952) at Los Mortolitos.

Somewhat outside our area, the Cueva del Montijano, (Málaga) contained an upper palaeolithic assemblage of end- and steep-scrapers, backed bladelets, and what looks like a Solutrean pointe à face plane (Sánchez Montes, 1947). This was called "Aurignacoid" but is perhaps Solutreo-Gravettian assemblage.

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In Alicante an upper palaeolithic assemblage examined by the present writer was removed from the Cueva de las Calaveras, (Còva de les Calaveres), near Benidoleig (Breuil & Obermaier, 1914, p. 251). Almagro has claimed that it contained a Solutrean point (Almagro, 1947a, p. 333) which does not seem to be on display now. Jordá (1951, p. 65)calls the assemblage evolved Mousterian. It seems to the present writer to be a somewhat generalised, nondescript upper palaeolithic assemblage.

Breuil claimed to have found a possibly Solutrean bifacial point at the Cueva Chiquita (a rock shelter with Levantine art) near the Cortijo de los Treinta, near Chirivel, Vélez Blanco, (Almería), describing the piece as,

> "une jolie flèche de taille probablement solutréenne; elle pourrait être néolithique" (Breuil & Obermaier, 1914, p. 242).

This single point is therefore not a convincing example of Solutrean presence at the site, as Breuil very properly acknowledged. Other artefacts from the shelter were designated Capsian (Obermaier, 1924, p. 194) rather than Solutrean. At another shelter with Levantine animal art (Breuil & Burkitt , 1915, p. 317), the Cantos de la Visera, on the edge of Monte Arabí, Yecla, (Murcia), an assemblage was found which was described as,

> "un certain nombre de silex de caractère paléolithique"

including small blades, racloirs, grattoirs, and,

> "un fragment de lamelle un peu plus forte (la blade) retouchée à la manière d'une feuille de saule solutréenne sur la face supérieure"

and, moreover, the whole assemblage is compared with one from Aceña, (Burgos), which had previously been classified by Breuil as Gravettian (Breuil & Obermaier, 1913, p. 13), as well as with a bifacially worked point (or perhaps a scraper ?) found by Cabré near the Calapatá, (Teruel), rock paintings (Cabré & Pérez Temprado, 1921, p. 278; Cabré, 1915, pp. 132 - 134).

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The Cueva Chiquita and the Cantos de la Visera 'Solutrean' implements have been quoted as evidence in support of a Solutrean age for at least some of the Levantine naturalistic paintings as recently as 1961 (Pericot, 1961), and whilst Breuil and Obermaier certainly shared the view that the Levantine art was upper palaeolithic, the foregoing quotations from these workers about the implements they discovered demonstrates that they always showed a very proper caution when applying the apithet Solutrean to those implements. Later, it will be argued on the grounds of excavations conducted by the present writer, that the art dates from the earliest neolithic and immediately preceding period, having been executed in the Neothermal Period and having nothing to do with the Solutrean or any other upper palaeolithic culture contemporary with the Late Pleniglacial of the Würm glaciation. The evidence which will be put forward seems sufficiently conclusive as to lead to the rejection of a Solutrean age for the Cueva Chiquita and Cantos de la Visera paintings, and, indeed, to permit the tentative suggestions that the artefacts encountered there might have belonged to Neothermal Period assemblages, though that is somewhat speculative.

It will be argued that the internal artistic evidence of Levantine art demands a later date. Suffice it to point out here that no specifically Solutrean artistic traits which are supposed to typify Breuil Aurignacian-Gravettian or Solutreo-Magdalenian artistic 'cycles' can be detected convincingly in Levantine paintings, apart from the doubtful identification of any such 'cycles' even within the upper palaeolithic Franco-Cantabrian caves themselves (Ucko & Rosenfeld, 1967; Leroi-Gourhan, 1968) according to recent critical re-appraisals. In so far as any art form can be recognised as distinctively Solutrean, it would seem to be either relief sculpture or else black, monochrome painting, perhaps with engraving, on small stone plaques. This is quite different from rural Levantine rock shelter art, which is mainly red monochrome, occasionally

occasionally black, almost never engraved. Plaques do occur, however, in Solutrean age layers at the Cueva del Parpalló (Pericot, 1942; Almagro 1947a, p. 279, fig. 298; Arnbruster, 1960, pp. 31 - 33), although the majority are equated with the Magdalenian II - IV stages at the cave. These plaques lack the anthropomorphic element of Levantine art, however Some plaques at Parpalló are earlier than the Solutrean layers, and have been found in Gravettian layers at lower level. This is interesting because despite the distinctiveness of the Parpalló Solutrean vis-à-vis the Gravettian, in contrast with many sites in eastern Spain, nevertheless some Gravettoid flint-work is found in Solutrean layers.

It may be remarked, therefore, that as yet it is impossible to consider the south-eastern Spanish Solutrean outside the context of a mixed Solutreo-Gravettian development, a statement equally true of the sites further north such as the Cueva del Parpalló and the Cueva del Reclau Viver, . There are within the Segura basin and adjacent areas a number of supposedly Solutrean finds whose authenticity is open to question as well as some sites with Solutreo-Gravettian assemblages, but there is little evidence to demonstrate that the Levantine art of south-east Spain is of Solutrean age.

It is very difficult to try to fix absolute dates to these assemblages. It has been suggested that some sites with Noailles burin might date from as early as 20,000 B.C. by analogy with French sites. Yet at the Cueva del Reclau Viver all upper palaeolithic radiocarbon dates are very late when contrasted against those for Cantabrian cave sites in another part of northern Spain or against those for French sites, thus :-

Cueva del Reclau Viver

AURIGNACIAN	M-1015	16,560 ± 600 B.P.	(14,610 B.C.)
	M-1016	18,700 ± 800 B.P.	(16,750 B.C.)
	M-1020	16,200 ± 500 B.P.	(14,350 B.C.)
GRAVETTIAN	M-1017	14,750 ± 600 B.P.	(12,800 B.C.)
	M-1018	14,800 ± 600 B.P.	(12,850 B.C.)
SOLUTREAN	M-1019	13,200 ± 600 B.P.	(11,250 B.C.)

(Dates as published in Radiocarbon, no corrections attempted.)
(Cra[illegible] & Griffin, 1966)

It is interesting that Almagro Gorbea (1971) quotes new radiocarbon estimations from the Cueva Ambrosio as falling between 10,000 - 6,000 B.C., and that at this and other sites there is much dispute among eminent authorities (Breuil, Almagro Basch, Martínez Santa-Olalla) as to whether particular implements are in fact Solutrean. At the Covalta site (Venta Miña, Buñol, Valencia) the original excavator claimed a Solutrean shouldered point and Fletcher agreed with that appellation, whilst Tarradell (1963) referred to the assemblage as 'mesolithic'. One must ask just how far the named cultural complexes in south-east Spain can be referred to those of France and the Cantabrian area. Shouldered points and bifacial workmanship might represent merely alternative methods of tool-manufacture dictated by environmental demands and the limitations of the raw material, rather than the exclusive hall-mark of a particular cultural tradition. Willey (1966) illustrates many bifacial projectile points from early Amerindian assemblages, and perhaps these indicate that there are limited forms available to flint-workers interested in making projectile points. Some of the so-called Spanish Solutrean points may well be equivalent to the post-Magdalenian points known from France and northern Europe, whilst others may be neolithic and not palaeolithic at all. The following attributions are proposed tentatively:-

Gravettian of pre-Solutrean facies

Cueva de la Zájara II
Cueva del Serrón (Siret's assemblage)
Cueva de los Palomaricos (del Palomarico)

Solutreo-Gravettian

Cueva de los Murciélagos at Lubrin
?? Cueva Ambrosio ??

Solutrean of Mondúber Massif, and Valencia

Cueva del Parpalló; Covacha de Barranc Blanc; (Còva de Covalta??)

Unknown

Cueva de la Vermeja (de la Bermeja)
Cueva de los Tollos (neolithic ??)
Cueva de las Perneras (Gravettian ??)
Cejo del Pantano
Los Mortolitos
Cueva Chiquita
Cueva de las Calaveras
Cantos de la Visera

Upper/

Upper Palaeolithic : Magdalenian and Artistic Plaques

At the Cueva del Parpalló most of the painted and engraved stone plaques come from layers characterised by the Magdalenian II - IV stages, from all layers at the cave there were almost six thousand. Now the Magdalenian is represented in two small areas of eastern Spain, one is in Gerona province in Catalonia (Cueva de Bora Gran d'En Carreres and Abrigo Romaní : Almagro, 1947a, p. 325), the other is in Valencia province (Cueva del Parpalló : Pericot 1942a ; Cueva de les Rates Penaes La Labor del SIP .... 1951 , 1952, pp. 32 - 35; Covacha del Barranc Blanc : La Labor del SIP .... 1953, 1954, pp. 37 - 39 : Cueva del Volcán del Faro : Fletcher & Aparicio, 1969, 1970; and the Cueva del Barranc del Llop : Sancho Santamaría, private communication). The Valencian sites all lie in or near the Mondúber massif and are outside the Segura and Vinalopó basins. But only at Parpalló is the Magdalenian well defined At the Barranc Blanc site, a Magdalenian bone point was found in an Epigravettian layer, and the Rates Penaes assemblage has been described as a disturbed mixture of Gravettian and early Magdalenian artefacts The Cueva del Volcán del Faro has provided the only bâton de commandement from the Levante. At Mallaetes, possibly contemporary with the Parpalló Magdalenian, there are microlithic Gravette points and recent excavations by Fortea (in 1970) have encountered shouldered points which might be compared perhaps with similar ones from French Magdalenian VI assemblages. At Parpalló itself, where the Magdalenian I - IV stages are well represented, it must be pointed out that there are elements which occur in both earlier and later cultural complexes in eastern Spain, viz backed blades, backed bladelets and points of quasi-geometric shape, small disc-oidal scrapers, small, pyramidal, nucleiform scrapers, and microburins (Microburins occur as early as the Solutreo-Gravettian at both Parpalló and the Cueva del Reclau Viver, Jordá, 1954, p. 24.)

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527

In view of the earlier remarks refuting a Solutrean age for Levantine rock paintings, it is worth considering what evidence, if any, might be brought forward for a Magdalenian attribution for such art, a view tentatively proposed by Burkitt (1925, p. 279) . Once again, the plaques with their zoomorphic and skeuomorphic content seem a far cry from the organised 'scenes' with abundant anthropomorphic detail which characterise Levantine rock art (see next chapter). Nevertheless, painted or engraved plaques do seem to become widespread towards the later stages of the upper palaeolithic in the Levante. At the Cueva de les Mallaetes, Barig, (Valencia) an engraved plaque with a bovid motifs is said to be Solutrean, although the precise circumstances of its discovery are unknown (Jordá, 1954, p. 20), and skeuomorphic plaques were found at this cave in Epigravettian layers (Fletcher, 1956, p. 77 ; 1956a, p. 857) and also in the more recent excavations.

An outline engraving of a cervid on a stone plaque is known from the Gravettian site of Balma de Sant Gregorí, Falset, (Tarragona) (Vilaseca, 1932 - 1934, pp. 427 - 429), a site the exact chronology of which is uncertain (see below). Paintings of a caprine and a possible bovine are portrayed on a plaque found at Can Butinyà, Badalona, (Barcelona), (Vicente i Castells, 1968). Engravings of fishes occur on the cave wall at Rates Penaes, Pétova, (Valencia), (Gurrea Crespo & Peñalba Faus, 1952, p. 45, Pl. I nos. 1-4), and the cave had a mixed Gravettian and early Magdalenian assemblage

Skeuomorphic plaques were also found at the Cueva de la Cocina Dos Aguas, (Valencia), (Pericot, 1946; Fortea, 1971) which seems to be a site of Neothermal Period date. A skeuomorphic plaque is also known from the Cueva del Filador, Margalef, (Tarragona), (Vilaseca, 1949, Pl. I fig. 2, opp. p. 350). From northern Spain skeuomorphic plaques have been found in various contexts, for instance, in Magdalenian layers at the Cueva de la Paloma, (Asturias), (Hernández-Pacheco, 1923).

The/ 3:28

The Cueva de la Cocina skeuomorphic plaques have been likened to Azilian painted motifs (Jordá, 1955, pp. 351 - 354; 1967, p. 18). There is no clear compatability nor comparability between skeuomorphic plaques and zoomorphic plaques and Levantine paintings.

The absolute chronology of the Magdalenian in Spain is unclear just as is that of the earlier upper palaeolithic cultures. At the Cueva de Bora Gran d'En Carreres, (Gerona), the Magdalenian IV - VI phases may be dated by sample M-1023 to 11,470 ± 500 B.P. (9,520 B.C.) (Crane & Griffin, 1965). This late date agrees well with the generally late dates for other upper palaeolithic assemblages in Catalonia, but is later than comparable French cultural dates (contrast against those in Movius 1960). There are earlier Magdalenian dates in the Cantabrian area of Spain. At the Cueva de Altamira, (Santander), the Magdalenian III may be dated by sample M-828 to 13,900 ± 700 B.P. (11,950 B.C.) and M-829 to 15,500 ± 700 B.P. (13,650 B.C.), and Juyo has given M-830 of 15,300 ± 700 B.P. (13,450 B.C.)(Crane & Griffin, 1960). (Dates given as in Radiocarbon, without attempting corrections.)

However, in France the Magdalenian seems to have persisted for upto five thousand years. There are long spans of radiocarbon dates both for La Garenne and for the Grotte de la Vache between 14,000 - 9,000 B.C. (Movius, 1960). These dates may be compared with an Epigravettian layer from the Levanzo cave in Sicily dated by sample R-566 to 11,180 ± 120 B.P. (9,230 B.C.), which agrees well with dates for the Epigravettian at the Romanelli and the Romita caves in Italy (Alessio et al., 1970), whilst being rather earlier than a date for the preceding, Magdalenian, layer at Levanzo itself, Pi-119 9,694 ± 110 B.P. (7,744 B.C.) (Ferrara et al., 1961). The last-mentioned might bear comparison with another late date from northern Spain for the Magdalenian of the Cueva de Santamamiñe, (Vizcaya), given by sample Gif-130 of 9,470 ± 400 B.P. (7,520 B.C.) (Delibrias et al., 1966). Thus, despite the strong possibility that the Levanzo Magdalenian radiocarbon date is inaccurate, nevertheless, it is possible that the Magdalenian lingered late in some

In southeastern Spain there seems to be a lack of the later Magdalenian stages V and VI. This seems to argue against tenth millennium dates as giving the context of the Cueva del Parpalló Magdalenian I - IV stages. However, it has been suggested (Walker, 1972) that the Magdalenian VI might indeed be represented in the area, and specifically by the industry excavated by Such (1919; 1920) at the Hoyo de la Mina near Málaga in eastern Andalusia. At that cave, the lowest layer, layer 4, (1.00 - 1.10 m. thick), contained parrot-beak burins, long straight-sided blades backed on one side, and shouldered points with retouch on both margins, as well as a boar's tusk with a perforation and criss-cross engraving, a bone fish-hook, and stone beads. Shouldered points are not unknown in the later stages of the French Magdalenian, and parrot-beak burins are considered to be characteristic of the French Magdalenian VI (e.g. de Sonneville-Bordes, 1960).

The fauna at Hoyo de la Mina layer 4 included Equus, Catus ferox, Sus scrofa, and various types of sea-shells, notably Tapes decussatus, (95%), and also Cardium edule, Solen, Pecten, Ostra edule, Murex, Haliotis, and Sepia . The fauna was different from that of the succeeding layers (see below), and it is interesting to contrast it with the fauna from the Cueva del Volcán del Faro, Cullera, (Valencia) (Davidson, 1972, 1972a). It is just possible that specialised animal dependency characterised different upper palaeolithic communities in eastern and southern Spain.

Ibero-Maurit anian/

Ibero-Mauritanian, Capsian and the Peninsula.

It is hard to compare the later upper palaeolithic assemblages of eastern Spain with those of other parts of Western Europe, and this has led some archaeologists to propose North African affinities. Only at the Catalan caves of Reclau Viver and Bora Gran d'En Carreres, (Gerona), and of Cau del Duc and Ullà in the Montgrí massif, are there found post-Magdalenian assemblages capable of comparison with the Asturian and Azilian cultural complexes of Cantabrian Spain or to the north of the Pyrenees (for an account of the Asturian, see Clark, 1971). Further south, in Tarragona province and in the Levantine provinces, there occur assemblages of rather different kinds. These will be referred to fully in the next section, and will be seen subsequently to be of importance for a consideration of neolithic origins in the area. For the moment, it is enough to comment that they have usually been allocated to one of two categories, on the one hand a backed bladelet or 'Epigravettian' facies and on the other a geometric or 'Capsian' facies. The term 'Capsian' is a misnomer, since these assemblages have little in common with those of the Capsian type-site of El-Gafseh in Tunisia, although at one time another the word has been employed with reference to Peninsular lithic material by Breuil, Obermaier, Bosch Gimpera and Pericot.

Although the backed bladelet assemblage has usually been considered in relation to the Gravettian of eastern Spain, and the term 'Epigravettian' for the microlithic variety of this culture is accepted usage, nonetheless it seems appropriate to point out that backed blade and bladelet assemblages are also well known in North Africa, in the form of the Oranian cultural complex, otherwise known as the Ibéro-Maurusien or Ibero-Mauritanian. These last terms are misleading, and were coined by a French archaeologist Pallary,(1909, pp. 45 - 46, 96 - 97), for which reason they are still frequently met with in French literature on North African upper palaeolithic cultures. This is unfortunate, since not only does it imply affinity between Spain and North Africa, an

affinity/

affinity denied by most modern authorities (Balout, 1955), who hold that the Oranian is present only in North Africa. The term is unfortunate also in that it is easily confused with quite different complexes believed to have been identified in the neolithic. These were defined by Martinez Santa-Olalla (1946) as Hispano-Mauritanian and Ibero-Saharan comprising geometric and bifacial flint complexes, respectively. A criticism of these will also be offered in the appropriate chapter on the neolithic.

The Oranian is characterised by backed blades and bladelets from the Sahara to the Mediterranean coast, and from the Maghreb to Cyrenaica (at the Haua Fteah cave) and even the Nile Valley (at Deir El-Fakhuri complexes D and E) (Balout, 1955; McBurney, 1960, 1967; Tixier, 1963; Smith, 1966; Brahimi, 1970; Wendorf et al., 1970). Tixier and Brahimi give detailed accounts of Oranian typology. Smith has proposed that the Silsilian and Sebekian complexes of the Kom Ombo Plain (in the Aswan region) represent early stages in its development, the Sebekian dating to before 12,000 B.C. (Smith, 1966) Wendorf likewise relates the Nubian Deir El-Fakhuri complexes D and to the Oranian, and these date between 15,000 - 12,000 B.C. (Wendorf al., 1970). At the Haua Fteah, the Oranian abruptly replaces the earlier Dabban complex and runs from 14,000 - 10,000 B.C.. McBurney proposed that here it represented an intrusive element related to Gravettoid complexes of south-west Asia, whilst adding, "No certainty yet exists about the date of this Asiatic development" (McBurney, 1967). and despite his earlier suggestion that the Oranian might have its origin in the Gravettian of south-western Europe (McBurney, 1960, pp 218 - 228). At the Grotte de Rassel near Algiers the Oranian is dated to about 12,000 B.C., and it appears to last until about 8,000 BC. in that area (Brahimi, 1970). At Taforalt in Morocco (Roche, 1963) a number of dates between 10,000 - 8,000 B.C. are available (Delibrias et al. 1964). Even with a relatively advanced nautical technology, there are

considerable/

considerable difficulties in navigating sailing craft between Spain and North Africa (Jáuregui, 1949). It is unlikely that upper palaeolithic peoples could have made the sea crossing in the absence of sea-going sailing ships. It seems likely that the Oranian arose in the Nile Valley or further east and spread westwards across North Africa. There are other arguments against a relationship between the European Gravettian and the Oranian. For instance, typically Gravette points do not represent a feature of the Oranian. In Spain the Magdalenian seems to have been contemporary with backed blade tool-making, and a strong element of this tradition entered into the Spanish Magdalenian.

The Capsian complex seems to derive from the Oranian in various regions of North Africa around 8,000 B.C., notably inland Tunisia (Balout, 1955; Tixier, 1963) and Cyrenaica (McBurney, 1967) The Capsian was so named by Vaufrey (1933), and differs from the Oranian in the large number of geometric forms (McBurney, 1960). Transverse points are a feature of the Capsian, and it has been pointed out that these are absent from European geometric industries (Clark, 1958). Some authorities divide the Capsian into the following stages Early, Evolved, and Capsian neolithic. The last of these is characterised by presence of pottery and (domesticated ??) ovicaprines, and may last until the third millennium B.C.. However, the early and evolved stages of the Capsian are without pottery and are upper palaeolithic stages, characterised by trapezes and transverse points and other small blade tools, larger flints, relief carvings of human faces and other motifs on stone and engravings on ostrich egg shell. The carvings are not at all like the Spanish stone plaques. Ostrich egg shell ornament is not known in Spain until the neolithic.

The type site of the evolved Capsian is El-Gafseh. Another nearby site is El-Mekta, dated by radiocarbon to 6,450 ± 400 B.C. (uncorrected) and to this may be compared the Algerian site of Dra

M'ta el-Ma el-Abioud of 5,050 ± 200 and 5,350 ± 200 B.C. (Hugot, 1963, p. 165; Tixier, 1963). At Columnata in Algeria the Oranian becomes increasingly geometric and turns into the Capsian dated by Gif-308 of 6,850 ± 350 B.P. (4,900 B.C.) and Gif-309 of 6,340 ± (4,390 B.C.) (Delibrias et al., 1970), with the neolithic Capsian appearing rather later, dated by Gif-307 of 5,250 ± 250 B.P. (3,300 BC) At the Haua Fteah McBurney states that the Capsian neolithic appears about 5,000 B.C. and lasts till about 2,700 B.C. (McBurney, 1967). In Algeria, too, there are earlier dates for the neolithic than that from Columnata, thus an unpublished date (i.e. not published in Radiocarbon) from Ai Naga on charcoal sample Gif-1221 of 5,550 ± 220 B.C. (Rahmouni et al., 1970).and evolved Capsian of preneolithic facies from the same site gave rather earlier dates, namely ALG-12 9,300 ± 300 B.P. (&,350 B.C.) and ALG-13 8,900 ± 280 B.P. (6,950 B.C.), and also the unpublished sample Gif-1220 of 7,200 ± 200 B.C. (ibidem).

It may be seen from these dates that the evolved Capsian is far too late to have had any influence on the geometricising tendency of the Magdalenian IV at the Cueva del Parpalló, even if trans-Mediterranean contacts were admitted for sake of argument, and contrary to the view of Pericot. As has been stated earlier, in Algeria and elsewhere in north-west Africa it was the non-geometric Oranian which was contemporary with the eastern Spanish Magdalenian (and, of course, with the contemporary eastern Spanish backed bladelet tradition). The absolute dates now available support the rejection of trans-Mediterranean later palaeolithic contacts that has for some time been the view, indeed, of various authorities (Vaufrey, 1933; Almagro, 1947a, pp. 389 - 401 ; Balout, 1955, p. 415). As these and other workers have pointed out, neither the Oranian nor the Capsian could have influenced the Peninsular upper palaeolithic without first shedding some of their characteristic artefact types, nor could the latter influence the North African cultures without also making corresponding changes.

In any case, hypotheses about migrationist influences suffer from three drawbacks :-

(a) unnecessary assumptions and complexity in order to explain away discordant features

(b) the reasons for the development of particular artefact types are not given, merely pushed back one stage

(c) such hypotheses are incapable of verification by archaeological methods at our disposal, and are inappropriate as working hypotheses especially if other more parsimonious hypotheses are available for testing.

It is now appropriate to outline the Peninsular assemblages in southeastern Spain of the later upper palaeolithic, and in a later chapter their relation to (a) Levantine rock paintings and to (b) the origin of the early neolithic will be demonstrated, as well as the broad contemporaneity with that art to the Neothermal Period to which it will be proposed these later upper palaeolithic and earlier neolithic assemblages belonged. The involvement of Oranian or Capsian influence upon those may be banished from consideration.

The/

The Later Upper Palaeolithic : An Essay in Diversity

For reasons which will become apparent it is convenient to replace some names for the lithic assemblages contemporary with the Magdalenian and extending to the onset of the neolithic in eastern Spain, names often encountered in the literature, by the non-commital wording "later upper palaeolithic" . This blanket wording embraces industries hitherto called variously Capsian, mesolithic, Epigravettian, epipalaeolithic, post-palaeolithic, etc.. In one way or another, these terms prejudice the classification of assemblages by implying particular relationships, whether morphological as referring to artefacts, or cultural, or chronological. In the subsequent chapters investigations will be described in an attempt to demonstrate the morphological and functional unity of later upper palaeolithic and earlier neolithic artefact assemblages of chipped flint implements.

Consideration will be given now to the components of the various later upper palaeolithic assemblages previously published, and especially to their stratigraphical relationships with earlier or later cultural complexes, in order to arrive at a minimal proposition about those assemblages in conformity with the principle of parsimony. Whilst such a proposition, of course, does not preclude other possibilities of greater intricacy, the aim will be to set up the simplest working hypothesis, and then to observe how well or badly it fits the facts in south-east Spain.

Perhaps the logical approach to the later upper palaeolithic is to consider first those assemblages whose stratigraphical position vis-à-vis upper/

palaeolithic assemblages is established, and then to consider those whose stratigraphical position vis-à-vis neolithic layers (or later) is known. From the standpoint of British archaeology this may seem a wholly conventional approach. It is necessary to point out, however, that it is far from being the method preferred by archaeologists who have worked in the Peninsula, where a preference has regularly been shown for identifying cultures typologically, and explaining away anomalous data on the basis of contamination (especially potsherds, which are often said to be 'later' contaminants as if they had some propulsive mechanism of their own allowing them to penetrate into deeper layers, and whilst the possibility always exists that disturbed soil - a not uncommon feature at Spanish rock shelter sites - can lead to contamination, nonetheless when one so-called anomalous contaminant seems to be ubiquitous, the argument of contamination becomes to say the least shaky). One must surely prefer detailed statistical inquiry into artefact types and assemblage composition, if the typological approach is to be utilised, to the type-fossil approach. Unfortunately, in many cases the complete excavation data are not available in the published literature nor even in museum collections, and in such cases it seems preferable to turn to those stratigraphical observations which have been recorded before considering typology.

upper
(1) Later/palaeolithic assemblages of early date.

In Spain a distinction is often made between Epigravettian or backed bladelet assemblages on the one hand, and mesolithic or Capsian or geometric assemblages on the other. It has already been said that microburin spalls are known from Solutrean age deposits . Microburin spalls are supposed to be stages in the production of geometric flints (e.g. Tixier, 1963, p. 40, fig. 8) though presumably the production of strangulated blades alone would also give rise to similar spalls. Geometric pieces do not characterise Solutrean assemblages. Quite the

contrary;/ 3:37

contrary; the flat pressure flaking is highly distinctive. But strangulated blades are known elsewhere in Western Europe from even earlier than the Solutrean, namely from Aurignacian deposits. Neither is the Aurignacian characterised by geometric flint forms, of course. In other words, both strangulated blades and microburins, whether occurring together or separately, are non-specific of named palaeolithic cultural assemblages by themselves; nor is there any necessity for one or either of such flint forms to occur only at sites where there are geometric flints. Nor, indeed, are geometric flints especially specific. There is a wealth of evidence that in Spain they are found in deposits ranging from the later upper palaeolithic through the neolithic down to the copper age.

Backed bladelets have an even longer time-span, from the Gravettian down to the neolithic at least. It would seem hazardous to attempt a diachronic classification of Peninsular cultures on the basis of the proportional representation of different kinds of different kinds of flint-working traditions unless backed by rigorous statistical and chronological evidence, and since such evidence is usually only available at very few sites and may conflict as between different sites, the typological approach has severe limitations.

Cueva del Parpalló

The Parpalló Magdalenian sequence is well established (Pericot, 1942a), and if the stages defined there are indeed chronologically equivalent to those of the French Magdalenian sequence, it is hard to put the Magdalenian IV at Parpalló much later than 10,000 B.C. The Parpalló Magdalenian IV is interesting because in addition to the typical bone-work, there are flints which include backed bladelets with steep retouch along both straight and convex margins of the bladelet, microburins, and narrow triangular bladelets formed by obliquely truncating a narrow backed blade and then steeply backing the truncated margin also. Perhaps these are similar to the larger North African transverse

points/ 3:38

points of the Capsian Culture. Certainly, they are different from the later upper palaeolithic and neolithic trapeze and scalene points from southeastern Spain. A subjective impression is that the Parpalló triangles, often irregular with sides of very unequal lengths, are attempts at manufacture of a reinforced graver point rather than a projectile point. Similar triangles from the Magdalenian II at Laugerie Haute in France are called to mind. The Parpalló Magdalenian IV may best be considered as an assemblage sui generis.

Following the Magdalenian IV at Parpalló, there is one which some archaeologists think may have evolved from it (Almagro, 1947a, p. 424). This layer contains neatly made scalene triangles quite comparable with other later upper palaeolithic and neolithic geometric industries in south-east Spain, as well as crescents, shouldered points on slender blades, end-scrapers, pyramidal and discoidal scrapers, notched and serrated pieces, awls and burins. In considering the significance of this assemblage, it is appropriate to bear in mind the functional and efficient nature of Magdalenian VI assemblages in France and the diversity of the later Magdalenian derivative industries and possible off-shoots such as the Hamburgian and Ahrensburgian. Many of the awl and burin pieces are on flakes rather than on blades. Some have features comparable with zinken and also with parrot-beak burins, but direct comparisons with any Magdalenian VI or derivative industry are difficult to make nevertheless. It is interesting that many Magdalenian VI assemblages from France contain crescents, backed blades and shouldered points. (It may be that some of the southeastern Spanish upper palaeolithic sites called Solutreo-Gravettian for no better reason than the occurrence of a shouldered point among a mass of nondescript flint-work, might really belong to a later phase contemporary with the closing stages of the Magdalenian elsewhere in Western Europe. The backed blade 'Gravettian' aspect of such assemblages would by no means be incompatible with such a revision.) It is a striking

feature/

feature of the Parpalló assemblages that several of the component flint implements strongly resemble the Federmessergruppen. The same is true for the rather different assemblage of layer 4 at Hoyo de la Mina, (Málaga), to whose parrot-beak burins, backed rods and blades, shouldered points, packed points and awls, end-scrapers, bone fish-hook, etc., reference has been made earlier. Comparison of the illustrations in Pericot (1942a) and Such (1920) with those of Federmessergruppen artefacts (Schwabedissen, 1954, esp. the zinken and awls, Abb. 13 p. 25, and backed rods, Abb. 8 p. 20) seems to indicate some similarity.

Hoyo de la Mina

Mention of layer 4 at this cave (called by Such 'Capsian') has been made earlier, and it was suggested that the parrot-beak burins from that layer might be of late Magdalenian affinity. If the uppermost layer at the Cueva del Parpalló is indeed to be located chronologically at the close of the Magdalenian, then layer 4 at the Hoyo de la Mina may well be roughly contemporary.

The next layer above is layer 3 (Such called it 'Tardenoisian') which contains similar awls and backed points to layer 4, but no shouldered points. It also contains backed rods, blades and bladelets, two burins, a fish-hook made from a Patella shell, a bone chisel, two perforated fragments of Conus shell, and three perforated Purpura shells. The fauna of this phase is said to include Canis vulgaris (dog), Sus scrofa, Oryctolagus cuniculus, Capra ibex, and Bos sp. (Such, 1920), but as the layer was only 100 mm thick, it is possible that this fauna came in part from layer 2 above, in which the early neolithic was defined on the basis of ceramic material and geometric flints, although backed points and awls also occurred. The topmost layer, layer 1, contained a rich neolithic ceramic assemblage.

It is hard to assess the significance of layer 3, since it might

equally/ 3140

equally well be placed in typological relationship to either layer 4 or layer 2 in so far as concerns its flint-work. Yet if the typological assessments of layers 4 and 2 be correct, their absolute ages must be separated by a time-span of at least three thousand years, even allowing that layer 4 might be as late as 8,000 B.C. or layer 2 as early as 5,000 B.C..

Cueva de les Mallaetes

This cave near Gandía, (Valencia), contained a rich backed bladelet industry following a Solutreo-Gravettian stage. It has been subdivided into an 'Epigravettian I' in which there was found a Magdalenian I type bone point, and an 'Epigravettian II' without Magdalenian implements, but containing microlithic Gravette points (Jordá, 1954, p. 17; Fletcher, 1956, p. 77; 1956a, p. 857). As has been mentioned earlier, the Epigravettian layers contained fifteen decorated stone plaques (Fletcher, ibidem), and others have been found recently in the 1970 excavations of sr. Fortea. From aceramic layers in this sequence Mr. Iain Davidson has identified sheep bones (Ovis aries) among the ovicaprine fauna (Davidson, private communication). The Epigravettian aceramic layers are followed by neolithic layers with backed blades, two trapeze points, and both cardial impressed and also incised pottery. Here again backed blades do not seem to warrant the inference that the 'Epigravettian' stages are necessarily typologically closer to the upper palaeolithic layers at the cave rather than to the neolithic ones. As at the Hoyo de la Mina, it seems wise to suspend judgement on the precise diachronic position of these later upper palaeolithic aceramic assemblages though once again, at least as far as concerns the 'Epigravettian I', a possible contemporaneity with the closing stages of the Magdalenian (whenever that was in southeastern Spain) may be tentatively proposed.

Barranc Blanc

The Covacha del Barranc Blanc, Rótova, (Valencia), contained

Gravettian, Solutreo-Gravettian, and then a riched backed bladelet industry with a possibly Magdalenian bone point, in that order, beneath an uppermost ceramic layer (La Labor del SIP .... 1954, 1955, pp. 37 - 39; Fletcher, 1956, p. 77; 1956a, pp. 858 - 859).

Cueva de les Meravelles

At yet another cave in the Mondúber massif of Valencia province, Gravettian and Solutreo-Gravettian deposits were followed by a backed blade assemblage, in turn succeded by a disturbed layer containing cardial impressed and Beaker incised wares and neolithic flint implements (Fletcher, 1956a, p. 863; Plá Ballester, 1946; La Labor del SIP .... 1953, 1954).

On the basis of the Mondúber massif backed blade assemblages Pericot and Jordá have proposed the contemporaneous occurrence of an 'Epigravettian I' with the Parpalló Magdalenian I-II assemblages, followed by an 'Epigravettian II' contemporaneous with the Parpalló Magdalenian III-IV (Pericot, 1954, p. 355; Jordá, 1954, pp. 25-26) Jordá defines in addition an 'Epigravettian III', as including part of the later Cueva de les Mallaetes backed blade assemblage and the uppermost Cueva del Parpalló assemblage. This seems unsatisfactory, as it is improbable that the latter lasted until anywhere near the onset of the neolithic, whereas at the Cueva de les Mallaetes it certainly did so.

Cueva de las Perneras

Siret stated clearly that the upper two layers , which were disturbed, had an assemblage quite different from the underlying Mousterian. What looks like a trapeze point from this site, presumably from the upper layers, is illustrated by Breuil (1913, p. 178, fig. 10, no. 2), although he indicates burin blows at two corners, and Siret illustrated a

point/ 342

point with backing retouch along both straight and convex margins as representatives of the 'Magdalenian' (Siret, 1893, p. 503, figs. 47,50) Points which may have retouch along either straight or convex margins are characteristic of the upper layer assemblage at Parpalló and of layer 4 at Hoyo de la Mina, and may be parallelled elsewhere in Western Europe in post-Magdalenian contexts. They are not typically Gravettoid, as is demonstrated by the occurrence sometimes of backing along the convex margins. This is one reason why the term 'Epigravettian' is undesirable.

Cueva de las Palomas

This is another cave in the Mazarrón-Lorca region of which very little published information exists about Siret's excavations other than a transverse point on a flake or blade (Siret, loc. cit., p. 503, fig.44) and a crescentiform backed blade of rather elongated proportions (Breuil 1913, p. 172, fig. 5, no.5) as well as a retouched truncated blade with what are shown as two corner burin blows (ibidem, p. 178, fig. 10, no.4) This last-mentioned has some retouch along one margin, which has been interrupted by the burin blow. It is similar to some other Noailles-type burins from the Murcian and Almerian cave sites, and if such implements have nothing to do with a Perigordian V_3 stage in the Peninsula, but are to be interpreted as a much later phenomenon, then many of the sites which also contain shouldered points from that region of the south-east ought not to be classified as Solutreo-Gravettian perhaps, but rather as later upper palaeolithic (for instance, Cueva de la Zájara II, Cueva de los Palomaricos, Cueva del Serrón, etc.).

Cueva Humosa

This cave is near Albox, (Almería), and was excavated by Siret. Triangular blade fragments with retouch along one truncated edge only are illustrated by Siret (ibidem, p. 503, fig. 45) and Breuil (1913, p. 172, fig. 5, nos. 10,11). They look more like the kind of triangular pieces from the upper layer at Parpalló than like later triangular geometric microliths.

Cueva/

Cueva del Tesoro

This Murcian cave excavated by Siret apparently contained a backed bladelet with retouch along a convex margin (Siret, ibidem, p. 503, fig. 49).

Balma de Sant Gregori

This site is near Falset in the Catalonian province of Tarragona. It cannot be directly related to underlying upper palaeolithic cultural complexes, although the lowest layer (layer 1 at this site) contained a Mousterian point, some facetted platform flakes, scrapers on flakes and the ends of blades, backed blades, some burins (one resemblin a Noailles burin with a single burin blow), and pyramidal cores (Vilaseca, 1934, pp. 419 - 423). The other layers, of which there were five (not four as is often stated), accounted for most of the 1.10 metre depth of deposits. Most of the data were given in Vilaseca (1932 - 1934) but some of the statistics were not published until later (Vilaseca, 194

From layer 2 upwards there were found fewer facetted platform flakes. Layer 2 provided a backed blade roughly semicircular with retouch on the convexity, a lame-à-coche, and the well-known stone plaque engraved with a cervine motif (Vilaseca, 1932 - 1934, pp. 427 - 429). Layer 3 was characterised by very long unretouched blades, reaching 86 mm long, and a piece of rock crystal. Layer 4 contained some discoidal scrapers and long Gravette points (24 - 35 mm long). The fauna of layers 1 - 4 included Oryctolagus cuniculus, Capra sp., Cervus sp., and was said to contain sheep (Ovis sp.) but apparently this last was a misidentification (Davidson, personal communication). Layer 5 contained an abundance of microlithic pieces and backed bladelets, some pyramidal cores only 20 - 30 mm. in size, a burin dièdre, a discoidal scraper, and it is worth noting

that some of the backed bladelets were retouched on the convex margins to give an almost crescentic form. Whereas layer 1 contained only 27 backed blades out of 1,029 pieces, layer 5 contained 22 backed blades and points out of 666 pieces (Vilaseca, 1949, p. 348).

The uppermost layer, layer 6, where it could be identified as discrete layer, contained plain and incised pottery, a barbed and tanged flint arrow-point, a rather unconvincing 'Asturian' pick, and the surface débris also contained what was illustrated as a 'Solutrean' shouldered point (Vilaseca, 1932-1934, p. 436, fig. 24,no.3).

The Balma de Sant Gregorí is a puzzle. It is unlikely that so shallow a fill could represent continuous occupation from Mousterian to neolithic times. Even the engraved plaque is not very helpful, since such plaques at the Cueva del Parpalló come from all layers and ages in the upper palaeolithic. Almagro states that the layer containing the plaques cannot be precisely dated (Almagro, 1947a, p. 374), although elsewhere he suggests that layer 2 might be synchronous with the late Magdalenian at Parpalló (ibidem, p. 365), doubtless due to his wish to see the Balma de Sant Gregori assemblage as extending until the 'Mesolithic' (ibidem, p. 379). Like the Hoyo de la Mina assemblage of layers 4 and 3, and unlike the Parpalló assemblage, there are no geometric forms.

Cueva del Filador

This is another cave in Tarragona province, with a somewhat deeper stratigraphy of 2.50 metres (Vilaseca, 1949). The layers here were numbered I - VII from above downwards. Backed bladelets and pyramidal cores occurred throughout the deposits, but were richest in layers III and V. Layer III also contained a crescent, microburins, end-scrapers, and an engraved plaque with a skeuomorphic motif (Vilaseca, 1949, Plate fig. 2, opp. p. 350, and text p. 353). Unlike the Sant Gregori site, there were neatly made regular triangles from layer V and a sub-crescentic bladelet. The small pyramidal scrapers and discoidal

scrapers,

scrapers present at Sant Gregori were absent at Filador. At Sant Gregori crescents were retouched more steeply than at Filador.

The Filador sequence underlines the impossibility of using geometric flint-work or backed blade flint-work as indicative of quite distinct cultural complexes. Unfortunately, the Filador chronology is every bit as unknown as that of Sant Gregori, so that few further conclusions can be drawn.

Jordá (1954) relates the lowest layers, especially VI, to his 'Epigravettian II' and 'Epigravettian IIIA'. By 'IIIA' he refers to post-Magdalenian backed bladelet or 'Levantine' assemblages in contrast to what he termed 'Capsian' or geometric 'Epigravettian IIIB' assemblages. His scheme demands that at Filador layer VI be classed as 'IIIA', and layer V as 'IIIB', with subsequent layers reverting to 'IIIA'. Perhaps Jordá recognised the difficulty that an over-rigorous application of his classification would lead to, when he discretely omitted attempting to classify the layers at Filador above layer VI ~~to~~ as either of his 'Epigravettian' sub-types. Indeed, only the most tortuous comings and goings of different groups with different tool-kits could suffice to explain the stratigraphical observations at this, as at many other Spanish sites. Moreover, as a working hypothesis, the two culture one is unsatisfactory because it explains away the anomalies, whilst yet it is incapable of being recognised at all other than in terms of sporadic intrusions by folk of the 'other' culture, given the absence of a third, chronological, indicator common to sites at where only one or other of the so-called cultural types appertains. Needless to say, such sites are conspicuous by their absence in southeastern Spain. Thus the two culture hypothesis is a circular argument designed to explain away the observed assemblages upon whose very characteristics it relies for its own recognition.

Now that is important, because it is a major element of Jordá's opinion on the origins of the neolithic in southeastern Spain. He holds that there are two separable elements in those origins which can be trace

back/ 3:46

back to his two strands within the 'Epigravettian III', viz.

(i) a 'Levantine' neolithic characterised by cardial impressed pottery lacking geometric trapeze points

and (ii) a neolithic with geometric flint-work represented by plain or incised pottery (Jordá, 1949, 1953).

For the moment it is enough to remark that the evidence for the presence of two such strands in the later upper palaeolithic is slender.

(2) Later upper palaeolithic assemblages of pre-neolithic age

It is now appropriate to consider those sites where later upper palaeolithic material is found stratified below layers containing neolithic or copper age material, and it will be seen that some of the sites are the same as those in the foregoing section, whilst others are new sites.

Hoyo de la Mina

Layer 3 at this site may be considered in relation to the overlying ceramic layer, layer 2, as has been mentioned earlier. This seems no less appropriate a way of looking at it, than does relating it to the underlying layer, layer 4. It is unlikely that layer 3 can relate to both layers, whichever option is selected.

Cueva de les Mallaetes

Here there is a strong argument for relating the later part of the backed blade industry to the subsequent neolithic layer. There is some evidence that the sheep was present in the aceramic layers immediately preceding the ceramic layers (Davidson, personal communication), and whilst there may have been wild sheep in Spain during the upper palaeolithic, it is also possible that these were domesticated animals. There are interesting parallels in the continuity of flint-work traditions between this site and that of the Abrigo Grande (see subsequent chapters) and perhaps the Cueva de Lagrimal, Villena, (Alicante). Further details must be left to Sr. Fortea's forthcoming publication on the cave.

Cueva de les Meravelles

The upper layers at this cave were disturbed, and it was reported that the Beaker sherds were stratified below sherds of cardial impressed ware. This is by no means unlikely, since it will be indicated later that there is some evidence for a late date for cardial impressed pottery at some southeastern Spanish sites. There is no secure evidence at this site for an early neolithic, and perhaps it is safer to assume no continuity of occupation between the preceramic and ceramic layers for the moment.

Balma de Sant Gregori

Much the same is true of Sant Gregori, since the superficial layer was by no means present in all parts of the rock shelter, and in others it was disturbed. Nor can continuity of lithic assemblages be demonstrated from aceramic to ceramic layers.

However, there are other sites at which the later upper palaeolithic appears to receive neolithic attributes in its later stages. The assemblages are not stratified above upper palaeolithic complexes and it is therefore reasonable to assign these sites to a period closer to the early neolithic than the upper palaeolithic. That is the core reason [illegible]

Cueva de la Cocina

This cave site is at Dos Aguas, (Valencia), and it is often cited by writers on the European Mesolithic (thus Clark, 1958). It was published by Pericot (1946) and more fully by Fortea (1971). The site shows four stages according to Fortea, two aceramic and two ceramic The following is an abbreviated summary of Fortea's admirable breakdown of the flint assemblages of the respective stages (Cocina I being the first stage, aceramic) :-

Artefact type	Cocina I no.	Cocina I %	Cocina II no.	Cocina II %	Cocina III no.	Cocina III %	Cocina IV no.	Cocina IV %
Scrapers	6	4.44			4	10.25	2	4.87
Burins	2	1.48						
Backed bladelets	4	2.96	4	2.28	4	10.24	2	4.87
Notched flints	40	29.62	19	10.85	4	10.25	3	7.31
GEOMETRIC Triangles	1	0.74	5	2.85	6	15.38	2	4.87
Pedunculated triangles			28	16.00	1	2.56		
Trapezes	47	34.81	18	10.28	2	5.12	3	7.31
Microburins	3	2.22	81	46.28	6	15.38	3	7.31
Other	32	23.70	18	10.28	4	10.25	22	53.66
Rhomboidal arrow-point							1	2.43
Totals	135	100%	175	100%	39	100%	41	100%

The proportion of backed bladelets is low throughout, and Fortea subdivides them, defining a special 'Cocina-type' of backed bladelet with a rib of the blade between the retouched back and the cutting edge. Nevertheless, it is interesting that backed bladelets do not disappear from the sequence in any layer at the site. Discoidal scrapers, end-scrapers, strangulated blades, cores and large pieces of flint, quartzite and limestone occurred among the excavation material. Cocina II contained caprine horns, pieces of red ochre, thirty-eight skeuomorphic engraved plaques of which twelve bore traces of red paint, and on the south wall of the cave Pericot refers to a red-painted animal figure. Cocina III contained cardial impressed pottery. Cocina IV contained incised, channelled, comb and relief ornamented sherds. A flat quern and a polished stone axe were also found in the neolithic layers.

Covacha de Llatas

At this cave near Andilla, (Valencia), there were three

layers/

layers (Jordá & Alcácer,1949), the lowest of which, layer 3, contained a crescentic microlith and a triangular geometric microlith. The middle layer contained several trapezes, as well as crescents, whilst layer 1 contained trapezes, crescents, triangles, and triangles with pedunculated spurs. Of some 5,351 pieces of flint and 20 of quartzite, 400 (7%) belonged to classifiable forms. There were 21 crescents (mainly layers 1 and 2) of which 11 were double facetted and 10 single facetted (said by Jordá to be less 'evolved' than the former). There were found 28 trapezes, mainly from the middle layer, 3 simple triangles (layers 1 and 3), 5 spurred triangles (layer 1), 10 backed blades, 17 strangulated or notched blades, 30 scrapers, 12 burins, and 260 long blades between 20 and 100 mm in length, some with retouched margins, as well as unclassifiable retouched pieces. Layer 1 contained pottery, both incised and relief ornamented sherds, as well as one possibly bronze age sherd. A complete layer by layer break-down of the assemblage was not published.

The excavators claimed that double facetted crescents at Llatas were parallelled by those of Cocina III - IV, and that since crescents from the lower layers there were only single facetted, then those layers of Cocina were earlier in date than the occupation at Llatas. The argument was influenced by Jordá's desire to make the early stages of of Cocina contemporary with the uppermost layer at the Cueva del Parpalló, and to embrace it with his 'Epigravettian IIIB' category. The argument is exceedingly tenuous, [illegible]

It is more likely that the two sites are roughly contemporary and belong somewhere in the period 6,000 - 4,000 B.C. in the Neothermal Period, along with the Portuguese Mugem midden sites, spanning the transition from the later upper palaeolithic to the early neolithic. Evidence to be presented in the following chapters reinforces such an interpretation (and see Fortea, 1971; Walker, 1971, 1972). It was suggested by Clark (1958) that there might be equivalence between the spurred triangles from Cocina and those from the Cabeço da Arruda midden in Portugal, and between the Cocina scalenes and those

from,

from Cabeço da Amoreira and Moita do Sebastão middens. The publication of the Moita do Sebastão assemblage (Roche, 1960) indicated that the parallel might be close indeed because out of 4,885 flint items 321 (25.89% of worked pieces) were geometric. At Moita do Sebastão, as at Cocina, backed bladelets do not disappear completely (15 items, 1.20%) (Roche, 1960, p. 159). Fortea has taken the argument further, and finds that for all artefact types there is similarity between the proportions of artefacts of different types from the Cocina I stage and those from Moita do Sebastão, and also between those of the preceramic layers at Cabeço da Amoreira and those from the Cocina II stage (Fortea, 1971, pp. 71 - 72). Those studies strengthen the opinion of the present writer (Walker, 1971, 1972) that the absolute dates of the preceramic and ceramic stages at Cocina might be expected to be of a similar order to those of the preceramic and ceramic stages at the Portuguese middens, rather than a long chronology spanning the whole period of three or four thousand years from the Magdalenian to the early neolithic. The Portuguese dates all fall within about two thousand years, thus: -

Preceramic stages

Sa-16	Moita do Sebastão (base of midden)	7,350 ± 350 B.P. (5,400 B.C.) (Delibrias et al., 1964, p. 244)
Sa-195	Cabeço da Amoreira (lower layer)	7,030 ± 350 B.P. (5,080 B.C.)
Sa-197	Cabeço da Amoreira (lower layer)	6,430 ± 300 B.P. (4,480 B.C.)

Ceramic stages

Sa-194	Cabeço da Amoreira (upper layer)	6,050 ± 300 B.P. (4,100 B.C.)
Sa-196	Cabeço da Amoreira (upper layer)	5,150 ± 300 B.P. (3,200 B.C.) (Delibrias et al., 1965, pp. 327-8)

There may be compared with the foregoing the estimation from the Breton site of Hoëdic of Gif-227 to 6,575 ± 300 B.P. or 4,625 B.C. (Delibrias et al., 1966), and Fortea mentions a date for the Sauveterrian site of Montclus of 6,180 B.C. (Escalon de Fonton, 1966, p. 162)

162). The earliest dates for the neolithic in the Peninsula are from the site of Coveta de l'Or, (Alicante), and are

KN-51 6,510 ± 160 B.P. (4,560 B.C.)

H-1754/1208 5,265 ± 75 B.P. (4,315 B.C.)

(Schwabedissen & Freundlich, 1966).

(All dates have been quoted as in Radiocarbon.)

Whatever these dates mean in real absolute dates, it is clear that there is no dating evidence for a long occupation at the midden sites and it seems reasonable to situate comparable assemblages spanning the transition from aceramic to ceramic stages in the period contained by a 'radiocarbon chronology' of 6,000 - 4,000 B.C.. In real terms, that may mean 7,000 - 5,000 B.C.. Unless the radiocarbon dates for the Magdalenian in Western Europe do not have to be increased in the same way as neolithic radiocarbon dates in order to arrive at the true, absolute date then there must be postulated a period of between 10,000 - 7,000 B.C. about which very little can safely be said. If the lowest upper palaeolithic dates (Cueva de Santamamiñe; Levanzo, Romanelli, Romita in Italy; vide supra) available from Western Europe in the Mediterranean area require no correction (and we are in ignorance about the corrections which may or may not be needed with regard to palaeolithic radiocarbon estimations), then a derivation of some of the lithic traditions of the preceramic assemblages in the Peninsula from upper palaeolithic traditions might just be possible. If the upper palaeolithic date have to be put back, then, of course, the hiatus remains.

Fortea has suggested that the Cocina assemblage should be compared with French geometric industries, yet he encounters difficulties

in/

in using the terms Tardenoisian or Sauveterrian in connection with the Spanish assemblages, and prefers to retain the name 'Epigravettian', pointing to the steep retouch of many of the Cocina geometric pieces in support of his view that battered back traditions indigenous to the Peninsula wielded a strong influence over the development of geometric industries in southeastern Spain. The assemblage from the uppermost layer of the Parpalló palaeolithic sequence might be mentioned in that connection. Moreover, the use of the terms Tardenoisian and Sauveterrian suggests a certain degree of mutual exclusiveness, which is the opposite of the situation encountered at the southeastern Spanish sites, where geometric and backed bladelet forms may occur together, sometimes in the same layer sometimes in interdigitating stratigraphical sequence.

Cueva del Lagrimal

Of the foregoing sites, perhaps only the Cueva de la Cocina really allows the firm conclusion to be drawn that an aceramic phase developed into a ceramic phase with relatively slight changes in the underlying lithic tool-kit. The Cueva del Lagrimal, Villena, (Alicante (Soler, in preparation) also seems to demonstrate that phenomenon. To date only a brief summary of this interesting site has been published (Soler, 1968 - 1969, pp. 47, 51). The lowest layer, layer IV, was aceramic and contained microburins, geometric and backed bladelet flints. The pieces from this layer (Soler, ibidem, Figs. 14,15,16,17,pp50,52,53, 55) depict a large number of backed bladelets and fragments of blades, with both unidirectional and bidirectional backing retouch. Both curved and straight margins may be backed, and some pieces are retouched along both margins to a point. It is very difficult to distinguish easily between some of the retouched blade fragments and geometric pieces - and even retouched flakes (i.e. there are many 'atypical' forms). In fact, the only convincing geometric piece is shown in fig. 17 no. 22, which has retouch along the transverse margin of the blade fragment, and some notches/

notches and abrupt retouch along a straight edge. Some sixteen to twenty other fragments of wider blades bear retouch along one edge, but whether these are to be considered as geometric pieces, or broken pieces of retouched blades, is a matter of taste. There are no triangles. There are no crescents. About thirty-six backed bladelets are illustrated. Three or four larger blades seem to have marginal retouch, being irregular in shape. One (fig. 15, no. 16) looks like a combination of a transverse scraper and and end-scraper on the same piece. A curious keeled knife on a flake or flake-blade (fig. 15, no. 15) is interesting because it occurs at other Neothermal Period sites (Cueva de la Palica; Abrigo Grande, etc. -- v. infra), as do pyramidal core-scraper objects (fig. 15 no. 32), and crudely notched pieces like the one illustrated from Cueva del Lagrimal (fig. 15, no. 45). There is a wide variety of scrapers , perhaps about twenty-five according to the figures, ranging from microlithic end-scrapers to transverse and squarish scrapers, large end-scrapers, and four or five discoidal scrapers. One hundred and twenty-one pieces in all are illustrated from the layer IV.

The next layer up, layer III, contains plain and lugged sherds, shell bracelets, backed bladelets, and 'an increased index of geometric' flints. In layer II, the proportion of backed bladelets decreases, and that of geometric pieces increases, but there are also bifacial flint points, a polished stone axe, shell bracelets, plain and lugged sherds, a sherd with impressed decoration along the rim, various sherds of a colander or strainer, five pieces of channelled ware, and two copper awls. As yet the details of these layers have not been fully published. Layer I consists of mediaeval material.

The Cueva del Lagrimal would appear to have an initial phase of occupation without pottery, followed by a continuation of the lithic assemblage, albeit varying somewhat in proportions of tool types, into a ceramic phase, followed in turn by a copper age utilisation of the site From what scanty published information is available, it would seem that

the excavator feels that the site was continuously utilised throughout the three phases. It is interesting that nowhere are triangles nor crescents represented in the lithic assemblage, that the so-called geometric pieces are crude and for the most part unretouched blade fragments, and that the principal tool type of layer IV (aceramic layer) seems to have been backed bladelets and scrapers.

Cueva d'En Pardo

This cave is at Vall de Gallinera, (Alicante), and was excavated some years ago by sr. Pascual of the Alcoy Museum. It is presently being re-examined by srta. Asquerina. According to sr. Pascual, his excavations showed that there was a complex stratigraphy totalling over 5 metres of fill, with ten clearly defined stratigraphical horizons. The lowest layer, layer 10, contained no identifiable worked stone implements, but did contain various mammalian bones, with a predominance of caprine bones over cervine bones. It was 0.40 metres thick. It was followed by a sterile layer 0.70 metres thick, layer 9. Above this were two thin layers, 8 and 7, 0.20 and 0.30 metres thick respectively, containing crude flint blades, with no definitive secondary working. Layers 6, 5, and 4 above those were of sandy soil, becoming stony in the upper part of the sequence. They were characterised by backed bladelets, a large number of snail shells, and no pottery. The thicknesses of these layers were as follows; layer 6, 0.40 metres; layer 5, 0.50 metres; layer 4, 0.30 metres A sterile layer, layer 3, followed those, and was 0.70 metres thick. Layer 2, of similar thickness, contained cardial decorated sherds, bifacial flint arrow-points and other neolithic material. The surface layer, layer 1, 0.80 metres thick, contained bifacial flint arrow-points, plain and incised pottery, spatulate, shouldered bone objects ('idols'), and human skeletons (studied by the present writer, see section on physical anthropology). This superficial layer is described as a copper age burial assemblage, which seems reasonable. Further details will be published by sr. Pascual and srta. Asquerina.

It/

It seems likely that the backed bladelet assemblages in the sandy layers correspond to the climatic phase B_2 defined earlier. It will be seen later that the Abrigo Grande aceramic backed bladelet assemblage discovered by the present writer occurred in similar circumstances. Unlike the latter site, however, the Cueva d'En Pardo shows that there was a hiatus between the backed bladdet stage and the succeeding ceramic phase of utilisation. Nor does the backed bladelet assemblage continue into the ceramic phase of utilisation of the cave, by contrast with both the Abrigo Grande (v. infra) and with the Cueva del Lagrimal Nevertheless, the geological observations suggest that the backed bladelet stage occurred during the Neothermal Period, and that it cannot be related to colder, upper palaeolithic conditions. This justifies its inclusion among sites in which the later upper palaeolithic assemblages stand in relationship to neolithic rather than upper palaeolithic material.

(3) Later upper palaeolithic assemblages of uncertain age, but probably pre-neolithic age

There are some sites where assemblages are found which cannot be related stratigraphically either to upper palaeolithic or to neolithic material at the same site. However, some of these sites may be of Neothermal Period age, and therefore they are appended here, rather than placed between (1) and (3). Geology and typology must be used to assess these sites, the latter being an especially unreliable tool in south-east Spain, unfortunately.

Cueva Pequeña de la Huesa Tacaña

This is a small cave near Villena, (Alicante), (Soler, 1968 - 1969). The rock shelter contained a fill of loose, grey soil with a few stones. The lithic assemblage (ibider, figs. 3,4, p. 36; fig. 5, p. 38) comprises five well-made trapeze points (quite unlike those geometric

fragments/

fragments from Cueva del Lagrimal, layer IV), two battered back bladelet pieces, one or two keeled knives on blades, three burins on blade fragments a strange keeled scraper, a pyramidal core-scraper object, a pyramidal core described as a 'denticulate' piece, and another described as a 'burin', and various other blade fragments. Forty-four pieces are illustrated and described. There was no pottery. There was no stratigraphical differentiation at the site. The trapezes, keeled knives, and backed bladelets are suggestive of a late date for this small collection, and the loose soil in which it occurred also argues for a Neothermal Period date. Aeolian sands only tend to occur in north-facing caves, and this rock shelter faces south-west, which might explain its absence.

Cueva Grande de la Huesa Tacaña

Five metres away from the foregoing is a slightly deeper cave in which a backed bladelet assemblage was found in thermoclastic depositional material, (Soler, 1968 - 1969, fig. 6, p. 39; Soler, 1956). The tools show double facetted (bidirectional) retouch and bear comparison with those from the Cueva del Lagrimal layer IV nearby, and those at the Abrigo Grande (v. infra). Twenty-one pieces are illustrated. Some are retouched along the straight, and some along the curved margin of the bladelet. Some are almost crescentic (Soler, 1968 - 1969, fig. 6, nos 15, 18, 19), and two are battered back triangles (ibidem, nos. 4,5) quite unlike the trapezes at the Cueva Pequeña, but not unlike some of Cueva de la Cocina forms. There are also two pointed, keeled flake-blades The geological interpretation of the Cueva Grande and the Cueva Pequeña is difficult, despite their extreme proximity, one might almost say their contiguity. The caves might be contemporary, and the tool-kits represent different aspects of one habitation unit, much as the garage and the bath-room of a modern house have different functions and tool-kits Thermoclastic scree occurs in phase B_3 (see above), and underlies the aeolian sands at the Abrigo Grande of phase B_2, at the commencement of/

of that site (see below). At that site, the angular scree becomes mixed with the inferior layers of the aeolian deposition above it, in an indeterminate phase of transition. Contemporaneity of the two Huesa Tacaña caves is possible if they represent such a phase of transition. Soler prefers a diachronic interpretation, based on the typological differences. The geological data do not rule out a diachronic interpretation, in which the backed bladelet assemblage would be earlier than the one with trapezes.

Pinar de Tarruella

This site is also at Villena,(Alicante), (Soler, 1968 - 1969). It is an open site and the collection of backed bladelets, one trapeze, denticulate, and discoidal scrapers, might not be homogeneous, representing a surface collection. Larger pieces look Mousterian.

Casa de Lara

This open site is an area of the Villena flood-plain of the Vinalopó. Surface collections from this region have yielded thousands of pieces of flint and pottery. Microburins, backed bladelets, trapezes, crescents, bifacial flint arrow-points, plain, lugged, and incised pottery cardial impressed, grooved, impressed, relief-ornamented sherds, fragments of marble bracelets, polished stone axes, a gold bead, shell beads, etc. (Soler, 1957, 1961, 1968 - 1969). The material comes from sands which are definitely aeolian sands deposited above a 'gley' soil, in turn lying above a peat horizon (Cuenca, in press). These aeolian sands must have been deposited in phase B_2, and have reappeared following the desiccation of the lagoon in post-mediaeval times. The extent to which the archaeological collection represents a mixture of materials transported by the river and settlements in situ around the shore of the diminishing lagoon in the Neothermal Period, is a matter which cannot be resolved.

Cueva/

Cueva de la Palica

This cave is on El Serrón, near Antas, (Almería), (Fortea, 1970). From above downwards the layers are numbered Ia, Ib, II, III, IV, V. They comprise a surface humic ~~till~~ soil, (Ia); a layer of soil with large stones(Ib,II) ;whiter, more compact limestone soil, (III); a very thick layer (to judge from the published section) of loose soil, and finally a tenuous layer of more compact soil (layers IV, V, respectively). Snail shells seem to have been common in all layers down to layer IV, being very plentiful in the upper ones. The lower two layers were probably archaeologically sterile (layer IV contained two flakes of flint). All the layers at the cave were without pottery. Layer III contained a scraper, a burin, 4 backed bladelets (three described as having a 'crest ' a denticulate blade, eight flint and two quartz flakes, and a Pecten shell Layer II contained a backed bladelet, two unretouched bladelets, a scraper and ten flakes. Layer Ib contained five scrapers (including discoidal forms), an awl, a burin, 3 backed bladelets, 2 crested bladelets, one denticulate piece, two notched pieces, fourteen unretouched bladelets, 6 blades, 85 flint flakes, and 17 quartz pieces (including 1 blade). The surface till contained 21 blades without retouch, 1 backed bladelet, 1 denticulate blade and 1 denticulate flake, a burin, a discoidal scraper an ogival scraper, and 11 quartz blades without retouch.

The proportion of retouched to unretouched pieces seems rather high when contrasted against sites such as Covacha de Llatas, Balma de Sant Gregori, Cueva del Filador, or the Abrigo Grande (v. infra). This may indicate an efficient industry, or merely that the site was one where tools made elsewhere were used rather than manufactured.

The location of the pieces above a layer of loose soil is rather suggestive of the onset of thermoclastic conditions in phase B_1 (c.p. the compact layer 2 at the Abrigo Grande, see below). It is hard to envisage an upper palaeolithic date for layer IV at the Cueva de la

Palica/

3.59

Malica on geological grounds, such that the industries overlying it might be chronologically related to upper palaeolithic assemblages elsewhere in the south-east. Although layer IV is not described as being sandy, it may well be that it corresponds to phase B_2, which would make the flint assemblage overlying it relatively late in date (i.e. pre-neolithic or aceramic neolithic*).

Fuente de la Zarza

This is an open site on the boundaries of Jumilla and Fortuna términos, (Murcia) beside a spring. An assemblage described as 'Mousterian' was reported (Explicación .... Fortuna, 1953). The present writer found aeolian sands (confirmed petrologically) covering the valley side above the spring rising to about ten metres above it. In these sands he discovered small pyramidal core objects and unretouched flint blade and flake fragments, as well as a few retouched forms of rather nondescript form but including burin and awl-like pieces, and possibly one end-scraper fig. 120. Presumably the aeolian sands belong to climatic phase B_2, and represent a Neothermal period wind-blown depositional aggradation.

Cueva de los Tollos

This site on El Serrón, Antas, (Almería), (Fortea, 1970) apparently contained a discoidal scraper, an end-scraper, and a keeled piece. No detailed published information is available.

Cocinilla del Obispo

The rock shelter of Cocinilla del Obispo in the Sierra de

Albarracín/

* By 'aceramic neolithic' is meant a possibly neolithic assemblage with chance absence of potsherds. It does not imply any subdivision cultural or chronological of the neolithic.

~~Albarracín~~, (Teruel), contained an assemblage in a 100 cm thick layer, covered by a thin layer of sand. The flints comprised a crude assemblage with a poorly made trapeze, a crescent extended into a sort of tanged point, an awl, a crescent and a microburin. There was also a very small polished fibrolite axe, (Almagro, 1944; 1947a, pp. 430 - 432 and 426 -427 figs. 341, 342). This might be classified as another aceramic neolithic collection, on the basis of the polished tool. The thin sandy layer is not comparable with the thick layers of aeolian sands at south-east Spanish sites, and this rock shelter is rather outside the area under consideration. It is interesting from the viewpoint of its being a rock shelter with paintings (see below and subsequent chapter), mainly bovine figures.

El Navazo

This rock shelter is near to the last-mentioned. It has Levantine paintings of bovines on the wall. A crude assemblage of discoid and end-scrapers was found there (Almagro, loc. cit.)

Doña Clotilde

Another rock shelter in the Albarracín group, Doña Clotilde, was also investigated by Almagro. It also has rock paintings, including more schematic figures and the only representation of a tree known from the eastern Spanish painted rock shelters. It contained a well-made flint assemblage of backed bladelets, discoidal scrapers, and crescents with bidirectional retouch, held to be a more 'evolved' feature contrasted against the two foregoing sites (Almagro, 1944; 1947a, p. 432 and pp. 430 - 431, figs. 345, 346).

Uncertain

For completeness, rather than because this is the most appropriate place, mention may be made of considerable blade assemblages (mainly unretouched blades) in the Almería Museum, but which the present writer has/

has not been able to study in detail, from :

Cueva de la Fuente del Lentisco, Totana, (Murcia)

Cañada de San Pedro,(Almería)

El Hacho, (Almería)

El Moralico, Vera, (Almería)

Cueva Ambrosio, Vélez Blanco, (Almería)

El Gárcel, Antas, (Almería).

Cueva de El Serrón, Antas, (Almería).

Much of this material appears to be the débitage from the excavations of the Sirets and of Cuadrado Ruiz, and perhaps also of Breuil at the Cueva Ambrosio. The flint-work seems to be divorced from the implements, since retouched pieces are not displayed at Almería. It is worth noting that especially from the Cueva Ambrosio and El Gárcel, the waste bladelets are small and slender, very similar to the wasters from the Abrigo Grande (see below) and from other later upper palaeolithic sites. This kind of blade and bladelet material seems to have been the basis for much of what was described as 'Capsian' by other workers. If the attribution of the epithet 'Solutrean' to the point from the Almería cave with Levantine paintings, the Cueva Chiquita, is incorrect, and likewise its attribution to a point from the Cantos de la Visera in Murcia, then it becomes of some interest that the assemblage from the former site was also described by Obermaier as 'Capsian', in the light of the possibly later upper palaeolithic age of such bladelet industries and the later upper palaeolithic or eraly neolithic date of some of the Albarracín rock shelters with Levantine paintings. It will be seen later that the Abrigo Grande is a rock shelter with Levantine art of later upper palaeolithic to early neolithic transition.

Significance/

Significance of Later Upper Palaeolithic

It might have been expected that a site such as the Cueva de la Cocina or the Covacha de Llatas or the Cueva del Lagrimal would have been taken as typifying the transition from an upper palaeolithic way of life to a neolithic one; the lithic industries more or less continuing with little change into layers characterised by the appearance of new materials namely pottery and polished stone implements.

This has not been the case, for several reasons, many of them dogmatic. First, ever since the Sirets excavated El Gárcel (Siret & Siret, 1887; Siret, 1893), a neolithic/or copper age open site with polished stone tools and a prolific flint industry characterised by geometric trapeze points (see Gossé, 1941), it has been held as a matter of faith that geometric trapezes and polished stone implements represent an intrusive colonisation by pottery-using, settled, neolithic farmers. A discussion of El Gárcel will be deferred for the moment. However, it may be stated firmly that there is no evidence whatever regarding the primacy of that site in the Peninsular neolithic chronological sequence, since there is no absolute date whatever for the site.

That is not so for the Alicante cave site of Coveta de l'Or, the radiocarbon dates for which in the fifth millennium have already been quoted. Unlike El Cárcel, the Coveta de l'Or contained a lot of cardial impressed pottery, and bifacially worked arrow-points were found in addition to geometric forms. Both sites, however, are characterised by the occurrence of cereal grains.

The inference has been drawn repeatedly that there were two strands in the development of the neolithic in southeastern Spain: -

(i) an assumed external element bringing geometric flints with plain or incised pottery, polished stone implements, and

cereal/

ceveal cultivation

(ii) an assumed indigenous element characterised by backed bladelets and cardial impressed pottery.

Underpinning this dual scheme was the notion that cereal cultivation represents a way of life so totally alien to a palaeolithic hunter-gatherer society, that its implantation requires external agents. Further tacit assumptions are then made about the direction which the indigenous people's culture takes when confronted with neighbouring colonies, viz. the acquisition of cereals and pottery (as at Coveta de l'Or, and perhaps at Cocina) So powerful has been this model of the basis of neolithic society, that conflicting stratigraphical evidence has either been explained away by unprovable hypotheses of ever-increasing complexity in order to accomodate the model, or it has just been ignored.

The presence of geometric flint-work interdigitating stratigraphically at the Cueva del Filador with backed bladelet forms was ignored as an inconvenient nuisance. The presence of pottery in the upper layers at Cocina, Llatas etc.,was explained away as a secondary borrowing by the natives off more advanced colonising neighbours, despite the total absence of any absolute chronological evidence for the primacy of agricultural settlements such as El Gárcel in the neolithic sequence. Awkward facts, such as the presence of 'advanced' bifacial arrow-points associated with cardial impressed wares and sometimes in deep stratigraphical positions, as at the Coveta de l'Or, were glossed over. The occurrence of cardial impressed wares around the Mediterranean in the fifth millennium and the significance of such sites for Peninsular sites have been given inadequate attention.

Now the presence in eastern Spain of rock paintings illustrating human predation on large mammals complicates the matter. Some workers have seen the paintings as upper palaeolithic in date, others, and among them is the present writer, prefers to date the paintings to the later

upper

upper palaeolithic, as the next chapters will attempt to do conclusively. Yet the emphasis of the art on man-mammal relationships has strengthened those who would envisage the onset of the neolithic as an agricultural cereal crop phenomenon, overturning the earlier way of life, and imposing a pattern of settled village communities on a landscape which hitherto had seen the passage of nomadic tribes seasonally in pursuit of the large mammal herds. Lingering hunting bands are assumed to have become acculturated, hence the acquisition of polished stone tools, pottery, etc..

It is the aim of the next two chapters to propose that the model is faulty. It will be proposed instead that the basis of the neolithic economic and population expansion in the area, and of the acquisition of a new neolithic technology (pottery, polished stone), was the continued reliance of the inhabitants of the area on large mammalian exploitation rather than on cereal crops, which were acquired as a result of the economic well-being permitted by large mammalian exploitation activities in order to supplement the diet and provide some storable reserves of carbohydrate. This acquisition could well have been attained by peacable trade and contact with surrounding populations less fortunately supplied with livestock, who had to take recourse to cereal crop cultivation in order to sustain their growing numbers. The vine and olive, and the so-called Mediterranean 'polyculture' may have been acquired only at a later date.

It will be proposed, moreover, that a livestock-based economy is ergonomically more satisfactory, more conducive to a population expansion and to economic expansion than a cereal crop agricultural society. It will be proposed that the population explosion so reached demanded the setting up of proto-urban townships, based upon herding and transhumance until the end of the bronze age. The power and wealth of these townships, and their exploitation of mineral resources and specialist technologies was localised in southeastern Spain, on account of the curious combination in that area of suitable livestock herds and of

limited/

3:65

limited, rather, well-nigh non-existent, land suitable for cereal crop cultivation on a scale which would have been necessary to maintain the sizeable population, given the prevailing geological sedimentary conditions (see previous chapter). Physical anthropological evidence will be used to counter the hypothesis that there were invaders in the neolithic and copper ages, responsible for the townships and technological advances This will be demonstrated in a later chapter.

In brief, it is proposed in this thesis that the appropriate model for social and cultural change in southeastern Spain is one of an economy based on livestock (at first domesticated, later not domesticated) which persisted as the principal basis of the diet of the majority of the people from upper palaeolithic until late bronze age times. It permitted a population explosion and an economic well-being otherwise unattainable, leading to localised urbanisation from as early as 4,000 B.C.. Continuity of lithic assemblages, and diversity both of lithic and ceramic assemblages represent the adaptation of the local population to the exigencies of their work and environment, and also the purchasing power of their successful livestock agriculture, as reflected in specialist craftsmen who could be maintained. There were no major invasions or colonisations from the upper palaeolithic onwards until the Carthaginians.

It is the purpose of the thesis to make out a convincing case for these propositions which stands up better than that for the traditional models. The next chapter will deal with the age and significance of the Levantine rock paintings, and the following chapter will consider new evidence for neolithic origins in the indigenous later upper palaeolithic provided by excavations conducted by the present writer. In connection with those, other possibly early neolithic sites in the region will be discussed

INVESTIGATIONS INTO ASSEMBLAGES AND ENVIRONMENTAL FACTORS OF THE LATER UPPER PALAEOLITHIC AND EARLY NEOLITHIC : I

Levantine Naturalistic Rock Paintings: Introduction

In which is outlined a geographical and historical introduction to Levantine rock art.

Levantine Naturalistic Rock Paintings : Methods

(a) Scale drawings
(b) Direct tracing and painting
(c) Black and white photography
(d) Colour photography
(e) Black and white photography with infra-red film
(f) Colour photography with infra-red film
(g) Colour photography with blue filter

Levantine Naturalistic Rock Paintings : Sites Investigated

(A) El Sabinar Group
(B) Nerpio Group
(C) Cieza Group
(D) Monte Arabí Group
(E) Minateda Group
(F) Alpera Group
(G) Vélez Blanco Group

Levantine Naturalistic Rock Paintings : Discussion

(A) Fauna
(B) Upper Palaeolithic versus Later Upper Palaeolithic Age
(C) Later Upper Palaeolithic and Early Neolithic Relationship

The discussion establishes that the faunal content of the art indicates an environment consistent with a Neothermal Period dating rather than an upper palaeolithic dating. Attribution of the art to the later upper palaeolithic and early neolithic is proposed. The physical anthropology of the painted anthropomorphs is discussed. Archaeological assemblages at sites with Levantine art are discussed, as a prelude to the subsequent chapter on the present writer's excavations at a site with rock art and a later upper palaeolithic to early neolithic transitional assemblage.

INVESTIGATIONS/

Levantine Naturalistic Rock Paintings : Introduction

From what has been said in the previous chapter, it is difficult to say that any sites with Levantine naturalistic rock art have deposits with Solutrean (or for that matter, Gravettian or Magdalenian) artefacts the authenticity of which is beyond dispute. On the contrary, there are some sites in the Sierra de Albarracín where generalised later upper palaeolithic assemblages have been found, one of which contained a polished stone axe, suggestive of acquaintance with neolithic artefacts.

The next chapter will consider in detail one site with rock art which the present writer has excavated, and which definitely shows a transition from strata lacking neolithic-type artefacts, to one with such artefacts, and yet nevertheless demonstrating a continuity of chipped flint implement forms.

Since it is the purpose of these two chapters to demonstrate that the simplest working hypothesis (not the only hypothesis, merely that involving least assumptions) for making cultural and chronological propositions about Levantine rock art is that such art is contemporaneous with the assemblages of the later upper palaeolithic and early neolithic, perhaps corresponding to the time-span 6,000 - 4,000 B.C., in support of which view excavation evidence will be offered in the next chapter, it is necessary to consider the art in some detail, with particular regard to

(i) the Segura and Vinalopó sites of such paintings

(ii) the painted fauna and its likelihood or unlikelihood of occurrence in the region during the Neothermal Period

(iii) depictions of man-animal relationships with regard to different models for explaining the interrelation of prehistoric people with their/

their environment.

This last-mentioned interrelation will be discussed more fully at the end of the next chapter following presentation of the excavation material and a consideration of the site exploitation territory of the site in question and will be developed into a discussion of the relative ergonomic merits of a livestock-based as compared with a cereal crop-based economy in the palaeo-environment of southeastern Spain, of the various sites which have been hitherto taken as typifying the early neolithic in the region, and the possible functional significances of their assemblages.

The Levantine naturalistic rock art is important because it furnishes us with interesting depictions of the faunal environment of the prehistoric artists, and perhaps of their responses to that fauna. It will also be seen that some artefacts are depicted, including forms which have usually been classed as neolithic.

The rock shelters decorated with naturalistic art of the Levantine type occur widely in eastern Spain (Map 9), and there are several in the Segura and Vinalopó river basins (Maps 5, 6). The Levantine political provinces strictly speaking are Castellón, Valencia, Alicante, and Murcia. However, the paintings occur in a wider area over eastern and south-east Spain; to the north in Lérida and Tarragona; to the east in Teruel, Cuenca, and Albacete; to the south in Jaén, Granada and Almería Curious outliers which strongly recall the Levantine paintings occur a Garcibuey and Las Batuecas in Salamanca province, and were probably the first rock paintings to be recognised as prehistoric or ancient in Western Europe. They were mentioned in a poem of Lope de Vega in the sixteenth century, who noticed that the painted fauna no longer lived in the region, entitled "Las Batuecas del Duque de Alba" :-

"Esas/

"Esas casas, que pintadas
Se ven en ese trabón
No son en Batuecas halladas,
Que nuestras casas no son
Tan polidas fabricadas.
Ni esos fuertes animales
Tan feroces ni tan listos,
Con ganas y lanas tales,
Son en nuestros valles vistos
Por montañas ni arenales.
Luego es señal que hay más gente,
Más mundo y cosas más bellas. "

These paintings have been described by Breuil (1918-1919; 1935) and Hernández-Pacheco (1923). There are zoomorphic paintings also at other sites in western and southwestern Spain which might bear comparison with Levantine art, viz. at Valdejunco, near Esperança, (Portalegre, Portugal; Breuil, 1917), Cueva de la Pretina, near Casas Viejas, (Cádiz; Cabré, 1915), and Rabanero, (Ciudad Real; Pericot, 1950).

Until lately, pride of place has been accorded to Levantine art sites in the northern part of the region, such as at Calapatá, (Teruel among which were some of the first to be discovered in 1903 (Breuil & Cabré, 1909; Cabré, 1915; Cabré & Pérez, 1921; Bosch Gimpera, 1924; Vallespí, 1957), and the Roca dels Moros, at Cogul, (Lérida; Cabré, 1915; Bosch Gimpera & Colominas, 1927; Breuil, 1935; Almagro, 1947, 1947a 1952a, 1957). Many other sites in the northern Levantine region are all well documented, thus the paintings near Tivisa, (Tarragona; Bosch Gimpera & Colominas, 1931; Hernández-Pacheco, 1921), of Morella, (Castellón; Hernández-Pacheco, 1918), of Valltorta, (Castellón; del Arco, 1917; Obermaier & Wernert, 1919; Cabré, 1923; Durán, 1923), of Casulla, (Castellón; Porcar Roig, 1934; Porcar Roig et al., 1934 - 1935; Kühn, 1926, 1927; Obermaier, 1935, 1937; Martínez Santa-Olalla, 1941 - 1942; Porcar Ripollés, 1935, 1943, 1950, 1953; Thompson, 1960; Ripoll, 1963), of the Sierra de Albarracín, (Teruel; Breuil & Cabré, 1911;/

del Humo, (Breuil, 1935; Almagro, 1947a; Hernández-Pacheco, 1959). In Albacete province the paintings near Alpera were studied early (Breuil et al., 1912; Breuil & Obermaier, 1912; Breuil, 1915; Cabré, 1915), as also were the paintings near Almansa on the hill of Mugrón, between Almansa and Alpera, (Cabré, 1915), and shortly afterwards there was found the famous Minateda series in the Segura valley, (Breuil, 1920, 1928, 1935). Recently, an important group has been discovered near Nerpio (Sánchez Carrilero, 1956-1961; García Guinea & Krapovickas, 1958-1959; García Guinea, 1961-1962, 1962). This group is spread over a wide area the upper reaches of the Taibilla valley, in the Segura basin, and it therefore falls within the area of the present study of course.

Geographically close to the Taibilla valley, painted shelters occur near El Sabinar, Moratalla término, (Murcia), (Martínez Sánchez 1969; Beltrán, 1968; Carbonell Escobar, 1970; Walker, 1969, 1971). Other unpublished sites exist in the Taibilla valley, notably at Casa de Sapo Nerpio, (Albacete), (Carbonell, personal communication), the Abrigo la Mujer (Moratalla término, Murcia, quoted in Beltrán , 1968, but shown by García Guinea, 1962, p. 459, as being in Nerpio término, Albacete), well as possibly another site in the same locality referred to by Beltrán (1968, p. 226)*. The hitherto unpublished site of schematic art with anthropomorphic and zoomorphic content at the Collado del Guijarral in Jaén province (above the cortijo of Parolís, near Yeste, Albacete, from which place the site is best approached) in the upper reaches of the Segura valley is given here (Plates XVI,XVII; fig. 19). Finally, near Cieza in the middle reaches of the Segura basin there has lately been found a fine series of rock shelters with Levantine art (López Pascual, 1968; Beltrán 1968b, 1969; Walker, 1971, 1972).

The/

*A distribution map in Murcia Museum shows a site between Cieza and Jumilla called Abrigos de la Calesica. The site is near a hamlet called Sabinar, and is most likely a confusion with the sites at Fuente Sabuco and Cañaíca del Calar, near El Sabinar, Moratalla término (v. infra).

The paintings of the Segura basin are interesting, because there occur both Levantine and schematic art types in the same areas. Further south the same phenomenon reappears in the upper reaches of a major tributary of the Segura, the Guadalentín-Sangonera valley system on the borders of Murcia and Almería. Rock shelters with Levantine art are recorded near Topares, (Almería; Cabré, 1915), near Almaciles, (Granada; Breuil & de Motos, 1915), at two sites near Chirivel, the Cueva Chiquita and Estrecho de Santonge, (Almería) and one near Vélez Blanco at Desfiladero de Leira, (Almería), (Breuil & Obermaier, 1914; Cabré, 1915; Breuil & de Motos, 1915; Breuil, 1935). There are many sites with schematic art near Vélez Blanco (see below). The more southerly sites have been neglected by some recent workers and fail to appear on distribution maps (thus Savory, 1968).

To the west of the headwaters of the Segura, in the province of Jaén and Ciudad Real, there begins the well-known series of rock shelters with schematic art which stretches westwards as far as Extremadura (Breuil, 1933, 1935). Even among these sites there are some which have possibly 'Levantine' type motifs, especially at Aldeaquemada, (Jaén; Cabré, 1915) Santa Elena, (Jaén; ibidem), and Rabanero, (Ciudad Real; Pericot, 1950). Mention has already been made of the possibility that some of the schematic sites further west may have motifs reminiscent of the Levantine naturalistic figures. This schematic style of art has recently been the subject of a monograph by Acosta (1968). More will be said of its relationship to the naturalistic art of the Segura basin at the end of the chapter and in a subsequent chapter. The significance of the wider geographical distribution of the schematic art is outside the geographical limits of the present study.

The following justifications are offered for treating the Levantine naturalistic zoomorphic and anthropomorphic paintings of the Segura and Vinalopó river basins in this thesis :-

(1)/

(1) Excavations conducted by the present writer suggest that one group of sites with such art represents a transition from a preneolithic a neolithic phase (as defined by absence or presence of pottery), but that

(2) the hunting and gathering economic basis of the respective phases may have been unchanged, and capable of supporting large communities and possibly led to incipient pastoralism .

(3) Internal evidence from the paintings suggests that they differ in important was from upper palaeolithic Franco-Cantabrian cave art, and also from schematic rock shelter art, and that they were executed during just such a warm post-glacial cliamtic phase when neolithic origins might have been anticipated. The simplest, but not the only hypothesis, is that the art is contemporary with the later upper palaeolithic and early neolithic.

Levantine Naturalistic Rock Paintings : Methods

Various pictorial methods for recording the art have been tried but not all can be illustrated here because of the expense that colour plates imposes. The methods are :-

(a) scale drawings
(b) direct tracing and painting
(c) black and white photography
(d) colour photography
(e) black and white infra-red photography
(f) colour infra-red photography
(g) colour photography with blue filters.

(a) Scale drawings

This method has been employed by the present writer in recording rock carvings in Britain and in Galicia (see Walker, 1970). It has been employed on south-east Spanish rock paintings (e.g. figs. 1, 5) combined with simple colour washes. The advantage of the technique is that scale reduction can be made at the site, and thus a large expanse of rock

can/

can be recorded in a short time with minimal use of materials. The disadvantage of the method is a loss of detail, which may be of critical importance where artefact identification or the determination of an animal species is desired.

(b) Direct tracing and painting

This involves copying the paintings at a 1:1 scale, and is expensive of materials, and can lead to carrying a lot of equipment over difficult terrain. It is not possible to project the rock panel onto a two dimensional plane. The rugosities and undulations of the rock perforce demand that the transparent sheets be moulded to accomodate them. Great detail can be achieved, but at the expense perhaps of losing the visual effects intended by the artist when the display is reduced from three to two dimensions (compare, for instance, Early Celtic metalwork). In order to copy the precise stroke-work of the prehistoric painters, a professional artist was employed to make the copies, Mrs. A. de Méric. The requirement for professional artists to undertake such work cannot be too strongly emphasised. Heavy gauge polythene sheeting was provided by Commercial Plastics Ltd., and it was found that the ideal non-running materials for painting on this were printing inks, kindly supplied by I.C.I.Ltd. Small, clear figures can be copied very exactly by this method, but to reproduce an entire rock panel is very time-consuming and rarely possible. Smudges of paint and faded paintwork cannot be copied satisfactorily by the method. There is an advantage in making colour reproductions, but the cost of providing illustrations in colour has meant that black and white prints have had to be taken off colour transparencies of the paintings done by Mrs. de Méric.

(c) Black and white photography

The scope of this technique is limited to small areas of rock

panels/

panels, and this is true for all photographic techniques. Nevertheless, it is possible to build up a sectional picture which can be useful if the paintings are clear and sharp, since a projection is provided in two dimnsions, thereby allowing visual effects possibly intended by the artist be captured. Again, professional photography can be of assistance, and the assistance in that capacity of Mr. P. Morrissey, M.A., is acknowledged. However, much of the photographic work was subsequently carried out by the present writer alone using an Asahi Pentax 35 mm camera.

Photography has various disadvantages. There is distortion of scale when an undulating surface is photographed. It is expensive of film when a large area of rock has to be recorded, and particularly when large expanses of rock devoid of paintings have to be recorded in order to link two painted areas of a rock shelter some metres apart. There is the difficulty of obtaining well-fitting sectional photographs unless a firm tripod is carried. Most seriously, records cannot be assessed until the film has been processed and prints taken. If these are unsatisfactory, a second visit is necessary to the site. If black and white photography alone is used, it may be impossible to tell from a print whether a particular dark mark represents a painted mark or a shadow cast by a crack or irregularity of the rock surface. Rock shelters overhang, moreover, so it is often necessary for the photographer to wait several hours in one shelter until the sun is in the right position. Flash may be used, but often produces a flat effect. A small group of half a dozen rock shelters may on occasions demand as many days work on the part of the diligent photographer.

(d) Colour photography

This overcomes the problem of deciphering shadows and fissures but is even more expensive. Nonetheless, colour reversal film is probably in the long run the best technique for large rock shelters where expanses

of/

of rock without paintings or with smudgy painted marks must be recorded. Black and white prints can be taken from the film, or even colour prints. Many of the photographs used as illustrations to the present work have be taken from colour reversal film. A loss of clarity may occur, however, es ecially if enlargements are attempted. Direct colour prints have also be taken, but the cost of reproducing these is large, and they are rather small, whereas transparencies can be projected in order that detail can be inspected.

(e) Black and white infra-red photography

Using infra-red film with a red filter a much improved definition can be obtained. Black and white and colour varieties of infra-red film exist. The original intention was to use such black and white film to reveal traces of paint too faint to be detected by the naked eye. The film is delicate and susceptible to heat, and must be processed in a laboratory. Unfortunately, the black and white variety does not resolve the possibility that cracks and projections of rocks may cast shadows which can be mistaken for paint marks.

(f) Colour infra-red photography

This was intended to overcome the last-mentioned difficulty, but the problems of heat susceptibility and laboratory processing are still present. Unfortunately, the prints are hard to interpret. The red on buff paintings appear as black on green, making identification difficult. With special printing techniques, a cream on brown effect was obtained - also rather hard to interpret. A series of colour slides which had been taken accidentally with this film without use of the red filter gave a clear purple on white effect, but red streaks and blurs intruded.

(g) Colour photography with blue filters

Recently direct colour film with blue filters has been used at

a/

a few sites to try to gain some of the advantages of ultra-violet flash photography. The results do not seem to be much better than those obtained without use of the filters, however. Some increase in clarity may be obtained, due to a reduced intensity of the browns and yellows of the background rock surface. The technique does not noticeably lead to detection of figures too faint to be seen by naked eye. (This could be due to absence of such figures at the sites investigated, of course.)

The need is for techniques which use light equipment, capable being carried by one man, and which are cheap. The present writer prefers a combination of (a),(c) and (d). Where trained staff are available, these may be supplemented by (b) . Reliance on one method alone is an unwise policy.

Levantine Naturalistic Rock Paintings : Sites Investigated

(A) El Sabinar Group

Several rock shelters occur in the north face of a canyon which runs from east to west in the Sierra de Taibilla to join the Taibilla valley. They lie about 7 kilometres south-west of El Sabinar in the *término* of Moratalla, (Murcia), between the hamlets of Royo Tejera (variously also known as Arroyo Tejera and Arroyo Tercero) in the west at approximately N. 38° 11′ 12″, E 1° 29′ 15″, and Calar de la Santa in the east at approximately N 38° 10′ 45″, E 1° 31′00″ (on Sheets 888 and 889 respectively of the 1:50,000 series published by the Instituto Geográfico y Catastral, based on the meridian of Madrid and not of Greenwich, as are all other co-ordinates given in this work). The canyon is called the Cañaíca del Calar and most of the rock shelters are high in the wall between 1,160 - 1,180 metres above sea-level. The painted shelters are on the north face of the canyon and thus face south, a common situation for rock shelters with Levantine art. Such slopes are called *solanas* because they receive the full force of the sun for much of the day. Possibly this situation, and also the proximity/

ximity of fresh springs or streams, were factors determining the choice of sites to be painted. The paintings were first visited by the present writer in 1968 and have now been published by various workers (Martínez Sánchez 1969; Walker, 1969, 1971; Carbonell Escobar, 1970). In an earlier article the present writer named the sites after the name of the hillside, Calar de Tapia or Escalar de Tapia, but the numbering has been revised here in accordance with the convention used by other workers, naming one site after a spring, Fuente del Sabuco, and the remainder after the canyon, Cañaíca del Calar.

Fuente del Sabuco (Site 1)

This lies at N 38° 11´07´´, E 1° 29´55´´ behind a clump of pines trees to the west of the spring which feeds the stream of the canyon, after which the rock shelter is called. The shelter bears traces of paint in several places, but the principal panel is shown in fig. 1 and fig. 5, and in Plates I and II (taken with black and white infra-red film). The central part of the panel comprises an equine, a large quadruped (also an equine?) a cervine, and another cervine head, a caprine, and two indistinct animals one of which may be an ursine (Beltrán, 1968). The large quadruped has an anthropomorph in relation to its dorsum (equine and rider ??). Other animals appear in fig. 5, of which one may be a bovine or another cervine two are very small quadrupeds, and at the right-hand side there appear a cervine head and two small quadrupeds.

There are many anthropomorphs painted at varying scales. Five large ones stand between the two larger quadrupeds, and are 100- 120 mm in height. At least two are wearing calf-length skirt-like garments, one has a protruberant abdomen (pregnant ?) and a hint of large breasts (and therefore possibly a female). At least thirty anthropomorphs are painted at different places in the rock shelter, many of the smaller ones being only 40 - 50 mm in height. Apart from the skirted figures, there is also another with a shorter skirt or loin-cloth. Eight anthropomorphs carry bows, wands or staves, which are between two-thirds and three-quarters of

their/

their stature in length. One is shown as being an undrawn self bow with the arrow notched. If the other objects are bows, they too must be self bows (see discussion on archery below). A skeuomorphic tectiform occurs below the horse at the left-hand side of the panel, being painted in a lighter red than the uniformly dark red of the rest of the figures.

Cañaíca del Calar (Site 2)

This site lies to the east of the spring, some 500 metres from site 1, and about half that distance from the spring. It is located at approximately N 38° 11′ 07″, E 1° 30′ 14″ and is at about the same altitude. As may be seen from fig. 6, there is a large expanse of rock divided into several small niches decorated with schematic motifs, dots, strokes, two curious white zoomorphs with tails, a five-pronged comb, a horned anthropomorph, three schematic cervines, two schematic anthropomorph and a rayed circle or sun motif. All the figures are red and very small (figs. 3, 6, and Plate III).

Cañaíca del Calar (Site 3)

This site is again some 500 metres east of the foregoing, at approximately N 38° 11′ 05″, E 1° 30′ 27″. Here, there are beautifully portrayed animals in the Levantine naturalistic manner; two large cervines, four less distinct quadrupeds, a caprine being pursued by an archer who is crouching, two animals shown in outline only of which one represents the head and points of a cervine, and an anthropomorph with a bow or wand who seems to be wearing a horned mask (figs. 2,4,8 and the black and white infra-red photograph Plate IV). The highlight of the panel is surely the young, grazing cervine (or female cervine, perhaps), with head slightly turned.

Cañaíca del Calar (Site 4)

One hundred metres from the preceding site is an inaccessible

and/

and ill-lit niche in the cliff there are two schematic black anthropomorphs not here illustrated. Other shelters in the canyon also bear smudges of paint, often obscured by soot from fires probably lit by shepherds in recent times.

Archaeology of the Canyon

A A small thumb-nail pyramidal flint scraper was found near Site 2, and a number of coarse sherds were found at various places in the sides of the canyon, all found on the surface.

On the opposite side of the canyon to the painted sites, and on a promontory formed by the intersection of two canyons, there was a observed a stone construction from which local people reported finding piedras de rayo ('thunderbolts', i.e. polished stone axes). There seemed some reason to associate the site with an early prehistoric occupation of the canyon, possibly contemporaneous with the rock art. An excavation was therefore conducted by the present writer at the site, known as El Castillico, or Corral de los Villaricos.

The site transpired to be later in date than had been anticipated Briefly, it consisted of a promontory settlement defended on two sides by sheer cliffs, and on the third by a stone defensive wall, still standing to a height of 3.50 metres and having a like width. The wall was erected in two phases, the second of which involved adding two square wall-towers one on either side of the gateway, and obliterating an earlier doorway through the wall. The rubble of the wall-tower foundations contained a fragment of a polished stone axe, and it is possible that the axe belonged to an earlier phase of occupation, perhaps belonging to the late bronze age. Behind the defensive wall there were small huts showing two phases of occupation, the second of which involved rectangular early Iberian iron age constructions, wheel-turned and painted early Iberian iron age pottery, and an iron chain. At the roots of a large tree, there were found fragments of a late bronze age vessel, suggesting that the first stage of occupation and perhaps

wall/

wall construction belonged to this period at the end of the second millennium B.C.. The second phase, with wall-towers and rectangular huts, was rather later, probably during the first half of the first millennium B.C. (Walker, 1971a). A radiocarbon date obtained for the second phase gives an uncorrected date of 1500 ± 100 B.P. (S-178-III; 265 g bone giving 78.1 cm CO_2; 5570 ½-life C14), giving 450 A.D. (subtracting from 1950). This date is clearly wrong, and must be due to contamination with later material.

About two kilometres away and at about 1,600 metres above sea-level at the summit of the Cerro del Peñón del Castellar, there were found traces of a somewhat earlier copper age occupation (see below).

(B) Nerpio Group

These are the painted rock shelters of the Taibilla valley in the adjoining province of Albacete. They have been the source of extensive publications (Sánchez Carrilero, 1956-1962; García Guinea & Kraposvickas, 1958-1959; García Guinea, 1961-1962, 1962) and it is not proposed to deal with the sites in the same detail as those at El Sabinar. García Guinea (1962) has published a distribution map of the paintings in the *término* of Nerpio which sorts them into naturalistic and schematic sites, respectively. Some of the sites are quite close to El Sabinar, near the reservoir of the Río Taibilla (Presa del Taibilla), but unfortunately the municipal bailiff, sr. Pedro Moreno, (Guardia Municipal, Nerpio), failed to locate these for the writer on an abortive field excursion. Most of the sites are near to Nerpio itself, but the most impressive, Solana de las Covachas, is 6 kilometres to the south-west.

Solana de las Covachas

This site is in the *término* of Nerpio, *pedanía* of Río Moral and by the *cortijo* of Perdro Andrés It is on the north slope of a hill

at/

at approximately N 38° 06′ 55″, E 1° 19′ 32″ and at about 1,500 m above sea-level (Sheet 909 of the 1:50,000 series). The full report on the five rock shelters which form contiguous niches demonstrates the great variety of both the zoomorphic and anthropomorphic figures (Sánchez Carrilero, 1956-1962). Opposite each plate, Sánchez published drawings apparently traced from the photographs. Partly to test the accuracy of recording by reduced scale drawing, technique (a), by itself, the present writer visited the site in December 1968 and made scale drawings without referring to the earlier publication, subsequently tinting the drawings with water-colours (Walker, 1969, and figs. 7,9). The method showed some loss of fine detail, especially of small figures only 40 mm in size, but had the advantage of placing all the figures in relationship to each other. Subsequent studies utilised colour photography and black and white (including infra-red) film (Plates V, VII - XV) as well as direct tracing and painting (figs. 10 - 18). Those techniques revealed the extent to which detail had been neglected in the reduced scale drawing, but also they demonstrated the limitations of the other methods when the rock surface is very large; namely, that only small areas of the panels were capable of photographic or direct painting techniques.

The rock surface is divided into five niches. There are in all about 63 zoomorphs (it is difficult to be wholly precise) of which one third portray caprines, one-third cervines, and the remainder defy interpretation, either because the animals are very small, having been drawn without much detail, or else because the paintings only represent hindquarters of beasts. In some cases the animals appear to have long necks; possibly they are equines. One small animal might be a dog (fig. 13a, 15a) and is portrayed in close relation to an anthropomorph with an appendage which in turn might be interpreted as a hafted axe of implement. The cervine illustrated by fig. 13 and Plate IX (c.p. Sánchez, 1956-1962, Plate XXX) has both a prominent dorsal hump and also a spreading palmate antler. The points are represented quite differently from those of other

Levantine art cervines. The size of this animal in relation to adjacent anthropomorphshas led this writer to propose tentatively that it may be Megaceros or Alces alces rather than Cervus elaphus.

The anthropomorphs also excite interest. That of fig. 16 is drawing a self bow to which an arrow has been notched, and both our illustrations and those of Sánchez depict the arrowpoint as having two barbs The significance of this feature will be commented upon later. The proximity of the anthropomorphs to the animals is a notable feature of this panel Three tall, skirted anthropomorphs, one of which has a shovel-shaped head (hair ? headgear ?) are painted in relation to a very large anthropomorph with out-turned feet and a possibly penile projection (fig. 17). The figure may be attached to a wand or rod. The significance of these figure will be discussed below. Fifteen other, smaller, anthropomorphs are also painted, most of which bear bows and arrows. There are twenty-one anthropomorphs in all.

Solana de las Covachas demonstrates the superpositioning of motifs (e.g. Plate IX) which is a not uncommon characteristic of prehistoric rock paintings of both Levantine and Franco-Cantabrian groups.

Other sites near Nerpio

Little will be said of these sites except to point out that six of the twelve sites on García Guinea's distribution map (1962, p.459) are naturalistic and six schematic. In the latter group is the Abrigo del Idolo, near Nerpio (Plate XVIIa). One of the naturalistic sites near shows a cervine, a caprine and a chamoix (Plate VI). A site at Casa de Sapo, near Nerpio, found recently by Carbonell (personal communication portrays cervines. It has already been said that the El Sabinar paintings comprise four shelters of which two are schematic and two naturalistic, and these are part and parcel of the Talbilla art series.

Collado/

Collado del Guijarral

The site is 50 metres below the summit of the 1,217 metre high mountain called Collado del Guijarral in Jaén province overlooking the Río Segura, but approached from the cortijo of Parolís, término of Yeste, (Albacete). It is located by the coordinates N 38° 16′ 25″, E 1° 13′ 55″(Sheet 888). Here there is a small rock shelter which has schematic paintings and very small naturalistic motifs apparently related to one another in the same panel (Plates XVI, XVII, fig. 19). The paintings were known to the villagers from some years. Prominent among the figures are oculus motifs such as have already been mentioned at the Abrigo del Idolo, near Nerpio, and which are commonly found painted and engraved on animal bones (especially equine phalanx bones) of the south-east Spanish copper ages. Two nondescript quadrupeds are depicted as well as archers, one of whom is wearing a knee-length skirt-like garment. (This might lead one to cast doubt on sexing painted anthropomorphs as female if such garments are worn.) There are many butterfly-like motifs interspersed among the other figures, possibly birds. However, the queerest figures are centipede-like motifs which defy interpretation (hunting tallies ?)

The site is rather less than 15 kilometres as the crow flies from the recently discovered paintings at Casa del Sapo, (Nerpio). It is hard to classify the paintings of the Collado del Guijarral as definitely Levantine or definitely schematic . If stylistic criteria are to be used , they are best described as intermediate.

(C) Cieza Group

In 1962 don Eduardo López Pascual of Cieza, a city on the Río Segura 35 kilometres upstream from Murcia, discovered a site with Levantine rock paintings in the Sierra de Azoey in a dry canyon called the Barranco de los Grajos. The Principal Painted Rock Shelter (Site 1) lies at about N 38° 15′ 55″ , E 2° 18′ 24″ and about 500 metres

above/

4:12

above sea-level (Sheet 861). The shelter has been studied by its discoverer (López Pascual, 1968) and Beltrán (1968b, 1969) who published colour photographs and a tracing of the paintings. The other rock shelters were not included in those studies. The second shelter has been called the Abrigo Grande on account of its size, and the paintings it contains have been reproduced by the present writer with sr. López (Walker, 1972).The Abrigo Grande contained an interesting later upper palaeolithic and early neolithic industry (see below) . A third rock shelter contains a single anthropomorphic representation.

Principal Painted Rock Shelter (Site 1)

Two walls of the shelter are painted. The right-hand wall as the shelter is approached (see Plate XXIX) bears the larger group of figures (figs. 29, 31), comprising eleven quadrupeds and twenty-five or twenty-six anthropomorphs. The animals include at least two cervines and two caprines, as well as four extraordinary small animals whose bodies are not painted in solid colour (the usual manner in Levantine paintings), but rather have vertical and chevron lines of black paint. Three of these small quadrupeds are headless, but have tails. One is tail-less but comes to a point anteriorly. There is also an animal in the bottom left-hand corner (see fig. 31) which may be a suine. One of the larger quadrupeds, which has a short tail but no head, has a horizontal dark band running antero-posteriorly along its body wall. The relation of the legs to trunk of the animal differs from that of the smaller beasts. Possibly it is a wild caprine, whereas the small quadrupeds, whose short stick-like legs are attached to a belly which is depicted as a straight line, lacking haunches, may be sheep.

The anthropomorphs differ both from those at El Sabinar and at Solana de las Covachas in their lack of bows and arrows. Only one figure has what might be a bow or wand, but it is held above the head by out-

stretched/

stretched arms (alternatively, it may be headgear). There is a very elongated anthropomorph towards the left-hand side of the panel, wearing a skirt and possibly with pendulous breasts. Eleven or twelve other anthropomorphs have knee-length skirts. The expressionist manner of representation suggests an attempt to capture movements, and arms and legs are in extravagant postures, as if dancing. Towards the right-hand side of the panel are more schematic anthropomorphs, one of which may be carrying a hafted implement from the waist. The opposite wall of the shelter has a small painted panel comprising two skirted anthropomorphs leaning forwards with one arm outstretched, the one in front grasping the horn of a caprine.

Unlike most rock shelters with Levantine art, this and the other rock shelters of the Barranco de los Grajos face north, not south. For most of the day they are in the shade. Even in Summer they do not receive the heat of sun except for about an hour between six and seven p.m.. It may be significant in this context that the anthropomorphs are skirted and not weapon-bearing. A cool shelter would be suitable for (female ?) domestic tasks.

Abrigo Grande (Site 2)

About a hundred metres up the canyon from the foregoing, and separated from it by a small rock shelter devoid of paintings, there is a very large rock shelter with a square entrance, whose paintings have not been published hitherto. Very queer black anthropomorphs of bitriangular hourglass form, with inverted triangular heads, and with stick limbs, are painted on one wall. They are filled in with hachured lines. One anthropomorph bears a staff, (figs. 32A, 32B, Plates XXXI, XXXII). The figures have been partly covered by a calcite flow, perhaps testifying to some antiquity. Also painted near to them are two minute qualrupeds with circular feet attached to the limbs, and one is carrying a rider. These are perhaps not unlike some figures from Tivisa and Calapatá (Breuil, 1935)

whose/

whose age is unknown, but which may be mediaeval. Whereas these figures are in black, there are also painted close to them some crude letters of the alphabet in red, as well as some meandering lines. In a quite different part of the rock shelter, in a niche in the rear wall, there is a single, sinuous red anthropomorph which probably belongs to the Levantine naturalistic type of art. This rock shelter contained an interesting archaeological fill which will be described later.

Site 3

Some three hundred metres or so further up the canyon, passing en route several undecorated rock shelters, there is a small fissure-like rock shelter, no more than a cleft in the cliff, which has a small, sinuous black anthropomorph (fig. 32C) which is comparable with the prehistoric naturalistic figures.

(D) Monte Arabí Group

The paintings at various sites on Monte Arabí, near Yecla, (Murcia), on the boundary of the province with that of Albacete, have been known for a very long time (Cabré, 1915; Breuil & Burkitt, 1915; Breuil, 1935). Recently, a new panel with a single figure has been found It was desired to investigate the faunal content of the art, and direct painting, colour photography, and infra-red colour photography were carried out. The rock shelters are four in number. Two are at Cantos de la Visera and have naturalistic animal art. One of these was presumably the rock shelter with a later upper palaeolithic industry excavated by Breuil The third rock shelter is called the Cueva del Mediodía, which has schematic motifs and is about one kilometre south-west. Some one hundred metres north-east of it in the same overhang of cliff there is a naturalistic figure painted on the flat roof of a niche of the cliff (Site 4).

Cantos/

Cantos de la Visera (Site 1)

At Cantos de la Visera there are two rock shelters about fifty metres apart, one above the other, on the lower slopes of Monte Arabí and below the cliffs which ring that mountain. Thelowest shelter has been called Site 1, the upper shelter, Site 2 . Site 1 is the "petit abri" of Breuil. It is in a sorry state because tourists have broken down the protective wall and roof in order to by-pass the iron grille and so gain accesss. They have frequently thrown water over the paintings to make the stand out more clearly. The practice is greatly to be condemned. A method to be preferred to throwing a bucket or can of water over paintings is a gentle and harmless spray of water from a perfume spray bottle or an insecticide spray gun. This will not wash away the paintings, unlike the former.

It can be seen from the illustrations of the art at the shelter published by Breuil and Burkitt (1915) that there were twenty-nine quadrupeds at least, of which a third were equines, three were caprines, three bovines, three cervines, and the remainder were either incomplete portrayals or else incapable of identification. A detail of one of the horses is shown here copied by the direct painting technique (fig. 21) and infra-red photography (Plate XVIII). There were no anthropomorphs.

Cantos de la Visera (Site 2)

This is the "grand abri" of Breuil, and here the paintings are better preserved, despite the fact that the doorway through the grille has long been without a lock and open to tourists, whose depredations have left their mark. Photographs in ordinary colour and infra-red colour gave Plates XIX, XXI, XXII, and direct painting was carried out on a part of the panel, giving fig. 20. There were originally thirty-two qaudrupeds some superimposed on top of others, of which nine were long horned bovines, three were cervines, and a fourth was a bovine the horns of which were over-painted by antlers to make a "pseudo-cervid", a feature also seen Alpera (see below). There was also a caprine, other unidentifiable

animals/

animals, and two birds (fig. 20, Plate XIX) whose long necks and legs suggest crane or heron. They are quite unlike the butterfly motifs at Collado del Guijarral. There are also eight anthropomorphs, but they are schematic. There are also two schematic cervines, an oculus motif (or perhaps two), a skeuomorph, and other non-naturalistic motifs.

Cueva del Mediodía (Site 3)

The paintings here (Plate) have suffered less, since they are behind a secure iron grille. The motifs are all schematic, comprising hook like figures, schematic anthropomorphs, two or three schematic caprines, and a stylised cervine, as well as some queer schematic beasts with long tails and bodies, very short legs, two "ears" and two forward projecting appendages which look like lobster claws.

Site 4

A hundred metres before the Cueva del Mediodía is reached from Cantos de la Visera, and in the same overhang of rock which forms the rock shelter in the cliff, there is a small niche. On the flat surface of the roof of the niche there is painted the hind-quarters of a quadruped (Plate XX). The present writer is grateful to don José Prats of Yecla for drawing his attention to this figure.

(E) Minateda Group

Six painted rock shelters existed at Minateda, near Hellín, (Albacete), in the Segura valley (Breuil, 1920, 1928, 1935), but one is apparently now "lost", according to don Samuel de los Santos of the Albacete Museum, with whom the present writer visited the shelters. The principal shelter, (" La Higuera"), is now protected by an iron grille, but the paintings have been so damaged by years of neglect, that the effect of this installation has been to bolt the door after the horse has gone. Poor visibility on the day in question resulted in unsuccessful photographs.

The/

The principal shelter was richly decorated with ten equines, seven bovines (some of which had been transformed into "pseudo-cervids"), thirty-nine cervines, twenty-seven caprines, one suine, sixty-three unidentifiable quadrupeds, and one hundred and thirty-one anthropomorphs, of which nine wore skirts, and fifty-one carried bows and arrows, including both self bows and reflex bows, and two have unmistakably penile projections. Some anthropomorphs wear garters with fronds or streamers attached. Three of four of the cervines have broad antlers, and Breuil took these to be elks, but they do not seem convincing candidates for such an attribution when compared with the large cervine at Solana de las Covachas.

(F) Alpera Group

There were reported to be six rock shelters with paintings near Alpera, (Albacete), (Breuil et al., 1912; Breuil & Obermaier, 1912; Breuil, 1915; Cabré, 1915; Burkitt, 1925). The principal shelter or Cueva de la Vieja is four kilometres north of the town of Alpera. The shelter has been protected by a grille, and access is given by the Guardia Municipal of Alpera. The paintings are remarkably well preserved and clear. Both direct painting as well as colour and colour infra-red photography were performed at the Cueva de la Vieja (figs. 22 - 28, Plates XXIII - XXVIII). In all there are twenty-five anthropomorphs with neither weaponry nor apparel, twenty-eight with bows and arrows, and two with skirts. The fauna comprises four bovines, eighteen cervines, eleven caprines, and sixteen unidentifiable quadrupeds. There are three "pseudo-cervids" . Two of the anthropomorphs have out-turned feet like the large one at Solana de las Covachas, and these two wear head-dresses and have bow in one hand and arrows in the other. One archer is drawing a bow with a notched arrow which has what looks like a single-barbed arrow-point, perhaps a trapeze or other microlithic form. Both self and reflex bows are depicted.

Above and to the left of the Cueva de la Vieja is the Cueva del Queso/

Queso. The paintings here have been much damaged by attempts to prise away the rock surface. A few fragments of coarse pottery were found in the floor of the rock shelter.

(G) Vélez Blanco Group

The headwaters of the Guadalentín-Sangonera tributaries of the Segura are in northern Almería near Vélez Blanco (Breuil & Obermaier 1914; Cabré, 1915; Breuil & Burkitt, 1915; Breuil, 1935) where various rock shelters in both the Levantine naturalistic and in the schematic art styles have been recorded. These may be subdivided into those near Chirivel and those near Vélez Blanco and María. The present writer has only visited the latter group. The Cueva de los Letreros is an important shelter with schematic paintings, and another exists on the mountain of Gergal. At the Desfiladero de Leira, near the Cueva Ambrosio, there is a Levantine art motif.

Cueva de los Letreros

This rock shelter is about half a kilometre from the road at the entrance to Vélez Blanco, and may be visited by application to the Guardia Municipal of that town, as it is guarded by a grille. Bitriangular red motifs are among the schematic figures (Plate LXVI, LXVII). Rocks in the floor of the shelter are painted all over their irregular surface, which is most unusual. Another rock shelter immediately below it also has traces of red paint. Other rock shelters reported by Breuil to be painted near the nearby Fuente de los Molinos do not have traces of paint. Breuil reported a prehistoric settlement close to the Cueva de los Letreros, and the present writer picked up coarse sherds from a scree slope below the rock shelter. Others were found near the Fuente de los Molinos, and again at the Cerro de los Judíos, nearby.

Desfiladero de Leira

This site is extremely difficult to reach. The worst road that the/

the present writer has ever attempted to drive his car along in Spain, has to be taken for twenty-five kilometres from María to the Cueva Ambrosio hamlet. The valley up to the cave is followed, and the cave left behind, as the valley is followed upwards for about two kilometres until it opens out surprisingly into a wider valley with green fields and poplar trees. On the right hand side is cliff with many small rock shelters. One of these contains the now very faded painting of a cervine forequarters (Plate LXVIII).

Gergal

Nearer to María, on the mountain of Gergal, there is another rock shelter access to which requires a ladder, with schematic paintings which have been studied by don Manuel García.

Levantine Naturalistic Rock Paintings : Discussion of Art

It is convenient at this point to discuss the significance of Levantine art from the internal evidence of the paintings for two reasons

(a) because any discussion must be lengthy

(b) because the present writer after studying some of the sites and discussing them, deduced a working hypothesis (Walker, 1969), which he then set out to verify, and his subsequent excavations at the Abrigo Grande undertaken with this aim substantially accord with the working hypothesis (Walker, 1972).

It is appropriate to maintain this scientific order of inquiry here, viz. Observations ⟹ Working Hypothesis ⟹ Investigations designed to test hypothesis ⟹ Deductions and further working hypotheses, etc.

The discussion, therefore, follows earlier writings by the present writer (Walker, 1969, 1971) fairly closely, and will put forward certain hypotheses which the excavations were designed to test. The excav-

ations/

ations will then be described, and further deductions and hypotheses will be made about the origins of the neolithic in the Segura and Vinalopó river basins.

(4) Fauna

Jordá has demanded recently that close attention be paid to the faunal content of Levantine art (Jordá, 1967). It is interesting, therefore, to compare those sites at which a sufficient number of animals is depicted for statistical comparison to be made : -

Site	Wild Mammals					Domesticated	Humans		
	Cerv	Capr	Bov	Equ	Other		Archers	Skirted	Other
Fte del Sabuco	3	1		1	8		8	2	20
C. del Calar*	3	1			5		2		
S. de las Covachas	23	19			21	?1	16	3	2
B. de los Grajos	2	3			2	?4	?1	15	14
Minateda	39	27	7	10	64		51	9	71
C. de la Visera 1	3	3		3	9 11				
C. de la Visera 2**	3	1		9	19				8
C. de la Vieja	18	11		4	16		28	2	25

* Site 4 of the El Sabinar Group
** Schematic figures not included in totals

The one site with a high proportion of skirted anthropomorphs to other anthropomorphs is the Barranco de los Grajos Principal Painted Shelter. This has very few wild animals. Possibly there may be a functional relationship of inverse nature between skirted anthropomorphs and wild animal activities, whereas the other sites, which have more archers and more wild animals, may reflect a direct functional relationship between these two types of motif. However, it would be premature to assume that skirted anthropomorphs were necessarily women engaged in non-hunting or domestic or tool-making or "ritual" activities, since, as has already been/

been observed there is at least one example of a skirted archer at the Collado del Guijarral. Those skirted anthropomorphs with large breasts are clearly female, and likewise naked anthropomorphs with penises are male, but such depictions are extremely rare. Extrapolation cannot be used to say that all skirted anthropomorphs must be female, nor that all naked weapon-bearing anthropomorphs must be male.

Ecological characteristics of the prehistoric environments of the painted shelters may be provided by the varying proportions of mammalian species depicted. If wild equines and bovines lived mainly in open, rolling country such as extends from the middle reaches of the Júcar across the headwaters of the Vinalopó to the middle reaches of the Segura, this might explain their presence at the Alpera, Monte Arabí and Minateda shelters. Fuente del Sabuco is at the edge of the dissected tableland and is in a similar environment. Descending into the Taibilla valley proper, these species are not met with, especially at Solana de las Covachas close to the source of the river. At the Barranco de los Grajos cattle and horse bones were found at the Abrigo Grande excavations. It will be proposed later that occupation débris is contemporary with the execution of the paintings of the Principal Painted Shelter. Deer and goats are painted at most sites, and this probably indicates their greater adaptability to different environments. The hypothesis that the palaeoecology is reflected in the art requires to be tested at sites with art and excavatable deposits. Such sites are rare, and therefore proof or disproof of the hypothesis must await discovery of new art sites which have occupation material and yield up a sufficient number of bones. At the Abrigo Grande the number of individual large mammals represented by the bones found is small (see below). However, Davidson (1972, 1972a) has examined faunal assemblages from a number of upper palaeolithic and later upper palaeolithic rock shelters of the Mondúber massif in Valencia province. It is important to mention that the sites and the massif as a whole lack Levantine/

ine paintings. He has proposed tentatively that differences in faunal remains [illegible] at those sites, as defined by proportions of bones of different species, might represent specialised dependency on particular species which could vary from site to site. One cannot rule out this possibility, though its applicability to the painted shelters of the Segura and Vinalopó basins might be open to question.

There is almost everywhere in the art a predominance of cervines over caprines. Perhaps this is due to observer-bias (i.e. by modern investigators) since many of the animals counted under the column 'Other' are small quadrupeds lacking distinctive cervine antlers or size, and many could be caprines. The deer most commonly depicted are unmistakably Cervus elaphus, the red deer. Both these and the small roe deer, Capreolus capreolus, occurred in the upper reaches of the Vinalopó valley in bronze age times (Boessneck, 1969), but do not now occur there. Possibly some of the smaller cervines and quadrupeds of Levantine art represent that species. Recently Davidson has confirmed that at the upper palaeolithic Cueva del Parpalló in the Mondúber massif there are remains of Dama dama, fallow deer, in the faunal assemblage (Davidson, private communication). The species is not represented in osteological assemblages of the bronze age or other later periods of prehistory for which extensive archaeological collections are available. Unfortunately osteological collections from neolithic excavations are scanty. It is interesting that Breuil purported to see fallow deer at the Cueva del Queso, Alpera, (Albacete) (Breuil, et al., 1912, p. 543) and later at Minateda. Unfortunately, the Queso paintings have been badly damaged, and those at Minateda are very faint. However, Breuil's own representations at those sites seem fairly convincing, being in each case small animals contrasted against the larger red deer, with antlers which manifest the broad brow typical of fallow deer. Be that as it may, such representations are uncommon, and it may be concluded that neither fallow deer nor roe deer played an important part in the diet or art,

art of later upper palaeolithic hunters. Of the three deer species, only red deer is nowadays found in the Segura region, but it is now confined to the high mountains of the Sierra de Taibilla, Sierra de Segura and Sierra Cazorla.

It is possible that other, larger forms lived in eastern Spain at the end of the Pleistocene, but it must be stressed that there is no bony evidence for such a claim. The palmate brow and dorsal hump of a cervine at Solana de las Covachas are so unlike other portrayals of red deer in Levantine art that it has been proposed that it could represent giant deer (Megaceros)or even elk (Alces), (Walker, 1969). Against such a view must be put the absence of osteological remains of that species, the occurrence of dorsal humps in some other red deer paintings, and the possibility that it is a red deer in unusual perspective. Breuil thought that elk might be another interpretation of the Minateda and Cueva del Queso paintings mentioned above as possibly being fallow deer, a view challenged by Cabré (1915), but accepted by Obermaier (1924) and Burkitt (1925). Obermaier also claimed an elk representation at the Cueva Remigia, (Castellón), (Obermaier, 1937). The present writer believes fallow deer to be a more likely identification of the paintings in question at all those sites. The Solana de las Covachas cervine with palmate antlers (fig. 13) is too large to be fallow deer. Finally, reference may be made to a mobiliary carving in Magdalenian style reputed to come from Alcañiz, (Teruel), (Breuil, 1964) which is of a reindeer (Rangifer tarandus). There is no bony evidence for the presence of the species in eastern Spain.

Other Upper Pleistocene faunal atavisms do seem to have lingered on in the Peninsula nonetheless. The chamoix, to-day found only in the Cantabrian and Pyrenean ranges of northern Spain, was once present eastern Spain. It is said to be painted at the Cueva de Tortosilla, (Valencia), (Breuil et al., 1912, p. 562, fig. 14) and it is painted in/

in the Taibilla valley near Nerpio (Plate VI). There is no osteological evidence for chamois from south-east Spain. The glutton, Gulo gulo is painted at the upper palaeolithic painted cave of Los Casares, (Guadalajara), (Ucko & Rosenfeld, 1967), and a bear has been proposed at the Fuente del Sabuco shelter, El Sabinar, Moratalla, (Murcia),(Beltrán, 1968). Bears still occur in northern Spain, notably in the Pyrenees and at the western end of the Cantabrian range, but they were once more widespread as bony remains from various neolithic and bronze age sites in the Peninsula attest (Siret & Siret, 1887; Blance, 1960). The present writer is unhappy about the Fuente del Sabuco identification. Assertions by Breuil and by Obermaier that Merck's rhinoceros, saiga antelope, and lion could be identified in Levantine art at Minateda and elsewhere have failed to convince other investigators (Cabré, 1915; 1923; Hernández-Pacheco, 1924; Jordá, 1967; Beltrán, 1968) who have stressed the absence of osteological evidence from excavations for such species. Nonetheless, the proximity of the upper palaeolithic painted caves of Guadalajara, Los Casares and La Hoz, to the Levantine paintings of the Sierra de Albarracín, (Teruel), may mean that the possibility cannot be altogether excluded that some Upper Pleistocene species survived into the Holocene in eastern Spain (Almagro, 1956). At Fuente del Cabrerizo in the Sierra del Albarracín Breuil claimed to identify a painting of Equus hydruntinus or wild ass, and lately the species has been confirmed among the Cueva del Parpalló bones of the upper palaeolithic (Davidson, personal communication). Breuil also claimed that the bovines at Roca dels Moros, Cogul, (Lérida), include representations of bison. Whilst that identification has been rejected by most workers, nonetheless many seem prepared to accept a relatively early date for the Roca dels Moros paintings in the Levantine art chronologies which have been put forward at different times.

Much of the argument about the Upper Pleistocene versus Holo-

cene/

cene nature of the fauna shown in Levantine paintings has involved the assumption that extinct Upper Pleistocene mammals were cold-adapted, and that if such fauna were portrayed it would provide circumstantial evidence for a pre-Holocene age for the art, which is to say that the art was likely to have been executed by upper palaeolithic artists of Gravettian, Solutrean or Magdalenian cultures, rather than by later cultures. The assumption is unwarranted, because not only are some of the faunal atavisms still found in the Peninsula (and those not always in the coldest places; thus the Cantabrian bears are found not in the highest part of the range, the Picos de Europa, but in the lower mountains of Asturias further west), but furthermore the upper palaeolithic art itself as shown by six thousand plaques at the Cueva del Parpalló, does not depict cold-adapted species in southeastern Spain, by contrast with the upper palaeolithic art of the Franco-Cantabrian caves further north.

This line of reasoning can be taken further. Giant cervines according to Kurtén (1968) require "parkland or savannah" country, which does not imply tundra. Giant cervines lived in Ireland during the early post-glacial period. Just such an open or "non-sylvan" profile is demonstrated by the non-sylvan fauna of layer b at the Cueva del Toll near Moyá, (Barcelona), which included Capra ibex, rather than the "sylvan" fauna of the earlier, Würm age deposits (cave bear, Ursus spelaeus, etc.) (Donner & Kurtén, 1958). It is likely that layer b belongs to a time around the warmer post-glacial period which the present writer terms the Neothermal Period. Donner and Kurtén include in their list of sylvan species hedgehog (Erinaceus), wild cat (Felis silvestris), roe deer, red deer, hippopotamus, Merck's rhinoceros, badges (Meles meles), and fox (Vulpes vulpes), and as non-sylvan species bison, wild cattle, wild horse, ibex, Rhinoceros tricerorhinus, and possibly chamoix. Whilst these lists do not seem altogether satisfactory (thus Scottish red deer and wild cats live in open rather than woodland country), nevertheless/

theless, it is hard to envisage a giant deer (Megaceros) with its enormous antlers moving with ease in a dense wood. Briefly, there is no special reason to argue for an earlier as opposed to a later date for giant deer, elks, bison, chamois, wild equines, etc..

The allocation of layer b at Toll to the Neothermal Period was based on the drier conditions indicated by pollen analysis (Menéndez Amor & Florschütz, 1962) as well as on the osteological data. However, Butzer and Freeman (1968) have criticised the faunal assessment, and have attempted a careful classification of the fauna layer by layer which suggests that layer b may have had roughly equal proportions of "sylvan" and "non-sylvan" species, contrasting against the 100% "sylvan" fauna of the preceding later, and "sylvan" species become very prominent again in the layer above. Rosselló (1970) asserts that between 11,500 - 8,500 B.C. there was an alternating oscillation of parkland - steppe - parkland steppe environments, followed by a "pluvial" phase lasting until 5,000 BC This differs from the view put forward by the present writer and Cuenca earlier, which proposes that a wetter phase did not begin in the south-east (Toll is in northeastern Spain) until perhaps as late as the fifth millennium B.C..

If that all seems rather confusing and contradictory, it is a salutary reminder that even where there are both detailed floral and faunal studies, different workers can draw different conclusions from the data, quot homines tot sententiae ! Nevertheless, there does seem to be some rough agreement that the later deposits at the Cueva del Toll belong to a warm post-glacial phase, and that layer b contained more non-sylvan species (notably Capra ibex) than the layers immediately before and after it. There seems to be some confusion over the term "parkland" as between different scientists; Kurtén uses it to mean open country or savannah, whereas Rosselló seems to imply woodlands in contrast to his "steppe"/

"steppe" ecology, or wetter as against drier climatic conditions. The investigations of the present writer and Cuenca in the south-east favour the simpler climatic succession of Butzer and Freeman to that of Rossellό.

Wild ibex seems to have been common during the early part of the post-glacial climatic sequence, and at cave sites with human habitation (e.g. Cueva del Parpallό) wild goat/ibex bones are common from the upper palaeolithic and later upper palaeolithic, though the Cueva del Volcán de Faro is an exception to this general statement (Davidson, 1972, 1972a) In the higher mountains of south-east Spain ibex is still found, namely in the Sierra de Segura, Sierra Cazorla, and further north in the Sierra Martés in Valencia province. Its present distribution is very restricted, however, and the species is protected.

A single Upper Pleistocene species of Capra ibex probably existed throughout the Peninsula. Isolation of ibexes to high mountain ranges throughout Europe during the Holocene has produced what are to-day geographically isolated groups. Those isolated reproductive groups, via the genetic mecharisms implied by the directional effects of natural selection and of in-breeding upon the equilibrium state, or perhaps just by genetic drift, could quite easily have evolved morphologically distinctive features. There is also the possibility that some of those features represent the result of feral populations or of inter-breeding between wild and feral goat populations.

Nevertheless, such a reductionist viewpoint is not held by all zoologists, although it has been commended to the present writer by Dr. Michael L. Ryder of the Animal Breeding Research Organisation at Edinburgh, who is an authority on the sub-family Caprinae, and it is a view favoured also by Payne (1968). There is some evidence in favour of interfertility between wild goats (Zeuner, 1963, p. 140; Payne, 1968, pp. 378-379)/

pp. 378 - 379), and strictly speaking this ought to be sufficient for classifying all of them within one species, since the biological definition of a species is that reproductive aggregate which produces viable offspring capable of further reproduction with individuals of the aggregate, but whose members have impaired fertility with other aggregates in a reciprocal manner. Sometimes the extra limitation "within their usual habitat" is added to that definition, but the biological justification for that is at best dubious, and at worst it is a face-saver for those taxonomists who have allocated separate specific names to groups identical in every respect, but which are accidentally separated from normal contact by a geographical hiatus. Really, such geographical isolates ought to be classed as varieties or subspecies within one species.

Within a species such as man, Homo sapiens, by no means every geographical isolate is identical in every respect to every other. There are differences of colour, hair form, blood groups, etc.. Mechanisms of natural selection and adaptation, of genetic drift, of founder principle, of in-breeding, etc. may be responsible for the varying incidence of such polymorphisms as exist between different geographical populations of men. There is no need to classify them by different specific names, since they are interfertile with one another. Tasmanian aborigines probably had no contact with other humans from 8,000 B.C. until the nineteenth century the same time-span as we are considering for the sub-family Caprinae. It is not suggested that Tasmanians belonged to any other species than Homo sapiens, despite their peculiar physical characteristics and the fact that no controlled breeding experiments were performed on them!

Yet the "splitters" among zoologists nevertheless claim that trivial differences in coat length or horn shape and skewness are enough to demand that geographically isolated groups of wild goats be given separate specific names, irrespective of interfertility or otherwise.

This/

This is unwarranted and illogical. Vernacular names (e.g. Tasmanian men, Spanish ibexes) or latin varietal or even subspecific names might be in order, but hardly separate specific names.The present writer is of the opinion that there is insufficient evidence to say firmly that there was more than one species of wild goat, Capra ibex, in post-glacial Europe, and that to-day there is at best more than one subspecies, Capra ibex (pyrenaica) in the Peninsula (otherwise known as the Spanish ibex, cabra hispánica or cabra montesa). The only way the splitters can maintain a justification for several species within the wild Caprinae (or at least, within the tribe Caprini) is by rejecting biological argument not to mention the possibility that some "wild" populations of goats are feral in origin, and by supporting their claim for independent evolutionary antiquity for each montane population isolate by reference to morphological characteristics capable of being demonstrated in palaeolithic assemblages. Bone shape and horn shape are the only indicators available, and they are often by no means unequivocal either as to their undisturbed position in an archaeological deposit or as to their evolutionary significance especially in a statistically significant population of ancient individuals of the proposed species (ie. identifications may have to be made on wholly inadequate samples, perhaps even just on one bone). Bone size and body size may be affected by changed environmental conditions, and by themselves may be inadequate diagnostics.

Nevertheless, the splitters confidently classify ibexes into two species, Capra ibex, the Steinbock, and Capra pyrenaica, the Spanish ibex. They are further subdivided into five and four subspecies, respectively (Miller, 1912; Ellerman and Scott, 1951; Harris, 1960-1961; Huerta y Ramírez and Palaus, 1967). In so far as that classification has any meaning, it is with regard to modern populations alone and the morphological differences between them. A key feature seems to be horn shape. One might be cautious about the value of horn shape, since modern domesticated

goats/

goats can have widely differing horn shapes, and therefore a labile characteristic such as that is not the best of diagnostics. The ibex has a scimitar-shaped horn, flattened antero-posteriorly with circumferential ribbing. The modern domesticated goat of the Alpine variety has not dissimilar horns, except that they are keeled anteriorly. However, most authorities agree that there is no evolutionary relationship between them and that modern domesticated goats, Capra hircus, should be considered to have evolved from the bezoar, Capra hircus (aegagrus), which is a wild species not found west of the Aegean archipelago. The ancestry of European domesticated goats is therefore in part governed by the tacit assumption that if a domesticate arose earliest in the Middle or Near East, then that is the most likely candidate for domesticates further west due to transfer of domesticated animals westwards by human agency, and that independent later domestications or crossing with local, different wild species ~~is~~ are less likely. That is to confuse biological argument with archaeological hypothesis.

Now the position of hircus forms themselves as a separate taxon from ibex forms of the genus Capra is overlooked by such reasoning or is at least taken for granted. But the interfertility of domesticated and wild goats (including ibexes) should make one cautious of taking this distinction as fundamental. Even before breeding experiments were carried out, Schwarz (1935) had criticised the distinction. Moreover, whether bezoars or ibexes, all domesticated goats differ from all wild forms by one very queer morphological characteristic of horn shape, which the splitters - who ought to be interested in such matters - sometimes find it convenient to overlook. Namely, domesticated goats have horns whose ribs spiral clockwise for the right horn, anticlockwise for the left horn ("homonymity"), whereas all wild forms show the opposite phenomenon of "heteronymity" . The arguments for accepting Capra hircus (aegagrus) as ancestor of the modern domesticated goat and which permit no role to

ibexes/

ibexes in this ancestry, even in those areas such as Western Europe outside the territory of distribution of wild bezoars, seem to be largely dependent on archaeological hypothesis rather than biological evidence.

Mention has been made above of ibexes in relation to archers in Levantine art (fig. 4). There are one or two exceptional instances of a more intimate relationship between anthropomorphs and caprines, thus the skirted anthropomorph grasping a goat horn at the Barranco de los Grajos (fig. 30), and an anthropomorph with bow and arrows leading a goat by a rope at El Polvorín, (Castellón). The significance of man-animal relationships in Levantine art will be discussed following an account of the Abrigo Grande excavations, in connexion with

(a) hunting possibilities and dietary requirements

(b) possibility of incipient domestication.

The purpose of the foregoing discussion on caprine taxonomy has been to point out the possibility of tautological argument, where an archaeologist draws conclusions on the basis of a zoologist's taxonomy which may itself depend upon implicit assumptions which are archaeological hypothesis rather than biological observations, as may happen with some splitting taxonomies. The subsequent discussion about possible domesticates will maintain a properly sceptical attitude, therefore, to the approach of zoological splitters.

(It will have been noted that vernacular forms used in this thesis usually end in "-ine", and are thus derived from the sub-family Linnaean Latin endings "-inae". Vernacular forms ending in "-id" and derived from the family names "-idae" are preferred by some writers. It seems immaterial which is used provided that consistency be maintained. Sub-family terms, however, have the advantage that they permit a closer identification to be made, whilst not committing the writer to a specific designation.)

Now/

Now there is another matter of importance which relates to the sub-family Caprinae. So far we have mentioned the chamoix (Rupicapra rupicapra) and Capra ibex as being subjects of Levantine paintings. The confusion which may arise between bones of chamoix and bones of sheep in osteological collections has been referred to by Payne (1968), but be that as it may, Rupicapra rupicapra was certainly painted by Levantine artists, even though it is now absent from eastern Spain and confined to the Pyrenees and Cantabrians in the north. Whether sheep were painted is a difficult matter to resolve. The present writer believes that sheep are depicted at the Barranco de los Grajos (fig. 29) by the small, ill-drawn animals with spindly legs and cross-hachured bodies, which have tails and no proper heads; as if they had been painted by artists lacking experience or conventions for portraying animals with which they were unfamiliar. (Of course, they could be some other unfamiliar species, not necessarily sheep.) At El Mortero, near Alacón, (Teruel), it has been said that there are sheep representations.

Davidson says that there is a sheep bone from a preneolithic layer at the Cueva de les Mallaetes (Davidson, private communication), but that the sheep identification at the Balma de Sant Gregori (Vilaseca, 1934) is wrong. Goat or possibly sheep bones were reported from the Portuguese middens near Muge (Obermaier, 1924), but those could correspond to the ceramic phase, just as the painted animals at the Barranco de los Grajos might correspond to the ceramic phase at the Abrigo Grande nearby Sheep apparently are known from Tardenoisian sites in France (Murray, 1970, p. 24) of preneolithic age, notably at Châteauneuf-les-Martigues in the south of France, as well as from Azilian sites. The animals at the latter were apparently small and have been compared with neolithic "turbary" sheep. Both large sheep and small sheep, comparable with mouflon and "turbary" sheep, respectively, are known from European upper palaeolithic sites (Zeuner, 1963; Murray, 1970), but as is pointed out by

Murray,

Murray dwarf forms can arise quite rapidly in adverse conditions. In any case, sheep are never common at upper palaeolithic or later upper palaeolithic sites, by contrast with the neolithic (e.g. the neolithic at Châteauneuf-les-Martigues). The mouflon, Ovis musimon, is found on Corisca and Sardinia (Zeuner, 1963) and was imported into Spain in the eighteenth century for the chase, being found to-day in the Sierra Cazorla above the headwaters of the Segura (Huerta y Ramírez & Palaus, 1967). It is generally held that the modern domesticated sheep derive from the urial or Ovis orientalis (sometimes subdivided into the urial O. vignei and the asiatic mouflon O. orientalis), from the argali or O. ammon, and the European mouflon. Perhaps the tendency to consider more potential ancestors for domesticated sheep than is the case for goats is due to the presence of putative ancestral wild forms in those areas of Asia and the Balkans for which there are relatively early radiocarbon dates for neolithic settlement, rather than being governed by osteological considerations alone. As far as the Peninsula is concerned, however, the evidence for sheep of any kind and in any numbers during the Neothermal Period must be considered very slender, yet if there were sheep in the Peninsula, it would not be impossible that they might have been domesticated.

It has already been remarked that Bison is not convincingly represented in Levantine painting, but Bos primigenius, the aurochs, is a frequent subject. Bovine bones are known from a number of cave shelter occupation sites, and Murray mentions that both aurochs bones and bones of a smaller bovine were found at Moita do Sebastião in Portugal (Murray, 1970, p. 22) according to Zbyszewski, but she does not give the reference to his publication. Nor is it clear that all the bony remains were from the preceramic phases at the site. However, Murray does refer to smaller sized cattle from French and Swiss mesolithic sites. There are no clear scenes of cattle domestication in Levantine art.

Horses,

Horses are common subjects of Levantine paintings. Two equine species are known from the Upper Pleistocene and Neothermal Periods in the Peninsula, Equus hydruntinus, or wild ass (recently confirmed at Parpalló Davidson, personal communication), and more often Equus caballus. Wild ass was certainly present in bronze age times as it has recently been identified by Boessneck (1969) at Cerro del Real, (Granada). Breuil believed that he had identified a wild ass painting at Fuente del Cabrerizo in the Sierra de Albarracín, (Teruel) (Breuil & Cabré, 1911; Obermaier, 1924). Feral asses (E. asinus) were common in that region in the Middle Ages according to Fernández Galiano (quoted by E. Hernández-Pacheco, 1959, pp. 537-538). However, the majority of horses in Levantine art are E. caballus. Wild horse bones occur in moderate proportions at Parpalló and the Cueva del Volcán del Faro (Davidson, 1972, 1972a), and the large numbers of horse bones from bronze age sites such as Cabezo Redondo, Villena, (Alicante) (Boessneck, 1969) and from the recently excavated site of Monachil, (Granada), (F. Molina, private communication) indicate the importance of horse in intermediate periods of prehistory. In Classical times Peninsular horses were much prized. When domestication of the horse began is an open question. There are possible horse and rider figures at El Mortero (Beltrán, 1968; Savory, 1968) and Fuente del Sabuco (fig. 1), and there are representations of a man leading a horse from Boniches de la Sierra, (Cuenca), and Canjorros de Peñarrubia, near Baños de la Encina, (Jaén) (Hernández-Pacheco, 1959; Breuil, 1935; Beltrán, 1968; Savory, 1968) but these may be later than naturalistic Levantine paintings elsewhere, perhaps better related to the schematic type of rock art which succeded them. In the Segura-Vinalopó basins, cattle and horses are painted at sites stretching between the middle reaches of the Segura and those of the Júcar river system in Valencia and Albacete provinces, a region of rolling uplands well suited to large herds no doubt in the Neothermal Period. Wild,

Wild boars or pigs are known from paintings (e.g. Còva Remigia, Castellón; possibly at Principal Painted Shelter, Barranco de los Grajos, Cieza, Murcia). Pig or boar bones are known from most upper and later upper palaeolithic sites, not to mention neolithic, copper and bronze age sites, where the usual identification published is Sus scrofa. Wild boar is still widespread in southeastern Spain. .

Canines have been reported at some Levantine painted shelters, though nowhere are these identifications unequivocal (e.g. fig. 15a). Possibly the Collado del Guijarral quadrupeds are dogs. There are still wolves in the high mountains in Spain, especially in the north. Canis familiaris is now well established from "mesolithic" sites in various parts of Europe (e.g. Star Carr,Yorkshire,England), and it is possible that dogs were used in south-east Spain in the later upper palaeolithic therefore. Canine bones were found at Hoyo de la Mina (Such, 1920). Dogs would prove useful in retrieving hunted birds or lagomorphs. The rabbit is indigenous to the Peninsula (Corbet,1966, p. 186) and Pericot believes that it played a large part in the diet of palaeolithic man (Pericot, 1968), a view disputed by Davidson (1972, 1972a). Rabbit is abundant at many sites (Parpalló; Abrigo Grande, v. infra) but the quantity of meat that could be provided by this species is hardly enough to have other than a marginal effect on total protein intake when contrasted against large mammalian prey. There are no clear rabbit portrayals in Levantine art. To argue that rabbits were so plentiful that there was no "need" to paint them (thus Pericot) involves more tacit assumptions about the reasons for animal painting than modern authorities would be willing to concede (see Ucko & Rosenfeld, 1967, for discussion on fertility magic, sympathetic magic, and totemism, and prehistoric rock art). Another uncommon subject is birdlife. The Cantos de la Visera birds at Site 2 (fig. 20) are well known. Possibly a different kind of bird is depicted at Collado del

Guijarral./

Guijarral. (It is interesting to note that both the lower palaeolithic site of Torralba in Aragón and the neolithic layers at the Carigüela cave in Granada contained cock bones, Gallus gallus. E. Aguirre, private communication.)

Vegetation is a very exceptional subject of the art, the only clear example being the fruit tree (?) at the Doña Clotilde shelter (Teruel). This may be a later painting than Levantine naturalistic art in general. Insect paintings are known from some shelters, notably the Cingle de la Mola Remigia (Castellón) and the Cuevas de la Araña, (Valencia).

(B) Upper Palaeolithic versus Later Upper Palaeolithic Age

It has been proposed that the faunal content of Levantine rock shelter paintings does not especially imply an Upper Pleistocene late Würmian age as opposed to a post-glacial age. Nor do rare identifications of bear (Ursus arctos)or even elk or giant deer (Alces alces or Megaceros) particularly favour a late Würmian as opposed to a post-glacial attribution. They no more demand a cold climatic environment than the nakedness of the Levantine anthropomorphs demands a warm one (pace Bandi, 1964). Following the disappearance of the Sierra Nevada glaciers, the environment around the headwaters of the Segura may not have been much different from that of the Cantabrians or Pyrenees in northern Spain to-day, with their fauna of bear, chamois, ibex, deer, and wolves. Nor indeed, may it have been much different from the environment of the Sierra Nevada foothills of the present day. A growing awareness of faunal atavisms in different regions of western Europe in post-glacial times should lead us to accept the possibility that they occurred in south-east Spain and were painted occasionally by the post-glacial Levantine artists, rather than to follow Breuil or Obermaier in seeing in them a late glacial starting point for Levantine art

(Breuil/

(Breuil, 1912 etc.; Obermaier, 1924).

Rather, the embarrassing feature to be explained away if a post-Würmian age is to be accepted for Levantine art is the "modern" look of the fauna depicted on nearly six thousand engraved stone plaques from the upper palaeolithic layers of the Cueva del Parpalló. This fauna seems to have little in common with that of the northern Spanish and French cave paintings of the contemporary upper palaeolithic cultures and much more in common with that of Levantine art. At first sight this is disconcerting. It is necessary to investigate other features of Levantine painted shelters in order to reveal the fundamental incongruity between the Parpalló art and that of the Levantine rock shelter art.

First, it must be remembered that Breuil claimed that the "style" of Levantine art was equivalent to that of Gravettian cave paintings at more northerly cave sites, a view which most Spanish archaeologists have dismissed, apart from Bosch-Gimpera (1964). However, some still to claim that an early phase of Levantine art can be identified and would relate this to upper palaeolithic art (Pericot, 1950, 1952). An origin in the Magdalenian was tentatively proposed by Burkitt (1925), and the upper palaeolithic paintings of the Sierra de Montsía, (Tarragona) have been compared with Levantine art (Ripoll, 1964a). Painted plaques are known from Mallaetes (Fletcher, 1956, 1956a), Rates Penaes (Gurrea Crespo & Peñalba Faus, 1952; Jordá,1954), and a Catalan open site at Can Butinyá, (Barcelona) (Vicente i Castells, 1968). The engraved plaque from Sant Gregori may also be included (Vilaseca, 1932 - 1934). Some Levantine shelters have what may be called archaic paintings, namely Cogul, (Lérida) and Cocinilla del Obispo (Almagro, 1944, 1947a). Even Beltrán (1968 , 1968a) does not completely exclude the possibility of upper palaeolithic influences on Levantine art.

Now/

Now some of the Parpalló engravings include that mixture of elegant perspective figures and stiffer, more awkward ones that characterises Levantine painted shelters, but whether there is any way by which archaeologists can make use of stylistic variations is very much an open question. Artistic individuality and/or competence could be invoked, not to mention the possibilities of regional schools, chronologically successive styles, and so on. Breuil claimed to discern thirteen layers of superpositioned Levantine figures at Minateda and interpreted these in terms of a long chronological development of successive styles, representing at least six major periods. Superpositioning is a common feature of primitive rock painting whether in prehistoric Europe or modern Australia. Australian ethnographic inquiries elicit varying reasons for superpositioning. One reason is that a particular area of a particular rock is special, and it receives all the painting. Superpositioned art may be executed at a few days, weeks, years or decades. Different artists will impose their different competence or style on the figures of the palimpsest. Certainly, until a cave or shelter is found with a good series of stratified lithic and bone industries paralleling the supposed "sequence of art styles" and contains pieces of painted rock with the appropriate "styles" in their corresponding stratigraphical positions, there is no ground for especially favouring Breuil's opinion that superpositioning necessarily indicates a longish period of artistic evolution at any given site. Indeed, Breuil's so-called stylistic "cycles" (Breuil, 1906, 1906a, 1912, etc.) and identifications can bear quite acceptable alternative interpretations, as much recent criticism implies (Leroi-Gourhan, 1968, Ucko & Rosenfeld, 1967).

The significance and recognition of style in prehistoric art must remain a matter for continuing dispute, and probably the subjective views of the investigators play as great a part as any other criteria.

Yet/

Yet there are differences between upper palaeolithic painted cave sites and sites with engravings, on the one hand, and Levantine painted rock shelters on the other. They suggest a functional and perhaps a cultural difference of attitude toward painting (or engraving). Franco-Cantabrian art is found in the dark zones of caves mainly, which is to say that artificial lighting is necessary to see the paintings. Levantine paintings are not so located, being almost always in daylight zones, yet there are plenty of deep caves in south-east Spain where art could have been executed in the dark zone had that been the artists wish, just as there are rock shelters in the Dordogne and Vézère valleys of the Périgord which were largely neglected by their upper palaeolithic painters. It has been proposed that Franco-Cantabrian caves were painted in an orderly manner ('sanctuaries' - Leroi-Gourhan, 1968), but it would be difficult indeed to reconstruct the thematic pattern which Leroi-Gourhan puts forward for Levantine rock shelters.

The exposed situation of Levantine rock shelters cannot be explained away on the ground that south-east Spain is warmer than northern Spain or France. It is true that many Levantine rock shelters are on south-facing slopes, and are unbearably hot sun-traps in Summer (though not all, see below), yet these same shelters are very cold and wind-swept in Winter, when warm clothing is essential. Moreover, the artists responsible for the Parpalló plaques lived not only at the cave mouth but also in the galleries beyond, in a manner similar to the artists of the northern Spanish and French caves, despite the different faunal circumstances which have been remarked upon above. Now it must not be imagined that Levantine rock shelters were utilised only in the Summer. Many paintings show red deer stags in full antler. Red deer stags slough their antlers in March, and the new antlers do not begin to appear until late Summer, being retained in the Autumn and Winter. It may be concluded that it is not the climate of southeastern Spain

which/

which favoured open-air rather than dark zone cave art, but rather that a functional difference associated with site-utilisation that was responsible. If the paintings played quite different parts in the life of the Franco-Cantabrian and the Levantine artists, respectively, then it is reasonable to assign the artists to unrelated cultural groups.

This does not mean necessarily that the cultural groups were diachronic rather than synchronic. All the sites might, for instance, be contemporary with the late glacial period or alternatively with the post-glacial period (vide the similarity of the Parpalló fauna to that of Levantine shelters) whilst yet being utilised by different people (for instance, Magdalenians at Parpalló and some other people at Levantine rock shelters).

Now the Magdalenian in the Western Mediterranean basin does not seem to have lasted beyond 9,000 B.C. (using dates as published in Radiocarbon, without further corrections), and the Magdalenian I-IV at Parpalló is unlikely to have persisted later than 10,000 B.C.. Other upper palaeolithic decorated caves are known from eastern and southern Spain (Map 9) overlapping with the area of distribution of Levantine rock shelters (Los Casares, La Hoz, Pileta, Nerja, etc.) or just outside it. These are decorated in the dark zone as at Franco-Cantabrian decorated caves. Even where there have not been archaeological excavations to establish upper palaeolithic cultural material, it seems reasonable to assign such cave art to the upper palaeolithic in a general way. Painted Levantine rock shelters are not found in the immediate vicinity of those caves, and this is true for the Mondúber massif where Parpalló and other upper palaeolithic caves are found.

A comparison of the faunal content of Franco-Cantabrian cave paintings with that of Levantine art demonstrates the well-known point

that/

point that the latter never have reindeer, elephant, bison, lion, and many of the other Upper Pleistocene large mammalian species that characterise the former (Cabré, 1915, 1923; Hernández-Pacheco, 1924, 1959; Martínez Santa-Olalla, 1946; Almagro, 1947, 1947a, 1951, 1952, 1952a, 1954, 1956, 1956a; Jordá, 1964,1967; Beltrán, 1968, 1968a). Even if the Parpalló plaques demonstrate that the faunal environment of their artists was not dissimilar to that of the Levantine artists, there is yet the further point that Levantine art invariably has a high anthropomorphic content, whereas Franco-Cantabrian art (including Parpalló and other southeastern upper palaeolithic decorated caves) does not.

Anthropomorphs are plentiful at Levantine painted shelters and are depicted in recognisable and close relationships to the animals. Details of clothing and weaponry may often be made out. The upper palaeolithic Franco-Cantabrian anthropomorphs are not clearly painted with artefacts, nor organised into scenes in special relation either with each other or with animals, and many anthropomorphs are often perversely indistinct or poorly conceived, as, for instance, at the cave of Los Casares,(Guadalajara) (Cabré, 1940-1941a; Beltrán & Barandiaran, 1968). This statement is true for Aurignacian, Gravettian, Solutrean and Magdalenian cave art in France and Spain where painted caves can be associated with occupation deposits of the appropriate cultures. The difference suggests that Levantine paintings are unrelated to any of those cultures. Moreover, there are known from southeastern Spain Gravettian, Solutrean and Magdalenian assemblages. It is reasonable to deduce that Levantine rock shelter art was executed outwith the context of those cultures. Since it is difficult to envisage a culture contemporary with the Gravettian, Solutrean or Magdalenian whose artefact assemblages are as yet undiscovered in southeast Spain, and the sole testimony to which is the art itself, it seems reasonable to conclude that Levantine art was painted <u>not earlier</u> than the end of the Magdalenian, say not before 9,000 B.C..

There/ 4:48

There are other important differences between Franco-Cantabrian cave art and Levantine art, in addition to content. Levantine figures are small, and sometimes are as little as 40 millimetres in size, contrasting markedly against the large size of some Franco-Cantabrian depictions. Levantine art is usually monochrome, whereas Franco-Cantabrian art uses both monochrome and polychrome painting. Finally, a naturalistic realism is subjected in Levantine art to a lively "expressionist" style which captures movement and activity.

(C) Later Upper Palaeolithic and Neolithic Relationships of Levantine Art

Whereas most of the arguments for rejecting an upper palaeolithic cultural context for Levantine art are based on the lack of definite upper palaeolithic associations or characteristics of the art and the presence in south-east Spain of upper palaeolithic decorated sites whose traditions have at least as much in common with Franco-Cantabrian sites as with Levantine ones (Parpalló, Rates Penaes, Los Casares, La Hoz, Nerja, etc.), it is gratifying to be able to base the arguments for associating Levantine art with later upper palaeolithic and early neolithic cultural material on excavation data. This evidence will be presented later in order that the Abrigo Grande excavation and the discussion of its significance may follow directly from an account of other evidence and of previously published data.

Although the careful portrayal of artefacts in Levantine art is rare, owing to the "expressionist" manner of execution, some paintings do allow identifications to be made and comparisons to be drawn with artefacts from excavations. The hunting techniques depicted in the art will not be dealt with in detail, since they have been the subject of discussion by Bandi and Maringer (1952). It is interesting to remark, however, that scenes such as those illustrated here in Plates

V/

V and IX or figures 4 and 16 indicate a quite remarkable proximity of both archers and skirted anthropomorphs to red deer and caprines. This could be more than artistic licence. In Scotland gamekeepers can become friendly with red deer and approach them with fodder, especially in Winter. At that time of year, when red deer stags are in full antler, they frequently approach human habitations and roads, coming down from the high mountains . The present writer has observed them doing just this near Inchnadamph in western Sutherland, and it has been well described by Sir Frank Fraser Darling (1956) , by keepers on Mull, and elsewhere in Scotland. Similar close relationships may be established between Lapps and reindeer, such that wild reindeer herds are guided towards suitable pastures by humans, and their numbers maintained in ecological balance by regulated slaughter. The kill needed to maintain Scottish red deer herds at a constant size has been estimated at one-sixth of the mature beasts per year (Vita-Finzi & Higgs, 1970, quoting Fraser Darling), and a recent B.B.C. radio broadcast in 1972 claimed that in favourable circumstances this figure could be considerably greater. One might borrow a phrase from microbiology and call such regulated killing a "symbiotic relationship" between cervine host prey and human predatory parasites.

If such specialised man-animal relationships developed in the later upper palaeolithic it would be no matter for surprise. They need not invariably have given rise to local domestication, as witnessed by the modern Lapps. Both the habits of the large mammal species preyed upon, and the level of technology of the human predator will no doubt play parts in determining the feasibility of domestication or otherwise in any given time or place. The word "place" is especially important, given the sub-desert conditions which prevailed in the postglacial period of southeastern Spain, perhaps themselves in part due to overgrazing and overexpansion of the herds. It will be argued later that the bene-

ficial/

ficial consequences of a livestock-based diet and economy might lead to a human population explosion, and that the non-availability of arable land for cereal crop agriculture owing to the arid conditions and lack of valley-bottom alluvia , might well have necessitated domestication, pastoralism and transhumance for survival. Transhumance has played a part in Spanish livestock farming in many areas up to the present day. This possibility will be returned to in due course.

Nor need such specialised man-animal relationships be restricted to cultures with lithic assemblages of later upper palaeolithic or pre-neolithic type. It has been suggested tentatively by Davidson (1972, 1972a) that the upper palaeolithic inhabitants of the Mondúber massif in Valencia province had similar specialised relationships. What is interesting, however, is the well-known persistence of later upper palaeolithic tool types into neolithic, ceramic layers at some sites (Portuguese middens, Hoyo de la Mina, Cueva de la Cocina, Covacha de Llatas, Cueva del Lagrimal, Abrigo Grande - v. infra). At some of these, as well as at many neolithic, copper and bronze age sites in south-east Spain large mammal bones are very numerous, especially cervines, equines and ovicaprines. A site catchment approach will be attempted after a discussion of the Abrigo Grande excavation. Suffice it to say that sporadic hunting forays would hardly have satisfied the caloric requirements of the later upper palaeolithic or earlier neolithic communities, given that we have almost no positive evidence for cereal crop exploitation and none for its large-scale exploitation, and that the maintenance of equilibrium between animal reproduction, ecological biotope, and animal numbers must have been a major concern to prehistoric man in southeastern Spain.

The absence of marked changes in tool types at some sites as the preceramic phase of occupation gave way to a ceramic phase suggests that there was no major change in the way prehistoric people

exploited/

exploited their environment. If some cave sites (e.g. Coveta de l'Or) do have cereal grains in small quantities, this says no more than that cereal cultivation, whether indigenous or borrowed from some other area, was not unknown, but it does not mean that it was necessarily the principal dietetic base rather than a trivial supplement to a quite different economy (see below). The explanation of those sites at which the tool types continue from preceramic to ceramic phases as a "secondary" neolithic acculturation, due to acquisition of pottery by people who were not truly neolithic (whatever a truly neolithic culture is supposed to be !) from truly neolithic neighbours, seems an unnecessarily complex hypothesis. It depends on :-

(a) ability to demonstrate nearby sites of equal or preferably earlier absolute date where it can be shown that the way of life was predominantly based on cereal crop agriculture and domesticated livestock, and

(b) a method of distinguishing between: (i) neolithic assemblages which represent a technology for cereal crop agriculture and domestic livestock breeding, (ii)neolithic assemblages representing a technology of nomadic pastoralism, (iii) neolithic assemblages representing technologies for varying cereal crop agriculture at some locations with seasonal transhumance of livestock to and from other sites, (iv) a hunting, fishing and gathering lithic technology which had acquired pottery "secondarily" .

The present writer holds that (a) has yet to be demonstrated for south-east Spain (it will be argued later that El Gárcel, which is the best candidate for the role is likely to be developed neolithic if not copper age, see below), and that our taxonomic methods are unable as yet to distinguish between the possibilities in (b) . Only wishful preconceptions about extrinsic origins for agriculture can sustain such thinking, and these speculations fall outwith the brief of archaeological methodology. Moreover, it will be later proposed that cultural

expansion and proto-urban development might have taken place more rapidly and might have led to a local accumulation of wealth capable of attracting foreign ideas and products, if based on a livestock economy rather than an arable economy, given the peculiar palaeoecological conditions of south-east Spain in the fifth and fourth millennium B.C.. It therefore seems preferable to place on one side the notion of "secondary" neolithic acculturation for the time being, as involving too many tacit assumptions for comfort.

Since the various economic possibilities listed under (b) in the preceding paragraph cannot be distinguished on the basis of lithic tool taxonomy, it seems preferable to restrict the term neolithic to a typological descriptive epithet, equivalent to ceramic and/or polished lithic containing assemblages, lacking artefacts found in copper-age assemblages. No assumptions are to be made about the economic base of the neolithic , or that there is any one "proper" neolithic way of life. Neolithic is merely presented in contrast to palaeolithic and copper age, and these are defined in terms of assemblage composition, too. In justification, it must be remembered that it is artefacts which are the object of archaeological observation, and that only from those observations and from other observations on the palaeoecology, can their functional analogues be deduced.

This is a convenient point in the argument to return to the Levantine paintings, and a most appropriate one. At some sites double-barbed arrow-points are portrayed clearly, viz. Solana de las Covachas, Cueva de la Vieja, and Còva Saltadora. The possibility that these are Solutrean may be ignored on the grounds that no convincing Levantine art sites have yielded up Solutrean implements, and that Levantine painting is unlike Solutrean painting. It is reasonable to interpret the painted points as neolithic or copper age points of bifacial workmanship. Barbed and tanged bifacial points are very common from neo-

lithic/

lithic and copper age assemblages in the Levante, by contrast with western areas of the Peninsula.

One of the Alpera archers is drawing a bow to which is notched an arrow whose point seems to have only one barb (fig. 28). This could either be a hollow-base bifacial form (more common in Andalusia and western areas than in the Levantine region) or a microlithic point. Trapezes or crescents might be intended by such representations and are known from preceramic and ceramic assemblages, as has been stated earlier.

The bows are interesting also. Some bows are recurved like a "Cupid" bow, notably at Alpera. Recurved bows are depicted at the Saharan painted rock shelters of Ozanéaré, Jabbaren, and Sefar in the Tassili n'Ajjer region (Lajoux, 1963). These sites belong to the third and fourth millennia B.C. (Delibrias et al., 1964, 1966). Possibly they represent a borrowing of recurved bows from Egypt; certainly, one of the Sefar anthropomorphs is holding an axe whose head is of typically Egyptian bulbous form. Recurved bows were made out of solid pieces of wood by the Egyptians who treated the ends of the staves with boiling water or steam. An example of this kind is displayed at the Royal Scottish Museum, Edinburgh, from the Middle Kingdom, ca. 1,750 B.C., and such bows may well have been known earlier in Egypt. Possibly the Egyptians borrowed the idea from hunting peoples of the Sahara with whom they came into contact. In any case, this adaptation of a bow which is a simple arc of solid wood, or "self" bow, is functional. A long self bow is very powerful, as English mediaeval archers well knew. But it is cumbersome for hunting with. Recurving the ends results in a bow no less strong, but which is more manageable in the circumstances of the chase. The same potential energy (or very nearly) can be developed in such a bow when it is drawn, as in the

long/

long self bow for any given expenditure of energy on the part of the archer. For this reason recurved bows are still popular with archers. In close range animal slaughter, such as was practised by the Levantine archers, a bow of this type would have been very useful. However, recurved bows do suffer from the disadvantage that greater internal stresses are set up after the arrow is notched, and recovery from the extremes of curvature is less good than in simple self bows (Elmer, 1952).

Other types of recurved bow are possible contenders for the recurved bows of Levantine art. One type has two curved, fixed and weighted end-pieces which are attached to a working arm bearing the hand-grip. Bows like this were made using oryx antlers in late pre-Dynastic and early Dynastic Egypt (ca. 3,000 B.C.) according to Wolf (1926). They have been used commonly in Asia in mediaeval and recent times, though different species of horns have been employed. Such bows are short, however, and in this respect they differ from those of the Levantine paintings. The third type of recurved bow is the composite, laminated bow of modern target archery. It overcomes the disadvantages of stress and poor recovery of shape inherent in the other two. This type of bow is also of some antiquity. Apparently it was introduced into Egypt by the Hyksos, being hitherto not known in Egypt (McLeod,1962).

The Levantine, Saharan and early Egyptian recurved bows are not the only recurved bows known from prehistoric times. A recurved bow is depicted on a decorated slab from a megalithic construction at Göhlitzsch on the River Saale in Germany, belonging to the Corded Ware - Single Grave complex of cultures, which themselves received influences from as far afield as the copper age of the steppes north of the Caucasus around 2,000 B.C. or earlier.

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It has been proposed by Jordá (1967) that the recurved bows of Levantine art were composite laminated bows, and on this supposed identification he claims that they must be comparable with recurved bows depicted on late bronze age stelae from the south-west of the Peninsula dating from about 1,000 B.C. (Almagro, 1966). Apart from the fact that there is no way in which we can distinguish a recurved long self bow from a recurved composite laminate bow on the basis of pictorial representation, there are other aspects of Jordá's argument which are unsound, to say the least. He holds that composite bows were introduced into Western Europe by Thraco-Cimmerian incursions in the first millennium B.C.. Yet there are no grounds whatever for believing that Thraco-Cimmerian influences reached the southern part of the Peninsula. Jordá refers to a late bronze age/ early Iberian iron age defended settlement above the Río Taibilla, at El Macalón, Nerpio, (Albacete). There, the excavators found, among other exotica, socketed metal arrowheads with single pedunculate barbs on the outside of the socket (García Guinea & San Miguel Ruiz, 1962). Jordá invokes these as demonstrating East European influences on weaponry. In fact, they are like neither Thraco-Cimmerian arrowheads nor the later Scythian arrowheads, which latter are known at several Western European iron age sites, and in any case, a Scythian dating would be too low for the stelae representations of recurved bows. Not only is there no reason other than blind faith for associating the Macalón arrowheads the stelae, and the elusive Thraco-Cimmerians, but furthermore there is no reason for associating all or any of these with Levantine depiction of recurved bows whose arrows have quite different points, especially since Levantine paintings do not depict any other typical artefacts of unmistakeably late bronze/early iron age date.

This last point may be taken a stage further in order to wind up the discussion on metal arrowheads and recurved bows. El Macalón is an/

an extremely remote and inaccessible mountain site, and surely there might have been expected traces of such East European weaponry from further north in the Peninsula at well-known sites, had such forms actually arrived in the Peninsula ? Moreover, near to Nerpio at the painted Abrigo Sautuola, the Levantine archers only have self bows! The same is true at Fuente del Sabuco, as has been seen. Fuente del Sabuco is only a few kilometres from El Macalón, and near to this rock shelter there is a similar late bronze age/early Iberian iron age defended settlement, El Castillico (Los Villaricos) (Walker, 1971a) to which mention has already been made. This site, too, shows some exotic features, such as the square wall-towers flanking the gateway, wheel-thrown pottery, primitive painted wares of proto-Iberian type,etc.. The present writer has argued elsewhere that the exotic influences on the late bronze age are most plausibly explained by implicating Carthaginian impact on the vestiges of the Argaric culture, leading to the blossoming forth of the Iberian culture proper. These seem more likely exotic factors in the Taibilla valley to explain both the Castillico and Macalón exotica than do putative Thraco-Cimmerian marauders. One may conclude by stating with some confidence that Levantine artists were not particularly likely to have been influenced by either Thraco-Cimmerian or Carthaginian weapons for the simple reason that their work was executed several millennia previously. As for the shapes of the bows, these have fluctuated in fashion from time to time and place to place, both in the Old World and the New, just as archery itself fluctuated in popularity at different times in antiquity (Clark, 1963). Nor should this surprise us when we bear in mind the wide variety of flint arrow-points of later upper palaeolithic, neolithic and copper ages in southeastern Spain.

Agricultural activities are never explicitly painted in Levantine art. Sheep are claimed at El Mortero, near Alacón, (Teruel)

(Ortego,/

(Ortego ,1948; Savory, 1968), and at El Polvorín, (Castellón), there is said to be a man leading a goat by a rope (Vilaseca, 1948). Horse and rider motifs may perhaps be intended at Fuente del Sabuco and El Mortero, and a man seems to be leading a horse at Boniches de la Sierra, (Cuenca). Possibly one of the Barranco de los Grajos skirted anthropomorphs is grasping a goat/ibex by the horn. At the same rock shelter there is depicted what may be a hafted implement, and possibly another is intended at Solana de las Covachas. At one of the Dos Aguas sites in Valencia province a skirted anthropomorph is shown striding out with a basket on one arm, as if sowing seeds, and baskets are also painted at Racó de Molero, (Castellón), and at the Cuevas de las Arañas, (Valencia) where figures are climbing ropes to gather honey (Hernández-Pacheco, 1924; Jordá & Alcácer, 1951). Basketry, of course, may have been known throughout the upper palaeolithic (Blanc, 1964) as may have ropes. Baskets were discovered at the Cueva de los Murciélagos, a copper age burial site in Granada province, along with skirts and other esparto grass clothing (Góngora, 1868). Figures climbing ropes are also depicted at Alpera, as has been mentioned earlier. When all is said, there is no single representation which explicitly shows cultivation or harvest, by contrast with the clearly depicted man-animal kill scenes.

A concentration on portraying hunting scenes does not exclude the possibility of even a fully agricultural society. At the Turkish neolithic town of Çatal Hüyük the wall paintings are exclusively of man-animal hunting scenes, yet the several thousand inhabitants of the town must have engaged in some agriculture. These paintings belong to the seventh or sixth millennia B.C.. However, any similarity between the Çatal Hüyük art and Levantine art (oddly proposed by Jordá, 1967, in the same article in which he drew parallels with first millennium B.C. Thraco-Cimmerian weaponry !)is most economically explained

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as likely to be due to convergence of hunting patterns in similar ecological conditions. Similar palaeoecological conditions could explain similarities between North African and Levantine art. The popularity of hunting art - and, indeed, of hunting as an activity - lingered on far longer than the neolithic of Çatal Hüyük into Classical, mediaeval, and even modern times. Hunting must have played a part in the diet of the Middle Ages. Even to-day, popular domestic decoration often includes hunting pictures or pictures of wild life ("Flying Geese" "The Stag At Bay") rather than pictures referring to agricultural, industrial, office, or kitchen tasks, despite the ignorance of those who hang such pictures in their houses of the wild animals depicted and the hunting techniques necessary for their capture !

The clothing of the anthropomorphs of Levantine art does not tell us much that is useful to date the paintings nor assign them to any particular archaeological culture(s) . This is partly because we know so little about prehistoric clothes. Like the upper palaeolithic anthropomorphs at Los Casares, (Guadalajara), those at many Levantine rock shelters are often naked, as may be demonstrated from those male figures with external genitalia. Accurate sexing is only possible when secondary sexual characters are carefully depicted, which is not often. Skirted anthropomorphs are **never** shown in activities which involve their carrying bows and arrows, with the exception of the Collado del Guijarral figure. At Cogul or at the Barranco de los Grajos, skirted anthropomorphs have often been held to be females. Later, some evidence about site-utilisation will be adduced in support of this identification. Bandi and Maringer (1952) claimed that their garments would be made of hides, wickerwork, or "powdered bark" (sic). This seems uncomfortable and unlikely. If the assumption is made that woven fibres did not exist before the neolithic, then hides and skins seem the best explanation, as has been postulated for East European Gravettian figurines which appear to show clothing. If the assumption is rejected, then woven

garments/

garments can be considered also. Flax cultivation was known in Spain in the bronze age (Arribas, 1968) and esparto grass clothing has already been mentioned. If sheep were reared there is the possibility of wool garments from early prehistoric times (e.g. from the neolithic).

The painted garments include calf-length or knee-length skirts or kilts. Some Classical authors state that kilts were worn by men in Iberian iron age times, although the usual dress seems to have been short, tight-fitting breeches, tunic and cape, as depicted on the painted pottery from San Miguel de Liria, (Valencia). Men of the Celtic iron age wore trousers and presumably also kilts, whilst going into battle naked, which must have been most uncomfortable in regions such as Britain. The point is not that the garments painted in Levantine art can be referred to those later periods, which they cannot, but rather that the parallels from the latter do not allow us to say that all Levantine skirted anthropomorphs are necessarily and exclusively women. Some may well be, for instance, the elongated skirted anthropomorph at the Principal Painted Shelter of the Barranco de los Grajos with pendulous breasts. Some may be male, however, such as the Collado del Guijarral archer, though this involves making the unprovable assumption that no women were ever allowed to practise archery. There are also possible Amerindian parallels here for male transvestism.

Other painted clothes in Levantine art are short trousers or breeches as worn by the painted archer at Els Secans, (Teruel) (Beltrán, 1954). At many Levantine sites, too, including the Cueva de la Vieja, there are arm-bands and leg-bands with streamers, and head-gear (? feathered ?). One of the Fuente del Sabuco archers wears a mini-skirt or loin cloth. At the shelter of Mas d'En Josep, (Castellón) an archer may be wearing a cloak (Bandi & Maringer, 1952). Many anthropomorphs, especially those bearing weapons, are naked.

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The direct copying technique of Levantine paintings allows attention to be paid to the original painting strokes (as desired by Porcar Ripollés, 1943a, 1945). From the reproductions it can be seen that hair was often worn long by skirted and by naked anthropomorphs, as also were beards and moustaches sometimes. Facial features are not usually clear, but where they can be made out, as at some of the Castellón sites, there is neither prognathism nor the portrayal of pouting thick lips, in contrast to some Saharan painted figures. In view of the possibility of some relationship between Levantine and Saharan later palaeolithic rock art, measurements have been taken to allow comparison of the physical features of the anthropomorphs painted in the two regions.

Wernert (1916) divided Levantine figures into the following types of physique:-

(a) well-proportioned, or Alpera type

(b) stylised stick men. or nematomorphous type

(c) thick legged with narrow trunk, or pachypodous type

(d) elongated body with triangular chest, or cestomatic type (e.g. at the Barranco de los Grajos).

It would be unwise to construct an evolutionary chronological sequence for Levantine art involving a "degeneration" of naturalism towards schematic portrayal, since more than one type may coexist at the same rock shelter.

Before attempting to compare Levantine and Saharan physical types on the basis of pictorial proportions, the validity of Wernert's subdivisions had to be tested. Fifty figures of Alpera type were compared, therefore, with an equivalent lumped sample representing all four of Wernert's types. The following measurements were taken:

(a) total lower limb length

(b)/

(b) total stature

(c) upper arm (brachial) length

(d) fore-arm (antebrachial) length

There was little significant difference between the two samples for these four measurements, nor for the "indices" (percentage ratios) which were computed (see below). Arbitrary sexing of figures was performed on the basis of genitalia and other secondary sexual characters, and on the assumptions that skirted anthropomorphs were women and those bearing weapons were men. The sexes had rather similar values :-

(a) Lower limb index

(100 x total lower limb length/total stature)

"Males"	"Females"
47 - 50	47

Comment: There was little significant sexual difference. Both sexes have relatively short legs compared with modern Europeans, and especially with modern Negroes. The apparently large-legged pachypodous figures do not have particularly long legs in fact.

(b) Brachial index

(100 x brachial length/total stature)

"Males"	"Females"
16	10

Comment: These also give low values.

(c) Ante-brachial index

(100 x ante-brachial length/total stature)

"Males"	"Females"
13	10

Comment: These are extremely low values, quite unlike any modern population known.

(d) Brachio-ante-brachial index

(100 x ante-brachial length/brachial length)

"Males"	"Females"
76	too few women for this to be calculated

Comment: The male value is also very low.

It is instructive to compare the foregoing Levantine body proportions with those from Saharan paintings, taken from the photographs in Lajoux (1963) by measuring with calipers and a micrometer reading to 0.1 millimetres. Only "males" could be identified.

(a) Lower limb index

"Males"

51

Comment: A low value when contrasted against modern African Negroes, whilst perhaps slightly in excess of that for Levantine figures. Again, the pachypodous figures are deceptive.

(b) Brachial index

"Males"

20

Comment: A remarkably high value, quite unlike Levantine figures.

(c) Ante-brachial index

"Males"

14

Comment: A low value.

(d) Brachio-ante-brachial index

"Males"

73

Comment: A low value.

The Brachial index, the prognathism, thick lips, and steatopygia of the Tassili painted figures are quite different from Levantine figures. One may safely conclude that there were no affinities between the people represented in the Tassili shelters and those at Levantine sites, despite contrary opinions of some archaeologists (thus Pericot, 1950a, 1952; Willcox, 1969). At the very least, the approach of the artists towards human representation was different in the two regions.

The/

The physical anthropological differences in the art reflect cultural differences as identified from the lithic assemblages between Spain and North Africa. It is interesting that in the Saharan area of the rock paintings, the Oranian and Capsian give way to bifacially worked barbed and tanged, stellate, and rhomboidal flint points not unlike those of the Spanish Levante. However, they have an inland distribution, nowhere near the North African coast from which embarkation would have had to have taken place in order that contact might be made. Only in the Maghreb do they approach the coastal region: the one region from which maritime journeys to the Peninsula become hazardous, and which anyhow faces southwestern Spain and Portugal where such flint forms are relatively uncommon (Forde-Johnston, 1959; Savory, 1968). Even the Tunisian Capsian hardly has a coastal distribution , and as has been emphasised, it is unlike the geometric forms of the Levantine later upper palaeolithic and earlier neolithic, and anyhow, it lacks rock paintings. Hollow-based flint arrow-points, perhaps originally of Egyptian inspiration, are found along the North African coast in the neolithic, and these are also found in the Peninsula. However, here they are most frequent in Andalusia and southwestern Spain and southern Portugal, and not at all common in the Levante. By copper age times there seems to have been even less trans-Mediterranean contact still (Tarradell, 1958,1959). The non-correlation of the geographical distributions aforementioned with the most suitable North African port of embarkation for eastern Spain, i.e. Tunisia (Jáuregui, 1949), and with the areas of distribution of analogous artefacts in the Peninsula, whether lithic or artistic, suggests that kind of <u>randomness</u> of adoption or non-adoption of the artefacts that would be anticipated if <u>ecological convergence</u> rather than direct cultural contact were the best explanation. This would allow the <u>non</u>-correlation of art and artefacts to be used in support of the

neothermal/

neothermal period dating for both Spanish and North African art. (There are two assumptions being made here, namely that of ecological convergence and that of functional convergence of cultures, so the hypothesis is not very parsimonious.) There must also be taken into account the practical limitations of the materials from which stone arrow-points are made, a point recently mentioned by Isaac (1972). In this connection it is interesting that many of the bifacial forms made in the Levante and in North Africa were also made by American Indians at roughly the same time, as may be seen by inspection of the illustrations published by Willey (1966 p. 62 fig. 2-26;80,3-1,2) The extent to which similar ecological responses (i.e. hunting requirements) and the extent to which technological tool-manufacturing limitations are involved is obviously a most complicated matter, which at present cannot be determined.

Given the Amerindian parallel, and for that matter the one of the European Solutrean bifacial projectile points, it seems perverse to insist that North African or Levantine bifacial arrow-points be derived from agricultural neolithic cultures elsewhere. Their presence in neolithic and copper age contexts may indicate some change in man-animal relationships rather than some deterministic "evolutionary" development. Their appearance concurrently with pottery in the archaeological record in certain areas need not mean that either or both is "intrusive" and dervived from some more advanced society. The ideas underlying the change to bifacial flint working may or may not have been borrowed from outside, but even within a relatively small region such as the Peninsula the proportions of different forms vary within it from one area to another. This surely indicates adaptation to prevailing local needs and/or cultural traditions. It produces a kind of randomness of distribution, as mentioned above.

Bifacial/

Bifacial flint points continued in use until at least 1,500 B.C., alongside copper and bronze points. Metal weapons are only very occasionally depicted in rock paintings in the Levante (e.g. at Calapatá and Tivisa : Cabré, 1915; Hernández-Pacheco, 1921; Breuil, 1935). Some of these might have been added to earlier paintings, as must be the Iberian inscription at Cogul (Almagro, 1957).

The establishment of a lower date for Levantine painting is a difficult problem. A number of inferences may be made, however. Schematic rock paintings are often found close to naturalistic art, for instance at Monte Arabí, near Nerpio, at El Sabinar, and near Vélez Blanco. Of fifty-two schematic art sites within the geographical region of the distribution of Levantine art, eighteen shelters have Levantine naturalistic painted figures on the same painted panel (see Appendix). Yet the Levantine art geographical area is not really the same as that of the schematic rock art (see Map 9). The latter is found over a wide area of northern Andalusia as far west as the Portuguese border, and has a considerable extension southward near Cádiz. The number of convincing naturalistic paintings from this area is very small. It might be deduced from this that, notwithstanding some contemporaneity of the two kinds of art, nevertheless schematic schematic art has a wider distribution with a different geographical centre of gravity. The failure of naturalistic art to penetrate this area, unlike the reverse situation, argues against a purely geographical differentiation of contemporaneous cultures. Rather, the most likely hypothesis is one which postulates a stage of contemporaneity followed by geographical expansion of schematic painting after cessation of naturalistic painting.

Now, the geographical distribution of Levantine art is roughly north-south, parallel to, but away from, the coast, and cutting across the middle and upper reaches of the Mediterranean river valley systems./

systems. The distribution of schematic art is east-west, from the headwaters of the southeastern rivers draining into the Mediterranean westwards over those mountain ranges whose rivers drain into the Atlantic, especially the mountains to the north of the Peni-Baetic Depression. Neither type of art has a coastal distribution. The total absence of art from the Sierra de Cartagena or Sierra Almagrera in southern Murcia and north-east Almería by the coast, and its absence from the Mondúber massif near the coast in southern Valencia and also from the mountains of northern Alicante which abut on the coast near Denia and Cabo de la Nao, are all worthy of remark, and certainly cannot be due to any lack of archaeological activity in those regions.

The inland distribution of Levantine art, and of most later upper palaeolithic and early neolithic sites, argues forcefully against a maritime, colonist origin. The schematic art has been the subject of various monographs (Breuil, 1933,1935; Acosta, 1968). By the copper age schematic motifs are frequent in mobiliary art, such as the symbolkeramik of the settlements of the Almerian valleys of the Río Almanzora, Río de Antas and Río Andarax (e.g. the well known vessel with schematic cervines from grave 15 at Los Millares in the Ashmolean Museum, and the numerous vessels decorated with oculi : Lesiner & Leisner, 1943). The oculus is found engraved and painted on phalangeal bones of horse and pig from many southeastern sites (Ballester, 1946; Almagro Gorbea, 1971). It has already been seen that similar motifs are found painted at rock shelters near Nerpio and elsewhere. Settlements with mobiliary art (Los Millares, Almizaraque, Ereta del Pedregal) seem to fall in the period 2,500 - 1,700 B.C., which is towards the end of the copper age and overlapping with its earliest Argaric development (see later chapters). Some of the painted pottery belongs to this period, though some is earlier. Further

inland/

inland, the schematic animal engraving on megalithic tomb L 15 at Montefrío, (Granada) probably belongs to this period (Leisner & Leisner, 1943), and perhaps too the beaker pottery with incised cervine motifs from Las Carolinas, (Madrid). Some of the coastal settlements such as Almizaraque, Los Millares and Vila Nova de Sao Pedro have contained animal figurines. However, not all schematic motifs are necessarily quite so late in date. A sherd from a deep situation at the Coveta de l'Or, (Alicante) and displayed at the Museo de Prehistoria, Valencia, is doubtless neolithic. The cave has provided a mid-fifth millennium radiocarbon estimation, as mentioned earlier. Moreover, decorated painted wares from Terra Venturas, near Tabernas, (Almería) are fairly similar geometric painted designs on Levantine pottery. At Terra Venturas they occur from the earliest layers, and middle levels at this copper age settlement have been dated for the present writer to the mid-fourth millennium (see later chapter).

A burial cave investigated by the present writer near Jumilla, (Murcia) has both Argaric ceramic forms and painted, incised, and cardial-type pottery, and has been dated for the present writer to about 2,000 B.C.. The burial contained a copper arrow-point and several bifacial flint points. What is of especial interest, however, is that the pottery includes not only the typically Levantine red-on-buff chevron and triangle designs, but also oculi in black-on-buff, (fig. 61). This site will be discussed later; suffice it to say that it is well within the area of Levantine art, and that there are schematic paintings, too, not very many kilometres distant at Monte Arabí near Yecla. The painted motifs on the sherd are very like those from the El Sabinar painted shelter and that of the Abrigo del Ídolo near Nerpio. A similar painted vessel with oculi is known from grave 21 at Los Millares, and there are numerous exam-

ples/

ples of oculi and other symbolkeramik motifs on Millaran pottery and also from Almizaraque. Those sites are slightly outside the area of rock painting, however. Triangles and chevrons are painted at the Cueva de los Letreros, Vélez Blanco, (Almería) and at other schematic art sites, and are common features of Levantine painted wares, and also of incised wares and plaster wares (gipsekeramik), probably of mainly copper age date. This matter will be discussed in a future chapter. It may be of interest to point out that the Cueva de la Pileta in Malaga province yielded decorated wares from the same chamber as the schematic wall paintings (Breuil et al., 1915). It has been stated that the pottery includes painted sherds (Bernabó Brea, 1954), but the present writer has examined the British Museum collection to which reference was made, and finds no painted sherds. (The cave also contains upper palaeolithic wall paintings, and it has been claimed that the schematic art is of upper palaeolithic there by Ripoll, 1964.)

There seems to have been some chronological and geographical overlap between Levantine naturalistic and Andaluso-Levantine schematic art, but in general terms, it seems safe to place the larger part of the latter in the copper age, and perhaps quite late in the copper age at that. The relationship of the motifs to those of mobiliary art from southeastern settlements is unclear, especially considering the very inland distribution of the schematic art away from those centres. The mobiliary art might represent the art form of people not accustomed to rock painting, or for whom rock decoration was irrelevant. The schematic tendency of rock art might have been borrowed from this mobiliary art tradition by rock artists, or might have developed out of naturalistic portrayal as a kind of short-hand, as has commonly been envisaged. There do seem to be chronological and geographical discontinuities, for which no simple hypothesis can be provided. Perhaps the only hypothesis which might be offered, is that a population expansion

associated/

associated with transhumant pastoralists or perhaps mineral ore exploitation in the geologically rich mountains of Granada and Córdoba provinces. This is speculative, and the archaeology of northern Andalusia requires much further fieldwork.

Some authorities have attempted to date Levantine naturalistic art to the copper age on the ground that man-bovine representations can be paralleled by representations of man-bovine activities of Minoan Crete (Ortego, 1956; Jordá, 1964). Such scenes in Levantine art are extremely rare, and usually contain subject matter extraneous to such a clear-cut interpretation. The skirted anthropomorphs and bulls at the Roca dels Moros, Cogul, (Lérida), have been sometimes quoted in this connection. It would be neither more nor less likely to derive the Cretan man-bovine activities from Spanish prototypes as vice versa. In the Peninsula man-bovine activities have a long ancestry, going back to Roman times (e.g. the Clunia sculpture: Hübner, 1893), if not to Iberian times (Blanco, 1961 - 1962; Arribas, 1964; Encyclopedia Britannica, 1968). The best parallel for Cretan man-bovine activities in the Peninsula, however, is the modern Portguese pega pega bull jumping, and it has been remarked that modern rural ceramic figurines from that country bear an uncanny resemblance to prehistoric Cretan figurines (Feltham, 1965). The point is not that these parallels are especially significant, but rather that it is unhelpful to leap at any attractive parallels to hand in order to "explain" prehistoric paintings. It brings one m closer to an understanding of what the art "means" than before the particular wild goose chase was embarked upon. Arguments about what derives from what can easily be inverted. There is a wealth of ethnographic material which points to alternative explanations, by no means mutually exclusive, for primitive rock painting -- cultic, totemic,

aesthetic,/

aesthetic, and secular. Single explanation hypotheses about prehistoric artistic motivations are unlikely to be valid. It is well known that there are Australian aboriginal rock painters who can give no reason as to why they execute paintings, and they may paint extinct animal species by stylistic traditions handed down from earlier times. In this regard, one might be wary of accepting some of the more stylised interpretations of crocodile, hippopotamus, elephant and giraffe in north-west Africa in neolithic times as evidence for the continuing presence of those species there at so late a date, a view which is nevertheless commonly accepted (see Axelrod, 1967, pp. 18 - 21). The Hadza of Tanzania disclaim responsibility for paintings they have executed, saying that ghosts have done the work during the night . Presence of cults and religions in some parts of the Old World cannot automatically be invoked as evidence that all Old World prehistoric activities not obviously related to the technology of a survival economy are necessarily religious. To inquire about the "meaning" of prehistoric art is somewhat unproductive unless qualified within specific contexts for which "meaningfulness" is sought by the archaeologist. These must surely be the contexts of archaeological and palaeoecological remains. Ethnological speculation is not a matter which is appropriate to the methodological and operational procedures of prehistoric archaeology by and large.

That having been said, the man-bovine representations at Alpera, where "pseudo-cervids" were painted by the addition of stag antlers to bovine horns, are of tantalising interest. There are other probable instances at both Cantos de la Visera and Minateda. Might these have been hunting decoys, which would involve the presupposition of some degree of bovine domestication ? Or did they have some esoteric significance which it is beyond our methodological limitations to speculate upon ?

If the contents of the paintings do not allow us to be very sure of the archaeological "cultures" responsible for them due to the paucity of distinctive painted type-fossil artefacts, nevertheless, the

sites at which artefacts have been found in a stratigraphically sealed situation seem to reinforce the general attribution of the art to later upper palaeolithic or early ceramic-using times. The circumstances of discovery, and the inadequate description of much of the material, however, leave a lot to be desired. Because of these defects and because an attempt to remedy them by the present writer's own excavations has been made, this matter has been left until last. Before these excavations are described in detail, mention may be made of sites with art and artefacts hitherto mentioned in the literature.

At the Cueva de la Cocina,(Dos Aguas, Valencia) there were found,in addition to the decorated stone plaques, traces of an animal figure in red on a wall of the cave (Pericot, 1946, p. 54). The lithic assemblage, pottery of the upper layer, and skeuomorphic plaques have received considerable attention (Pericot, 1946; Fortea, 1971). The site appears to be a transitional occupation from later preceramic to early ceramic-using phases. The relationship, if any, between the parietal painting and the stratigraphy of the fill, is unknown.

At Cantos de la Visera, (Yecla, Murcia) Breuil and Burkitt (1915, pp. 314-6) reported an upper palaeolithic type of assemblage to which reference has already been made with regard to a putative "Solutrean" piece. The excavators compared the assemblage with one they had previously classified as Gravettian, whilst being cautious enough to describe it in generalised terms as "upper palaeolithic". There were apparently many long blades, yet none was over 30 mm in length. The contradiction may be resolved by interpreting them as slender, rather than long, blades, which would be in good agreement with the débitage from many later upper palaeolithic or early neolithic sites. The retouch was unilateral, and presumably of a backing retouch variety, if the Gravettian comparison is a guide. In the light of evidence to be presented below from the Abrigo Grande, perhaps the

most/

most significant feature of all is that the excavators reported the discovery of crude potsherds. This aspect has not been much commented upon, by contrast with the supposedly "Solutrean" flint item. The paintings have received mention earlier, and include naturalistic and more schematic figures.

At Alpera, (Albacete), crude flints were also found by Breuil, Serrano and Cabré (1912, p. 531) on the El Bosque hill where the painted shelters occur. At the small painted shelter immediately above and to the left of the Cueva de la Vieja (which now has a metal protective grille), and which is either the Cueva del Queso or the Cueva del Ciervo, whose paintings have been defaced, the present writer found crude sherds, and there is a small quantity of soil which might repay excavation. Reference to bifacial arrowpoints in the art at the Cueva de la Vieja has been made above.

The Cueva de los Letreros,(Vélez Blanco, Almería), has schematic art. The present writer found crude sherds and pieces of flint in the scree below the shelter. Breuil (1935, p. 19) refers to a late neolithic or copper age settlement in the vicinity. Further west, Breuil (ibid.,pp. 20-3) mentions two painted rock shelters at the Fuente de los Molinos. As has been mentioned, the present writer finds no trace of paint, but the shelters contain fills which apparently contain pottery, and Breuil refers to a neolithic settlement above the spring. The escarpment between the spring and the shelters is liberally sprinkled with coarse sherds.

Flint implements were found near the naturalistic paintings at the Roca dels Moros, (Cogul, Lérida), including three crescentic pieces (Bosch & Colominas, 1931, pp. 19-23, figs. 39-40 p.20; Almagro, 1947a, p. 439 fig. 355; Hernández-Pacheco, 1959, p. 345 fig. 265).

Nondescript/

Nondescript flints were found by Cabré at Matarraña, (Teruel), and a crude scraper or perhaps a point was found at the Racó dels Moros, (Calapatá, Teruel : Cabré, 1915, pp. 132-4; Cabré & Temprado, 1921, p. 278; Hernández-Pacheco, 1959, p. 358 fig. 279), but these pieces may have had no close relation to painted shelters.

At the Cocinilla del Obispo shelter in the Sierra de Albarracín, (Teruel), there was a crude industry including a poorly made trapeze, a crescentic piece extended into a kind of tanged point, and an awl-like implement, as well as another crescent and a microburin. The layer was only 10 cms thick, and was covered by a thin sandy layer. A very small fibrolite polished stone axe was found with the flint assemblage. The whole collection has been compared with Almerian neolithic assemblages (Almagro, 1944; 1947a, pp. 430 - 432 and pp. 426 - 427 fig. 341,342). Another rock shelter in this series, that of El Navazo, contained a crude assemblage with discoidal and end-scrapers (ibidem). At both shelters the paintings include bovines, and at the latter there are also anthropomorphs. The neighbouring Doña Clotilde rock shelter, whose more schematic art includes a tree, contained a more extensive assemblage with well made crescents, trapezes, backed bladelets, discoidal scrapers, etc. (Almagro, 1944; 1947a, p. 432 and pp. 430 - 431 figs. 345 - 346). The bidirectional retouch of the crescents was held to be an evolved feature, contrasting against the other sites in the series. However, there can be little doubt that all the sites are more or less contemporary with the later upper palaeolithic and early neolithic transitional phase. The Cocinilla del Obispo polished stone axe surely indicates that. Polished stone tools are not a common feature of such sites, but they do also occur in the ceramic stages of the Cueva de la Cocina sequence.

The Valltorta canyon, (Castellón), contains many painted shelters. One shelter without paintings contained an interesting

assemblage./ 174

assemblage. The Cueva de la Rabosa had eight layers. Layers 1 and 2 contained Iberian and other material. Layers 3,4 and 5 contained trapezes (eight in all), as well as seven bifacial flint arrow-points of barbed and tanged, rhomboidal and foliate forms, and also retouched blades. There were two simple vessels; a shallow bowl and a steep-sided flat-based bowl of a kind common in the neolithic and copper ages. There were also five bone punches, and one bone pin with a segmented head suggesting a copper age date (Pallares, 1923, pp. 454 - 457 figs. 65,66; Almagro, 1947a, p. 437, and pp. 421-422 figs. 333,334). Other caves, likewise without art, gave probably contemporary assemblages, namely the Cueva del Estaró which contained pottery, flint, bones of horse, red deer, goat or ibex, and cattle; the Cueva del Puntal which contained Roman sherds, cordon decorated prehistoric pottery, flints and a polished stone axe; the Cueva de Pipa which contained nondescript flints; and the Cueva del Trenc which contained backed and truncated bladelets. The various Planells or rock overhangs where the paintings are also situated, provided bifadial flint arrow-points from various places (Almagro, 1947a). Also from Castellón province, a trapeze was found at the painted rock shelter of La Joquera (Porcar Roig, 1932). Bifacial arrow-points figure in some of the Valltorta naturalistic paintings.

At the Cueva del Pudial, (Ladruñán, Teruel), which has a bovine painting, contained a notched or serrated blade and a few coarse, plain sherds (Ortego, 1946).

The present writer found a small pyramidal scraper and some coarse sherds on the scree below Cañaíca del Calar Site 1 (Murcia) though these cannot be related to the art especially.

The bifacial flint piece from the Cueva Chiquita,(Almería), which has naturalistic art, may again be mentioned for completeness, (a putative "Solutrean" artefact, see above).

V

INVESTIGATIONS INTO ASSEMBLAGES AND ENVIRONMENTAL FACTORS OF THE LATER UPPER PALAEOLITHIC AND EARLY NEOLITHIC : II THE ABRIGO GRANDE EXCAVATIONS

Introduction

The Abrigo Grande Site

The Artefacts

Radiocarbon Estimations

Total Lithic Breakdown

The Functional and Cultural Significance of the Excavation Material

In which the material is compared with other early neolithic assemblages in the south-east, a chronology for the neolithic is proposed, and the possible domestic economy of the Abrigo Grande is discussed in terms of dependence upon large mammals rather than on agricultural cultivation of cereals.

INVESTIGATIONS INTO ASSEMBLAGES AND ENVIRONMENTAL FACTORS OF THE LATER UPPER PALAEOLITHIC AND EARLY NEOLITHIC : II THE ABRIGO GRANDE EXCAVATIONS.

Introduction

So far in this thesis two lines of argument have been presented:

(a) on the basis of lithic assemblages it has been proposed that artefact forms such as backed bladelets, crescents and geometric flints belong to the Neothermal Period around 6,000 - 4,000 B.C.

(b) on the basis of Levantine painted rock shelters, the content of their art, and their archaeological associations, it has been proposed that the naturalistic art belongs to a similar period, with a possible extension for the schematic motifs.

Evidence linking the painted sites to Neothermal Period lithic assemblages, however, has been poor and circumstantial, and the notion of a link between them is more in the nature of working hypothesis (based on the theory of parsimony) rather than proven fact.

It was at this stage of the argument that the attention of the present writer was drawn to a site which proved extremely important in lending strong support to the hypothesis. Excavations at this site conducted by the present writer demonstrate (i) that the early neolithic is firmly rooted in preceramic assemblages of the kind referred to in (a) above, (ii) that the period proposed for these preceramic and for the earliest ceramic assemblages is roughly correct, (iii) that there is a good case for linking the naturalistic art with the assemblages of that period. The earliest radiocarbon dates for ceramic assemblages in Spain come from this site, and the appropriateness of the choice of the Segura and Vinalopó basins for investigations into the origin of the local neolithic in the context of an inland culture in which man-animal relationships played a major part is vindicated.

The/

The Abrigo Grande Site

The Abrigo Grande of the Barranco de los Grajos, Cieza, (Murcia), has already been mentioned in the preceding section with regard to its peculiar black and red schematic art and to a quite different, sinuous, red anthropomorph of Levantine type. The large rock shelter is very close to the Principal Painted Shelter which is entirely decorated with naturalistic figures. The discoverer of the paintings, sr. don Eduardo López Pascual of Cieza, noticed that there were flints in the loose soil of the floor at the Abrigo Grande and showed some of them to the present writer in December, 1968. A brief mention of these was also made by Beltrán (1968c, 1969) following sr. López's observation and the collection of a sample of surface flints by the Grupo Espeleológico de Cieza. Owing to the extreme interest of the assemblage and to the depradations to which the deposit was subject on account of the activities of gypsies living in nearby caves, a formal instancia requesting permission to excavate was presented in June 1970 by the present writer to sr. don Martín Almagro, Comisario Nacional de Excavaciones Arqueológicas, in Madrid, and a telegram in reply confirmed that permission to excavate was granted in September of that year, with the special circumstance that an 'inspector' would not be required to be in attendance owing to the unforeseen illness of the person originally so nominated. The material assemblage was subsequently sent to the Museo Arqueológico Nacional, Madrid, and a report was submitted in Spanish for publication in Noticiario Arqueológico Hispánico in 1971 (Walker, in press).

Plans and elevations of the rock shelter are given in figs. 33 and 34, and the stratigraphy is shown in figs. 35 and 36, the lettering of which corresponds to the grid in the site-plan. The lowest layer, layer 5, was not really a layer at all, but rather small pockets in the limestone bed-rock containing the break-down products of limestone.

Thus/
5:2

Thus there was no underlying layer of undisturbed 'natural soil'. It may be seen that the thickness of the layers varied continuously from point to point on account of the irregularity and slope of the bed-rock floor, and details of these thicknesses are best obtained from the sections therefore and their scales. For this reason the unusual step of providing separate drawings of all four sections of each cutting are offered for inspection. No structures were found during the excavation.

Layer 1 comprised a superficial layer of disturbed dark grey or blackish powdery soil. Layer 2 was a discontinuous thin layer with small angular limestone fragments in a firmly packed matrix of grey soil of lighter colour, indicative of thermoclastic processes. Layer 3 comprised a thick layer of yellow aeolian sand with few rock fragments. It tended to merge diffusely with the grey or grey-brown soil of layer 4 which contained many large stones and limestone blocks up to 400 mm across. At the deepest point of the excavation where layer 4 was in contact with bed-rock, a very small quantity of charcoal was encountered. There was no sign of a hearth.

Disturbance had been marked, especially at the part of the shelter marked 'd' in the site-plan. Layer 1 had been disturbed at points 'H' and 'N' . One pit, the fill of which was soil of identical consistency with that of layer 1, had been dug from the surface cutting into layer 3 in recent times, since it provided a nineteenth century metal cuff-link and a piece of lead shot. This was a clearly defined pit, but it seems to have been cut into previously disturbed soil in the region of 'H - N' such that close to that section an earlier disturbance seems to have cut through layer 3 completely reaching down to layer 4 perhaps. In that area it was difficult to distinguish between soil of layer 1 type and that of layer 4.

The/
5:3

The approximation to horizontality of the surfaces of the layers originally led the present writer to postulate that the fills had been intentional in order to overcome the disadvantage of a steeply sloping rocky floor, and that from time to time it has been necessary to raise the floor level, especially towards the mouth of the shelter. It was originally suggested that the sand had been brought from a distance to that end. However, subsequent awareness of the aeolian sands which accumulate in north-facing caves in the Segura-Vinalopó region, and microscopic examination of samples from layer 3, confirmed that layer 3 represents an aeolian deposition, indicative of sub-desert arid conditions following an earlier thermoclastic phase (layer 4) and followed by another thermoclastic phase (layer 2) and the development of a rendsina profile.

Stages of the excavation in progress are indicated by Plates XXXVI and XXXVIII - XLI. The horizontal extent of each layer and the distribution of artefact types and other material in each layer geographically are shown in fig. 37. The artefacts are illustrated in figs. 47 - 53 and Plates XLII - LXV. The line-drawings are arranged layer by layer

The Artefacts

The catalogue number refers to the number written on each object and contains information about the location of the piece. Thus Roman numerals indicate square cuttings (I,II,III) or baulks (I/II, etc.). The Arabic numeral in parentheses refers to the layer. The next Arabic numeral represents an arbitrary number for cataloguing, whether enclosed in a triangle or standing alone. The key in the left-hand column refers to the illustrations numbered in each figure . This refers to line-drawings only, since the photographs include some pieces of débitage as well as retouched pieces. Unretouched pieces were not given catalogue numbers, though some may have been used as implements of course.

Layer (1)

Fig. 47

No.	Catal.No.	Description and dimensions in millimetres	
1	I(1)1	Crescentic microlith of grey flint	18 x 7
2	I(1)2	Backed bladelet with retouch on opposing margins of grey flint	29 x 5
3	I(1)3	Backed bladelet of grey-brown flint	22 x 6
4	I(1)4	Backed bladelet of grey-brown flint	24 x 6
5	I(1)5	Backed bladelet with two rows of retouch along the same margin, and two small notches in the opposite margin	43 x 9
6	I(1)6	Backed bladelet of light brown flint	16 x 4
7	I(1)7	Notched flake-blade with signs of use of grey-brown flint	41 x 20
8	I(1)8	End-scraper of grey-brown flint	26 x 15
9	I(1)9	Pyramidal scraper of grey flint	40 x 19
10	II(1)1	Blade with retouch along opposing margins of grey flint	52 x 13
11	II(1)2	Backed bladelet of light-brown flint	24 x 7
12	II(1)3	Backed bladelet of grey flint	25 x 7
13	II(1)4	Backed bladelet of grey-brown flint	20 x 4
14	I/II(1)1	Backed bladelet of opaque white-grey flint with retouch in two rows along same margin	30 x 7
15	I/II(1)2	Backed bladelet of grey-brown with retouch in two rows along same margin	25 x 7
16	III(1)1	Pyramidal core of black flint	40 x 30 x 21
17	III(1)2	Backed bladelet of grey flint	44 x 6
18	III(1)3	Awl of grey-brown flint	43 x 18
19	III(1)4	Backed bladelet of pale brown flint	44 x 6
20	III(1)5	Backed bladelet of opaque grey flint	24 x 5
21	III(1)6	Backed bladelet of grey-brown flint	24 x 5
22	III(1)7	Backed bladelet of grey-brown flint	27 x 8
23	III(1)8	Backed bladelet of grey-brown flint	21 x 7
24	III(1)9	Backed bladelet of grey-brown flint	23 x 5
25	III(1)10	Backed bladelet of black flint	16 x 5

26	III(1)11	Backed bladelet of light brown flint	20 x 6
27	III(1)12	Notched blade with sheen indicating utilisation of grey-brown flint	41 x 16
28	III(1)13	Retouched blade (? awl) of light brown flint	27 x 12
29	III(1)14	End scraper of grey-brown flint	28 x 15
30	III(1)15	Notched flake of black flint	23 x 15
31	I(1)5	Pyramidal core of white flint	75 x 28 x 2
32	III(1) 16	Potsherd flake showing external surface and rim, coarse, plain ware of creamy colour	41 x 21 x 7
33	I/II(1)16	Pottery handle of pink ware with conspicuous mineral filler	49 x 19 x 1
34	I/II(1)17	Sherd of hard pottery, black on external surface and highly polished, grey white on internal surface, with large crystals of filler, especially on external surface	36 x 26 x 5
35	I/II(1)15	Sherd of plain coarse ware with micaceous crystals prominent on both surfaces, buff on external surface, black on internal surface and cross-section.	37 x 33 x 6
36	III(1)11	Small sherd of coarse grey ware with impressed "pseudo-cardial" decoration.	19 x 17 x 7
37	I/II(1)18	Sherd of hard black burnished coarse ware with prominent crystals of filler	32 x 21 x 6
38	II(1)8	Decorated bone rod (Plate) with two groups of raised ridges that are ca. 1 mm long.	20 x 2 x 2
39	I(1) 1	Perforated shell, Donacilla cornea, with traces of artificial perforation	18 x 12

(Not illustrated in the line drawings are a modern metal cuff-link — Plate XLIV; piece of lead shot, a lump of red ochre, and a fragment of rock crystal.)

Layer (2)

Figs. 48 - 50.

1	I(2)1	Backed bladelet of blue-black flint	24 x 6
2	I(2)2	Backed bladelet of light brown flint	22 x 6
3	I(2)3	Backed bladelet of grey flint	29 x 6
4	I(2)4	Backed bladelet of light brown flint	15 x 3

5	I(2)5	Backed bladelet of grey flint	24 x 7
6	I(2)6	Backed bladelet of grey-brown flint	36 x 7
7	I(2)7	Backed bladelet of black flint	28 x 8
8	I(2)8	Backed bladelet of light brown flint	30 x 8
9	II(2)1	Backed bladelet of grey flint	33 x 6
10	II(2)2	Backed bladelet with two rows of retouch along the same margin, of grey-brown flint	26 x 7
11	II(2)3	Backed bladelet with two rows of retouch alonf the same margin, of grey flint	15 x 9
12	II(2)4	Backed bladelet of brown flint	20 x 4
13	II(2)5	Notched flake of black flint	14 x 14
14	II(3)6	Notched flake of grey-brown flint	33 x 18
15	II(2)7	Pyramidal core of grey-brown flint	40 x 31 x 19
16	II(2)△9	Pyramidal core of grey flint	56 x 43 x 28
17	II(2)△10	Pyramidal core of light brown flint	50 x 29 x 22
18	III(2)△12	Pyramidal core of grey flint	63 x 51
19	I(2)△6	Crumbly sherd of coarse ware with micaceous crystals of filler on both surfaces, buff on external surface, black on internal surface	23 x 16 x 8
20	I(2)△7	Fragments of large crumbly vessel of baggy shape with handle of pink coarse ware	68 x 63 x 8 109 x 71 x 8 113 x 82 x 8 50 x 26

Layer (3)

Fig. 51

1	I(3)1	Backed bladelet with two rows of retouch along the same margin of grey flint	30 x 13
2	I(3)2	Backed bladelet of grey-brown flint	24 x 7
3	I(3)3	Backed bladelet of grey flint	21 x 4
4	I(3)4	Pyramidal scraper	21 x 13 x 1
5	I(3)5	Pyramidal artefact on flake of black flint	37 x 18
6	I(3)6	Pyramidal core of black flint	29 x 20
7	I/II(3)1	Backed bladelet of grey-brown flint	30 x 9
8	I/II(3)2	Backed bladelet with signs of use on opposite margin of light brown flint	19 x 5

9	I/II(3)3	Backed bladelet of light brown flint	23 x 7
10	I/II(3)4	Backed bladelet of black flint	24 x 6
11	I/II(3)5	Pyramidal scraper	13 x 22 x 20
12	I/II(3)6	Pyramidal core of dark brown flint	30 x 21 x 14
13	II(3)1	Backed bladelet with retouch on opposing margins of grey flint	37 x 6
14	II(3)2	Backed bladelet with retouch in two rows along the same margin, of grey flint	23 x 6
15	II(3)3	Notched double end scraper of grey-brown flint	39 x 19
16	II(3)4	Pyramidal scraper of light brown and white flint	20 x 17 x 9
17	II(3)5	Pyramidal scraper of grey chert	18 x 15 x 7
18	I/II(3)19	Pyramidal core of white flint	44 x 34 x 24
19	I/II(3)20	Pyramidal core of grey flint	59 x 41 x 30
20	I(3)3	Perforated shell, Donacilla cornea, with indications of artificial perforation	15 x 11

Layer (4)

Fig. 52

1	I(4)1	Backed bladelet of light grey flint with retouch along opposing margins	60 x 15
2	I(4)2	End scraper of light grey-brown flint	40 x 11 x 6
3	II(4)3	Pyramidal core or scraper of poor quality pink flint	20 x 15 x 1[illegible]
4	II(4)14	Semicircular scraper of light brown flint	35 x 30 x 1[illegible]

Surface Finds

Fig. 53

1	S1	Sherd of cardial impressed ware, hard and well-fired black ware, smoothed on the external surface	45 x 50 x [illegible]
2	S2	Micaceous plain sherd, buff on external surface, black on internal surface, smoothed on both surfaces	91 x 91 x [illegible]
3	S3	Small sherd with cordon of coarse red ware	27 x 24 x [illegible]
4	S4	End scraper	40 x 37

In addition to the foregoing, mention may be made of fragments of Pecten jacobaeus from layers (2) and (4), and also of fifteen shells of Littorina littoralis from layers (3) and (4), as well as of nine pieces of red ochre from layers (1), (3), and (4).

Faunal Remains

A complete breakdown of individual bones will not be given. The following represents a breakdown on the basis of numbers of individuals (minimum numbers):

Vertebrate Fauna

	Layer (1)	(2)	(3)	(4)
Oryctolagus cuniculus	+ (42)	+ (16)	+ (23)	+ (2)
Sus scrofa	+ (2)	+ (1)	+ (1)	+ (1)
Cervus elaphus		+ (1)	+ (1)	+ (1)
Equus caballus		? + (1)	+ (1)	+ (1)
Caprinae	+ (1)	+ (1)		
Bos sp.	+ (1)	? + (1)		

Invertebrate Fauna : Shells

Rumina decollata	+ (126)	+ (31)		
Otala alonensis and Sphincterochila candidissima	+ (235)	+ (102)	+ (41)	+ (100)
Pecten jacobaeus		+ (1)		+ (1)
Littorina littoralis			+ (8)	+ (7)
Donacilla cornea	+ (1)		+ (1)	

The queried specimens from layer (2) refer to a single bone capable of interpretation either as an equine or a bovine. During the excavation O. alonensis and S. candidissima were not always differentiated, but a sample 660 mm square suggested O. alonensis was commoner in layer (1) (80%/

5:9

(80% : 20%), whereas in the lower layers the two species were present in roughly equal proportions (Otala: Sphincterochila 55%:45%).

Radiocarbon Estimations

An initial sample of bone from the surface was submitted to Birmingham University in 1969, but appears to represent modern débris, as the estimation, Birm-200 gave a delta-C^{14}% of -16.7 ± 33.3 (Shotton & Williams, 1971,p. 155).

From the excavation in 1970 two samples were submitted to A.E.R.E., Harwell, and have been estimated by Dr. R.L. Otlet (private communication, February, 1973).

The first sample was a mixed sample comprising two separate samples, one of charcoal from the base of layer (4), the other unidentifiable bone fragments from layers (3) and (4) combined. The smallness of these samples necessitated their being pooled at the laboratory. Even so, the sample shows a very high standard error and is unreliable:

S-180 (160 g giving 13 cm CO_2) (5570 ½-life C-14)

5120 ± 620 B.P. or 3170 B.C. (subtracting 1950)

correcting on the basis of the Bristlecone Calibration (Damon, et. al., 1972) gives 3960 ± 630 B.C. in absolute terms. Clearly no reliance can be placed on so inadequate a sample with such a high margin of error.

The second sample was a larger sample of bone fragments from layers (1) and (2), giving a good yield of CO_2 :

S-179-(III) (650 g giving 62.7 cm CO_2)

7200 ± 160 B.P. or 5250 B.C. (subtracting 1950)

This date lies beyond the range of the Bristlecone Pine calibration, but using the 5730 ½-life of C-14 (i.e. multiplying by x 1.03) gives a date of 5470 B.C.. This may be on the recent side, and a true date may be earlier still in the sixth millennium B.C..

Total/
5:10

Total Lithic Breakdown

The break-down of the lithic pieces is as follows:

Table I - by cutting
Table II - by layer
Table III - by type.

Table I

Type	Cutting I				Total
	Layer 1	Layer 2	Layer 3	Layer 4	
flakes	567	238	808	391	2004
blades	237	97	245	66	645
lumps	8	4	11	10	33
artefacts/cores	12	8	14	1	35
limestone			3		3
Total	824	347	1081	468	2720
	Cutting II				
flakes	585	335	485	196	1601
blades	169	107	118	44	436
lumps	19	7	7	5	38
artefacts/cores	4	9	5	3	21
limestone	1		1		2
Total	778	458	614	248	2098
	Cutting I/II (Baulk)				
flakes	106		350	178	632
blades	58		120	41	219
lumps	5		11	6	22
artefacts/cores	2		8		10
limestone			3		3
Total	171		492	223	886

Cutting/
5.11

	Cutting III				
	Layer 1	Layer 2	Layer 3	Layer 4	
flakes	788				788
blades	286				286
lumps	8				8
artefacts/cores	15				15
Total	1097				1097

Layer 2 was not identified in Cutting I/II, and layers 2 - 4 were not identified in Cutting III.

Table II

Layer	Type					Total
	flakes	blades	lumps	artefacts cores	limestone	
1	1940	692	35	31	1	2699
2	573	204	11	17		805
3	1293	361	18	19	4	1695
4	587	110	15	4		716
Total	4393	1367	79	71	5	5915

Table III

Cutting	Type					Total
	flakes	blades	lumps	artefacts cores	limestone	
I	1372	426	11	25		1834
II	1601	436	38	21	2	2098
I/II	632	219	22	10	3	886
III	788	286	8	15		1097
Total	4393	1367	79	71	5	5915

The break-down of the artefacts and cores is as follows:-

Table/
5:12

Table IV

Type	Layer 1	2	3	4	Total
crescent	1				1
backed bladelet	19	12	9		40
retouched blade	1			1	2
notched/serrated blade	2		1		3
awl	2				2
end-scraper	2		11	1	4
discoidal scraper				1	1
pyramidal scraper	1		4	1	6
pyramidal core	2	4	3		9
notched flake	1	2			3
notched flake-blade	1				1
Total	32	18	18	4	72*

* The total of 72 rather than 71 (as in previous tables) is due to a double end-scraper on a notched blade being classified separately under each category.

Two microburins were also found, but have not been entered in the foregoing table because they are accidental by-products of tool-manufacture and not strictly speaking implements (Plate LII); they came from layers 1 and 3, respectively. There were various burin-like pieces, but could not be classified as implements since not only were the burin blows rather doubtful, but moreover in no case did the putative burin show a clear striking platform or bulb of percussion for the blade as a whole. In other words, given the doubtful nature of the burin blows, there was no way of ascertaining whether the spalls which were removed and which gave rise to burin-like cutting edges had been removed

accidentally/

accidentally whilst the whole piece was still attached to the parent core or removed intentionall from an intentionally struck blade (as would have been clearly the case if the individual blades showed either a striking platform or bulb of percussion). If this seems somewhat pedantic, and if such a rigorous definition might exclude many burins identified by experts in upper palaeolithic assemblages in the past, the present writer justifies the rigorous classification on the grounds that there is no obvious alternative one. In any case, the point has been amply made from ethnographic studies (e.g. White & Thomas, 1972) that clear distinctions between débitage and retouched pieces reflect more observer-bias than subsequent utilisation of flint pieces on the part of primitive peoples who manufacture them. For this reason some thought has gone into presenting the unretouched 'débitage' from the Abrigo Grande in the present account, in addition to the retouched pieces. Previous studies in southeastern Spain have tended to ignore the unretouched material, by contrast.

The brute data tables (I- IV, above) of the partitioning of the total lithic assemblage mask certain interesting features which are revealed by a more subtle analysis. Pi-diagrams of the unretouched flints assorted by weight per layer as a proportion of total weight (10410 g), and also of distribution by layer have been prepared (figs. 43, 48). The average weight of each waste spall is 1.8 g, ranging from 1.5 - 2.2 g, depending on the layer in question. Perhaps flint-knapping techniques were fairly consistent throughout the occupation. Now, Table II and fig. 38 both neglect the relative density of items in the various layers. Since layer 2 was very thin and layer 3 was very thick, such a presentation is unsatisfactory. A corrected pi-diagram (fig. 39) expresses the distribution in terms of density per cubic metre of soil per layer. The percentage indicated in each case refers to a notional total representing the summed totals from 1 cubic metre of each of the four layers. The diagram indicates that layer 2 has a

slightly greater density than has layer 3.

The backed bladelets are not all identical. Some have one row of retouch, whereas some have two rows on the backed margin. Of the latter, these may again be subdivided into those whose facets of each row have been due to blows struck in the same direction, and those where they have been caused by blows struck in opposing directions. This splitting of the artefacts into sub-types is indicated graphically by the pi-diagram fig. 45. The percentages sum to over 100% because some artefacts fall into more than one class. The assortment of artefacts into broad types in Table IV and fig. 45 requires some justification over and above the subjective visual inspection of the archaeologist. To achieve some kind of objective evaluation, the angles formed between the bulbar surface of the bladelet or flake and the retouch facets was measured with a goniometer which had a projecting horizontal shelf at right-angles to the calibrated dial and swinging arm. The piece was placed on the shelf in a stable resting position and the swinging arm brought into contact with the retouch facets. This seems a simpler and no less satsifactory method than that proposed by Movius (1971), provided that several readings are taken. The results are shown in fig. 40 as a histogram. The pyramidal pieces and scrapers have a retouch angle clustering around 60°, whereas the bladelets have retouch facets clustering around $80 - 90^{\circ}$, with a subsidiary peak at around 120° representing the inclusion of those backed bladelets retouched by means of blows in opposite directions along the retouched margin. The partitioning suggests that there is a functional difference between the pieces subjectively called scrapers and those called backed bladelets.

It also seemed worthwhile to compare the dimensions of the retouched backed bladelets with unretouched bladelets of '<u>débitage</u>' . Both length and breadth measurements were compared, and in each case a bimodal distribution was found (figs. 41, 42). The worked pieces were

both/
5:15

both shorter and narrower than the unretouched pieces. Whether the former was due to breakage following use, and the latter due to the effects of retouch, are matters for speculation. What is perhaps noteworthy about the unretouched pieces is that the graphs demonstrate a curious absence with regard to the areas corresponding to the lower values of the débitage sample. A wider spread of values for the unretouched group contrasted against the retouched group might have been anticipated. Possibly there was a functional requirement for blades of a particular size with relatively little production of smaller blades, indicating very few accidental mistakes during the initial removal of blades from the parent cores. Backing retouch of the blades would then reduce their breadth, and domestic or other accidents would be responsible for their truncation during use.

Plate LX shows some unretouched spalls, including a few with burin-like blows and a vaguely triangular unretouched piece. This latter, and the microburins mentioned above, are the only testimonies to the possible production of geometric pieces. There was one crescent from the superficial layer. It has single row backing retouch, not the 'advanced' double row type of retouch which Almagro and Jordá have claimed as typically neolithic. However, the crescent is from a ceramic layer, whereas double backed bladelets are found not only in ceramic layers, but also in preceramic layers. Double row backing retouch does not seem to have anything to do with an evolution from preceramic to ceramic cultural traditions at this site.

Comparing the pieces layer by layer as in the histogram fig. 46, it is interesting to note that the preceramic layers show a larger proportion of pyramidal pieces, and the upper layers a higher proportion of backed bladelets. Since the absolute numbers are very small, this may be of no significance. The trend would be even more pronounced, nevertheless, if a correction were made for the greater density of the ceramic layer 2. Backed bladelets are often held to be of 'palaeolithic affiniti

5:16

affinities, a kind of Gravettoid cultural atavism, as has been said earlier. At the Abrigo Grande the high proportions of such artefacts in the upper two, ceramic, layers suggests that, on the contrary, they represent an important part of the earliest neolithic in south-east Spain, whether or not they can be traceable back to the upper palaeolithic.

The Functional and Cultural Significance of the Excavation Material

The lithic assemblage may be compared typologically with that from the Balma de Sant Gregori, of unknown age (Vilaseca, 1932 - 1934 discussed earlier. That site is reported to have had Mousterian artefacts in the lowest layer, a cervine engraving from the backed bladelet layers, and pottery and a bifacial flint point from the top layer. Layer (5) at Sant Gregori, in particular, may be singled out as a parallel for the Abrigo Grande assemblages, with its pyramidal cores discoidal scraper, and backed bladelets. In a later article, Vilaseca (1949) said that this layer contained 666 flint pieces of which 22 were backed bladelets and points, a proportion very similar to that for layers 1 and 2 at the Abrigo Grande. Discoidal scrapers, end-scrapers, pyramidal scrapers, and rock crystal are common to both sites, but crescents and microburins are far less common at the Abrigo Grande, although present. As at all published south-east Spanish sites, the failure to publish a complete break-down of the lithic assemblage makes comparisons other than on a subjective level quite impossible in so far as the Balma de Sant Gregori is concerned.

The difficulty over the chronological date of the Balma de Sant Gregori is met with at several south-eastern and eastern Spanish sites with which one might wish to compare the Abrigo Grande; thus the Cueva del Filador, Covacha de Llatas, and Cueva de la Cocina (notwithstanding the geometricising tendency of these sites), and

the Cueva del Lagrimal, Cueva Grande de la Huesa Tacaña, Doña Clotilde rock shelter, Cueva de la Palica, and Cueva de les Mallaetes. The backed bladelets at the Cueva d'En Pardo might also be mentioned. Cocina, Sant Gregori, Mallaetes and Filador all have decorated plaques, and Cocina was said to have a painted parietal motif. The Abrigo Grande has no decorated plaques, but does have parietal art, as also has the nearby Principal Painted Shelter. In this connection, it is interesting that red ochre was found in several layers of the excavation at the Abrigo Grande, and also at Cocina.

At Cocina, Llatas, Lagrimal and Mallaetes, aceramic stages give way to ceramic stages without too much change in the assemblage compositions, in so far as the lithic industries are concerned. At Cocina the trapezes and pedunculated triangles of the lower layers are less common, but their place does not seem to be taken by any particular type in stages Cocina III and IV (Fortea, 1971). At Lagrimal it is reported that geometric forms become commoner in the ceramic stage of layer III, though it is not until the next layer, layer II (which contained a polished stone axe and two copper awls)(Soler 1968 - 1969, pp. 47, 51) that the incidence of backed bladelets is said to decrease markedly. The lowest layer, which was aceramic, and does not seem to have provided very many convincing geometric forms, is most like the Abrigo Grande material, though the large transverse and side scrapers are not found at the latter site. Mention has already been made of a bulky keeled artefact which may be a knife (or scraper ?) similar to one from the Cueva de la Palica, to a piece from the Abrigo Grande (Plate LIII, far right; fig. 47 no. 22), and the Cueva Ambrosio (v.inf

Cocina, the Cueva del Lagrimal (copper age layer), and the Cocinilla del Obispo rock shelter produced polished stone tools, unlike the Abrigo Grande, though it has been speculated that one of the

anthropomorphs at the Principal Painted Shelter nearby might be carrying such an implement. Polished stone implements were found in layer 1 at Hoyo de la Mina, but they do not seem to have been present in the ceramic layer (layer 2) overlying the aceramic assemblage in Chamber No.3 (Such 1919, 1920). The geometric and crescentic tool-types at that site, and the curious points, are rather unlike other assemblages in the south-east.

Bifacial arrow-points were found in the surface layer at the Balma de Sant Gregori, the Cueva de la Cocina, and in layer II (copper age layer) at Lagrimal. None were found at the Abrigo Grande.

The Mondúber massif site of the Cueva de les Mallaetes, currently under re-excavation, may provide another parallel for the Abrigo Grande. Here, trapeze and backed bladelet flints occurred in ceramic layers overlying aceramic layers of later upper palaeolithic aspect, not dissimilar to the Abrigo Grande assemblage perhaps (Fletcher, 1956, 1956a). Geometric forms are said to have been rare at that site. Davidson has recently reported sheep bones from those later upper palaeolithic layers, and this is perhaps interesting in the light of previous comments about the possibility of sheep paintings at the Principal Painted Rock Shelter near the Abrigo Grande. The pottery at Mallaetes included cardial impressed pottery and incised sherds. Cardial impressed pottery was also found in the Cocina III assemblage (Fortea, 1971) and in the superficial deposit of the Abrigo Grande. Incised, channelled, comb and relief ornamented sherds were also found at Cocina. A relief ornamented sherd was found at the Abrig Grande in the superficial layer, and Llatas, also, provided incised and relief decorated wares from the superficial layer. At Hoyo de la Mina the pottery of layer 2 was plain or relief ornamented ware with handles, contrasting against the more elaborate incised and impressed wares of layer 1 at that site. Mention may be made of other Mondúber massif

caves/
5:19

caves, in addition to Mallaetes, such as Rates Penaes and Meravelles, where once again backed bladelet assemblages were reported from ceramic layers containing cardial impressed and other pottery.

At the Cueva de Nerja, (Málaga), neolithic layers were found stratified above later upper palaeolithic layers in the Belén chamber (Pellicer, 1962). There were also copper age layers at higher level in the stratigraphy. Bifacial hollow-base flint arrow-points occurred immediately over the later upper palaeolithic, aceramic layers, in the context of 'almagra' wares, and also impressed and incised sherds. Some of the vessels had spouted handles, a feature of Hoyo de la Mina (Such, 1919, p. 16), the Genista cave, Gibraltar (Busk, 1869, Pl. XI, fig. 1), and the Cueva de los Murciélagos, (Albuñol, Granada) which would seem to be of metal age date as a gold diadem was found there (Góngora, 1868, p. 45). (A bronze fish-hook was also found at Genista cave.) Cardial and pseudo-cardial impressed vessels with holes near the rim in lieu of spouts are also found at the Cueva de la Sarsa and Coveta de l'Or. The neolithic layer at Nerja also contained a costrel jar with two handles of a kind known from El Gárcel (see below). The lack of continuity of the pre-neolithic lithic assemblage at Nerja argues against the neolithic at that site being early in the Peninsular neolithic sequence.

It has long been known that cardial impressed wares are uncommon in Andalusia as opposed to south-east Spain, however the lowest layers of the Cueva de la Carigüela's neolithic sequence (layers XV, XVI) provided cardial sherds stratified below layers with 'almagra' wares (Pellicer, 1964, p. 54). There does not seem to have been any cardial ware at the Cueva de Nerja,* on the other hand. There are other Andalusian caves where neolithic material was found stratified above later upper palaeolithic material, thus at

the/

* Except for one surface sherd (Pellicer,1962,p. 35).

the Cueva del Cala, (Málaga), ceramic assemblages were apparently found overlying an aceramic assemblage of angle burins, 'Gravette points' and elongated triangles and trapezes (Breuil, 1921).

Within the Segura-Vinalopó area mention must also be made of the assemblage at Cantos de la Visera (Breuil & Burkitt, 1915, p. 317) where slender blades with unilateral retouch less than 30 mm in length were found by the excavators, who also reported finding pottery. Unfortunately details are not available, which is the more regrettable since apart from the Abrigo Grande, this must be one of the few rock shelters with naturalistic Levantine art to have given a material assemblage. The Cueva Ambrosio also lies in the upper reaches of the Guadalentín tributary of the Segura, and despite the inadequacies of the published account, it must also be mentioned in relation to the Abrigo Grande assemblage on account of its strategic position on the Andalusian periphery of the Segura region. This cave has no rock art, though it is only a couple of kilometres from the Lavaderos de Tello painted site.

Publication of the 1944 excavations of Cuadrado Ruiz and Jiménez Navarro leaves much to be desired in the way of clarity (Jiménez, 1962). The lithic débitage in the Museo L. Siret at Almería, however, suggests to the present writer a striking resemblance with regard to the unretouched slender bladelets from the Abrigo Grande, and perhaps may also be similar to what has been described about the Cantos de la Visera bladelets. As at the Cueva de la Carigüela the curious Spanish prehistoric archaeological demarcation procedure led to separate excavators at different times investigating the neolithic and palaeolithic deposits, respectively. The excavators of the neolithic fill encountered what they described as neolithic material below disturbed surface soil 100 mm thick. The neolithic material occupied a depth of over -1.000 metres before upper palaeolithic deposits were reached.

As at many Spanish cave sites, the excavator does not refer to stratigraphical changes, but confines himself to remarking that in the lower part of the neolithic deposit the lithic industry became more microlithic and there was a notable decrease in the amount of pottery encountered. Elsewhere (Jiménez, 1947, p. 129) it is stated that there was no metal found at the site, and that the neolithic flints were of 'Hispano-Mauritanian' (i.e. microlithic or geometric; not bifacial) type. It is also stated that one quarter of all ceramic pieces were decorated in the upper 600 mm of the fill, and the beaker sherds at this site are discussed with regard to the origins of that kind of ware. Similar arguments had previously been put forward by del Castillo (1928, 1943, 1944) on the basis of earlier collections at the Cueva Ambrosio. The present writer has found beaker sherds in the spoil heaps at the second of the two rock shelters (see below).

The lower part of the neolithic sequence at Ambrosio, with microlithic flint-work and scarce pottery is of especial interest from the viewpoint of the Abrigo Grande assemblages. There were many blade-lets, including some with backing retouch (Jiménez, 1962, p. 38, fig. 19, nos. 2,20) and others with signs of use (ibid., fig. 19,no. 9). A somewhat larger blade with retouch is also shown (ibid. fig. 19,no.17) as well as the shouldered Solutreo-Gravettian point from another part of the cave which has been mentioned in an earlier chapter (ibidem, fig. 19,no.19). There is also a rather thick blade or flake fragment of carinated form (ibid. fig. 20, no.12) similar to three others from a higher level in the deposits (ibidem, p. 21, fig. 2, nos. 1,2,7) which four pieces bear comparison with implements from the Abrigo Grande, Cueva del Lagrimal, and Cueva de la Palica. Various pyramidal scrapers (ibidem, p. 39, fig. 20, nos. 5 - 11), discoidal scrapers (ibidem, p. 38, fig. 19, no.10; p. 39, fig. 20, nos. 3,4), and end-scrapers were also found. Two rather crude trapezes are illustrated

(ibidem/)
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(ibidem, p. 23, fig. 5, no.10, and perhaps p. 38, fig. 19, unnumbered between nos. 16 and 20), as well as other signs of the geometric technique such as notched blades and microburins (ibid., pp. 41-43, fig 21 - 23, various). Awls are also depicted in several figures.

According to the excavator's account, retouched backed bladelets were commoner than his illustrations would lead one to think (ibid p. 43), and he states that burins were rare and always untypical (ibid. p. 44). This feature was also remarked upon by Gossé at El Gárcel (Gossé, 1941, p. 71,fig. 13 'Buriles dudosos'), and has been commented on with regard to possible burins or lack of them at the Abrigo Grande above.

Jiménez comments on the unretouched very slender blades with a triangular cross-section. Those displayed at the Museo L. Siret at Almería strongly recall the Abrigo Grande unretouched bladelets. He states that no trapeze with retouch occurred in the lowest layer of neolithic, and presumably the unnumbered trapeze in his fig. 19 referred to above lacks retouch. He seems to have considered that the trapeze with retouch (Jiménez, 1962, fig. 5, no. 10,p. 23 and see text p. 20) belonged to a somewhat higher situation in the neolithic sequenc referring to it immediately after objects which he states occurred in the lower layer. This is a rather confusing account, in fact, and one must either accept that the writer contradicted himself, or that there is a garbled account of the relative stratigraphical sequence presented. The notched blades are much larger than the backed bladelets, which might be anticipated if the microburin technique were being practised o: them with the aim of removing a trapeziform piece for subsequent retouch as a point. Such large blades as are illustrated by Jiménez (ibidem, p. 42, fig. 22) are absent from the Abrigo Grande assemblage, though they do occur at El Gárcel (see below), which is hardly surprising given the large number of trapezes and microburins at that site.

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From the upper parts of the neolithic sequence there are more discoidal scrapers (ibidem, p. 22, fig. 4), more large blades, some end-scrapers, and rather larger bladelets than in the lower layer (ibid. p. 23, fig. 5), some with retouch, in one case on opposing margins (c.p. Abrigo Grande, fig. 47,no.2, fig. 51,no.13, fig. 52, no. 1), the piece being illustrated by Jiménez (op. cit., p. 23, fig. 5,no.8).

Two shiny polished stone axes are reported to have been taken from the cave by plunderers. The excavators found four fragments of polished amphibolite axes, a fragment of a polished axe of metamorphic sandstone, a schist polishing stone, and various grain rubbing stones. There were also bone punches, fragments of two marble bangles (one with traces of red colouring in the incised linear decoration), a pierced bone pendant, other bone ornaments, beads of Columbella (?) shells, fragments of Pecten jacobaeus (c.p. Abrigo Grande), and osteological and dental remains of goat, cattle, horse, red deer, wild cat (?), and, as at the Abrigo Grande, an extraordinary abundance of rabbit. Antler tines of red deer were also found. With regard to the sea-shells, it is interesting to comment that like the Abrigo Grande, the Cueva Ambrosio is some 60 kilometres from the coast.

The pottery from the lower part of the neolithic sequence is not specified in detail, but vague references are made to plain sherds of small grey bowls, coarsely made. At higher levels pottery was abundant: channelled, cordon-decorated, impressed, incised, and apparently even excised (Jiménez, op. cit., p. 29) ornament being found. Beaker sherds (confirmed by the present writer), and 'pre-Beaker' wares (Savory, 1968, p. 173) of zone-ornamented vessels have led to the site being considered as a crucial one from the standpoint of the development of this kind of pottery (del Castillo, 1928, 1943, 1944; Jiménez,1947).

The Cueva Ambrosio is a large rock shelter above a stream which flows all the year round and feeds the headwaters of the Guadalentín tributary of the Segura (Plate LXIX). The main shelter is visible from a distance, and it is here that deep excavations were made by Breuil and de Motos, Cuadrado Ruiz, Riquelme etc.. To the right-hand

side of the main shelter, hidden by a large piece of detached cliff, is another rock-shelter, which apparently has a shallower fill. Recently cuttings have been made by Ripoll into the black powdery soil of this second shelter. There is a large amount of pottery strewn around the surface of the shelter, and the present writer found a beaker sherd on the spoil heap. At the main shelter, there is no clear sign of stratigraphical changes in the cutting, but it is uncertain whether it has been completely excavated; certainly, several massive boulders have been left in place in the cutting (and see Ripoll 1968 1). Thus it is as yet uncertain from which shelter or from which stratigraphical situation the material which has provided the latest radiocarbon dates referred to in an earlier chapter (10,000 to 6,000 B.C.) derive. One might assume that they are related to the (?later) upper palaeolithic material, and that if that material is in fact of so relatively late a date, then there might be a case for considering that the neolithic layers could in fact be in chronological succession to a later upper palaeolithic lithic assemblage characterised by shouldered points, rather than separated by a hiatus. Against this hypothesis is the absence of bifacial flint-work from the neolithic deposits.

Jiménez refers to exploration of other rock shelters, including a Cueva Alta which contained 'mesolithic' flints. He also mentions two sites with schematic rock paintings near the Cueva Ambrosio, the Cueva del Ciervo , which seems to be same as the site known as Lavaderos de Tello or Desfiladero de Leira (Plate LXVIII) to other writers. This site has a naturalistic Levantine cervine painting, in one of the many rock shelters at this point, and also traces of paint on boulders and rock outcrop at the foot of the shelters. This is an unusual situation for paintings, but seems to have been employed at the Cueva de los Letreros, Vélez Blanco in addition to parietal painting by the artists responsible for schematic art. The present writer's photograph of the cervine is indecipherable, but Breuil and de Motos (1915, fig. 9)

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depict an animal with a marked dorsal hump (c.p. Solana de las Covachas ??). Breuil (1935) also refers to schematic paintings nearby, and these must be the locations termed by Jiménez Las Tenás or Corralizas (Jiménez, 1962, p. 18, figl - map). The paintings are 1 - 2 kms from the Cueva Ambrosio. Walking up the stream (Arroyo del Moral), the present writer found prehistoric potsherds at several locations where the stream had cut through a recent aggradation of sands and other soils.

As has already been said in earlier part of the thesis, it is the present writer's intention to confine most of the principal comparisons of prehistoric assemblages from the Segura-Vinalopó basins to an intra-regional rather than inter-regional discussion. The Ambrosio assemblages and those from Lagrimal differ from the Abrigo Grande in the presence of later neolithic and/or copper age material, which makes identification of a specifically early or initial neolithic phase rather imprecise. The same is true of such other Andalusian caves as the Carigüela, Nerja and Hoyo de la Mina. However, the 'sun-baked' pottery which Such claimed to find in the neolithic layers at Hoyo de la Mina (1919, p. 16), whether this was in fact fired or not, might be comparable with the poorly fired pottery from layer 2 at the Abrigo Grande. Just as red ochre was found at the latter site, and traces of red colouring on a stone bangle at Ambrosio, so at Hoyo de la Mina traces of red colouring were present on a Cardium sea-shell from layer 2 (neolithic) (Such, 1920, p. 27). There was no cardial impressed pottery at Hoyo de la Mina, however. Stone bangles are found at Nerja, the Cueva de la Carigüela, the Cueva de los Murciélagos, (Albuñol, Granada) and other Andalusian caves. But they are also found in the Valencian caves and in neolithic and copper age contexts which are not by any means necessarily very early. They do not occur at the Abrigo Grande.

Before the Valencian caves are considered, however, there are some other sites in the Segura-Vinalopó region which ought to

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be mentioned briefly. The Cueva del Gato in the Sierra del Roble, to the north of Moratalla, (Murcia), was excavated to make way for road-building operations (Cuadrado Díaz, 1947). The stratigraphy comprised a superficial layer of 0.800 metres of sandy soil without archaeological material, followed by a 0.100 metre layer of burnt soil, 0.100 metres of yellow sand, and 0.200 metres of sandy soil discoloured by ashes. The layer of burnt soil above the sandy layer (i.e. the second layer down) contained an archaeological assemblage. Cuadrado (op. cit. p. 119) illustrated 36 microlithic pieces of which three show retouch of backed bladelet type (including one with retouch on opposing margins), and one piece is either a fragment of a trapeziform point or of some other non-bifacial artefact (illustrated as no. 24; it is unclear). A bladelet without retouch of agate was also found, and a larger quartzite object. Three sherds were discovered. Two were said to of fine black ware, one with a red wash on both surfaces, the other with a similar wash on the external surface only. The third sherd was of coarse ware. The forms may have been simple bowls. The position of the assemblage immediately above a sandy layer calls to mind the position of layer 2 with pottery at the Abrigo Grande. It is not known whether these sands at the Cueva del Gato were aeolian or fluvial, but the location of the site suggests they were of the former type, and therefore perhaps contemporary with the neothermal period of aridity elsewhere in the Segura-Vinalopó region. Moreover, the cave or rock shelter was a north-facing opening as Cuadrado Díaz's sketch (op. cit., p. 117) shows, and it is in north-facing caves that Cuenca consistently finds aeolian sands. (Cuadrado Díaz, an engineer, is a thorough and meticulous worker, not to be confused with the late Cuadrado Ruíz.)

Backed bladelets and rods and copious snail shells were found in the sandy layer (the sixth layer below the surface) at the Cueva d'En Pardo, Vall de Gallinera, (Alicante), and continue upwards into the next layer which was of sandy soil with more stones (Vicente Pascual,

private communication). Sterile layers separated these from layer 2 with cardial impressed pottery and crude bifacial points, in turn overlain by copper age interments. Publication of the recent excavations of srta. María Dolores Asquerina is eagerly awaited. The aceramic lithic assemblage suggests some similarities with the aceramic Abrigo Grande material of layer 3 at the latter site, as well as of the tool-types of the ceramic layers.

The Cueva Grande and Cueva Pequeña of Huesa Tacaña near Villena, (Alicante), have been mentioned in an earlier chapter. The assemblage of backed bladelets from the former cave, in a thermoclastic deposit, is comparable with that of the Abrigo Grande, but the assemblage of the smaller cave, whilst also having some backed bladelets, has a number of clearly retouched trapezes, and also a carinated piece (Soler, 1968-1969, p. 36 fig. 3a, no.1) perhaps similar to those from Palica, Abrigo Grande, Ambrosio, etc. referred to earlier. The assemblage was from a layer of loose soil, perhaps similar to that at the Cueva de la Palica. The cave does not face north, hence there was no deposition of aeolian sand, and perhaps the non-north-facing aspects of Palica and Ambrosio also account for a similar absence of such sands. As at En Pardo, there was no pottery at either cave on the Huesa Tacaña.

The Cueva d'En Pardo is really in the area of the Valencian caves, being in the extreme north of the province of Alicante. The Covacha de Llatas and Cueva de la Cocina in Valencia province have already been mentioned. By contrast with the more southerly sites (excepting the Cueva Pequeña of Huesa Tacaña) these caves have retouched trapezes and been considered as being rather different from the backed bladelet assemblages. This is not strictly true, however, as Fortea (1971) argues for the Cueva de la Cocina. He emphasises that the retouch of many pieces is more like that of Sauveterrian traditions or Epigravettian traditions than Tardenoisian geometric industries./

ries. Small numbers of backed bladelets occur in all stages, moreover. The Mondúber massif caves have already been referred to (Mallaetes, Rates Penaes, and Meravelles). Further publications are awaited, but several of the caves of that region have been disturbed and contain copper age burials as at En Pardo. Finally mention may be made of two caves in the uplands between Alicante and Valencia, the Coveta de l'O (Beniarrés, Alicante) and the Cueva de la Sarsa (Bocairente, Valencia) The cardial impressed pottery from these two sites is well known (Ballester, 1928; San Valero, 1945, 1946, 1948; Ponsell, 1946; La Labor 1950 ....1931, 1932; La Labor...1934, 1935; Tarradell, 1963). Once again, full publication of these sites has not been completed. Tarradell points out that at Sarsa plain pottery is by no means uncommon in addition to cordon-decorated, impressed and cardial-impressed wares with characteristic zone decoration. Handles and lugs of elaborate types occur, and a twin vessel with a communicating hole and cardial impressions (San Valero, 1950). ~~said by Tarradell (1963, p. 44) to have a communication~~. The forms tend to be globular and ovoid, with slight necks. Trapezes, backed bladelets, awls, points (some reminiscent of those at Hoyo de la Mina), and unretouched bladelets and long, broad blades were found, as well as fragments of polished sandstone bracelets or bangles, bone spoons, and a piece of bone incised with lozenges and triangles (La Labor ... 1934, 1935, p. 13; Tarradell, ~~op. cit~~ 1963., pp. 44 - 49). One vessel with cardial impressed zone decoration (Tarradell, 1963, opposite p. 53 - Plate) strongly recalls that from the Cueva Santa, (Caudete, Albacete), at the head of the Vinalopó valley (fig. 75 , Plate LXXVI). Polished stone axes were found at Sarsa, and apparently burnt wheat grains., (Tarradell, 1963, p. 45

The Coveta de l'Or has less elaborate patterns on the pottery, and some sherds have random cardial impressions (c.p. Molfetta-type cardial ware from Italy and Sicily). Incised wares are found (as also at Sarsa). Possibly some sherds are scratched, though the published illustrations do not make this clear, and the present write

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did not observe such sherds in the Alcoy Museum collection from 1'Or. (Scratched wares are found at Hoyo de la Mina — Such 1919, p. 34, fig. 37 — and perhaps suggest further Sicilian similarities.) A sherd with incised cervine motifs was also found (on display at the Museo de Prehistoria, Valencia), apparently from a deep stratigraphical position. Plá (1961, pp. 215-6) states that seven layers were excavated at 1'Or, and over 1,000 flint pieces found, of which trapezes accounted for 7½% and crescents 2½% of the pieces from layers 2 - 7 inclusive. A twin pot vessel was also found at 1'Or and is reported by Plá. The decorated wares are commonest in the lower layers at 1'Or according to Plá, becoming less common by layer 4, and giving way to plain wares in succeeding levels. Zone-decorated incised, impressed and cardial decorated pottery are found in the lower layers, although as has been stated, some forms of cardial ware differ from the commoner types at Sarsa somewhat. Schubart and Pascual (1966, p. 48) mention tanged points, and some are displayed at the Valencia Museo de Prehistoria, presumably from the upper layers, though this is unclear.

Situated below the plain ware part of the 1'Or sequence a sample of grain was found comprising Triticum monococcum, T. dicoccum and Hordeum vulgare (Hopf, 1966; Hopf & Schubart, 1965). These gave radiocarbon dates of the fifth millennium B.C. (Schubart & Pascual, 1966; Schubart, 1965) as follows:-

KN-51	6510	±	160	B.P.	or	4560 B.C. (subtracting 1950
H-1754/1208	5265	±	75	B.P.	or	4315 B.C.

(dates as quoted in Radiocarbon: Schwabedissen & Freundlich, 1965). Placing these on the Bristlecone Pine calibration curve would lead to dates around 5,000 B.C., or slightly earlier. At any rate, they are later than the date from the ceramic assemblage at the Abrigo Grande, which, if corrected, would presumably be in the early sixth millennium B.C..

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The high proportion of trapezes and crescents among the one thousand flint pieces (always provided that all of the unretouched chips were collected -- which is likely considering the careful excavation technique of the Valencian workers) is suggestive of a more efficient technical procedure than at the Cueva de la Cocina, Covacha de Llatas or the Abrigo Grande. This is interesting in connection with what will later be said about the El Gárcel lithic assemblage, and the possibility that these sites represent a more advanced phase of the neolithic. At l'Or decorated wares give way to plain wares, and plain wares characterise the El Gárcel ceramic material. It is perhaps worth recalling the proposal that there were two waves of ceramic styles in eastern Spain (Evans, 1958), although it must be borne in mind that plain wares, whether at the Abrigo Grande, Cocina, l'Or, Sarsa, Lagrimal, Llatas, or other cave sites further south, occur intermingled with decorated pottery. In any case, the absence of an aceramic underlying phase at l'Or and Sarsa effectively argues against making them examples of the first neolithic settlement sites in the Peninsula, when contrasted against the Abrigo Grande, Cocina, Lagrimal, Llatas, Hoyo de la Mina, or the Portuguese middens, where deeper, aceramic phases of later upper palaeolithic lithic tool-kits occupy the lower levels. Whilst the Abrigo Grande radiocarbon dates might not really permit it to be said too confidently to have chronological primacy, nevertheless, there is not on the other hand any particularly strong stratigraphical or absolute dating evidence for assigning such primacy to the Coveta de l'Or. If the present writer seems to be hedging his bets, then that seems a safe thing to do, given the uncertainties which surround the various sites and their evidence, and which only future discoveries will resolve. Nor ought too much to be read into the cereal grains from l'Or, for whilst pointing to their similarity with some Near Eastern neolithic combinations of species, Hopf and Schubart (1965) allow that local edaphic conditions

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might have been responsible. Crops reaped at different times and/or from different plots might have become mixed under prehistoric condition of storage at the cave.

As will be mentioned later, several Valencian caves have cardial impressed sherds, but in some cases these belong to a late date, and in many cases the caves have been badly disturbed both in antiquity and in more recent times. One cave recently explored may be mentioned, however, the Còva de Dalt, Bichauca, Tarbena, (Alicante). Here there were three thin layers; a superficial layer 0.150 metres thick containing plain and cardial decorated pottery, a middle layer 0.080 metres thick containing similar pottery, one trapeze, four backed bladelets, and a notched blade, and a lowest layer 0.120 metres thick with plain sherds. The fauna in all layers included lagomorphs, caprines, and, in the middle layer, bovines (Sarrión, 1971). This cave site is likely to be an undisturbed neolithic occupation.

The open sites of the Segura-Vinalopó basins must be mention ed in connection with their typological affinities to the Abrigo Grande assemblage and other cave sites. The extensive Casa de Lara site north of Villena, (Alicante), has been mentioned earlier. Very large surface collections have been made of material a parently lying in a thick deposit of aeolian sand: discoidal and end-scrapers, notched blades, microburins, triangles(some with 'spurs' : c.p. Cocina phase II), trapezes, crescents, bifacial flint arrow-points, backed bladelet (fig. 120), plain, lugged, cordon-decorated, incised, grooved, other impressed and cardial-impressed pottery, polished stone tools, shell beads, stone bracelets and arcs carinated 'Argaric' vessels, globular and ovoid decorated vessels (figs. 97), and a gold bead area among the many artefacts discovered (Soler, 1956a, 1961, 1968-1969). The extent to which subsequent mixing of a neolithic assemblag with later material took place during periodic flooding of the swamp

in the Villena Vinalopó flood-plain cannot be determined. Certain characteristics of the pottery suggest that it might be not typical of copper age wares in the area, however.

An open site at Cañadas de San Pedro, Zeneta, (Murcia), seems to have been discovered by Cuadrado Ruiz. Possibly it lay on the land of 'Lo Bellando' farm. Two sherds of cardial ware are mentioned from 'Zeneta' by Fernández de Avilés (1941,p.73)as having been present in the Murcia Museo Arqueológico in 1940. In an earlier account of the prehistoric material from the Murcia collection 1 sherd is recorded from Zeneta in a list of sherds from various places, followed by the comment that one sherd among those listed had cardial impressions, but that it came originally from the Monserrat caves in Catalonia (Fernández de Avilés & Alvarez-Ossorio, 1930 - 1931, p. 14). A small flat-based bowl is illustrated also in the latter publication as being from 'Lo Bellando', Zeneta (ibid., fig. I no. 1) as is a large carinated 'Argaric' vessel from a burial on the land of 'Lo Bellando' (ibid., fig. IV). Sobejano (1924) in his inventory of the collection lists the last two vessels, but not any sherds. Jorge (1956 in a more recent inventory, mentions no pottery from Zeneta, nor is there any on display. Possibly the temporary transference of part of the collection to Cartagena during the Civil War resulted in loss of the two intact vessels. But the sherds mentioned by Fernández de Avilés (1941) are recorded as present after the setting up of the present Museo Arqueológico at Murcia, and their disappearance is to say the least odd. The reason for linking the putative sherds from Zeneta with a neolithic open site at Cañadas de San Pedro, and both with Juan Cuadrado Ruiz is highly circumstantial. The Almería Museo Luis Siret contains a collection of slender bladelets from Cañadas de San Pedro. It also contains much material collected by Cuadrado Ruiz in various areas of Murcia province (especially near Puerto

Lumbreras and Lorca). The year 1940 was around the time when Cuadrado Ruiz was working, moreover. It is possible the sherds and flints were not from the same area of Zeneta township, of course, and that only the latter really came from Cañadas de San Pedro. The mother of the present writer's wife owns Zeneta and yet copious enquiries have failed to elicit any memories of archaeological discoveries at Cañadas de San Pedro or on 'Lo Bellando' . The matter will be investigated further by the present writer.

The flint bladelets from Cañadas de San Pedro are very similar to the unretouched bladelets both from the Abrigo Grande and the Cueva Ambrosio. They are also similar to collections, again most probably made by Cuadrado Ruiz, at the Fuente de la Lentiscosa, near Totana, (Murcia), El Moralico, near Vera, (Almería), and some other sites in Almería which have been loosely classed as 'upper palaeolithic' . Future work will be directed at identifying the sites and examining the assemblages.

A small collection of pottery and backed bladelets (fig.65) is displayed at the Museo Arqueológico in Murcia from the dunes which separate the Mar Menor from the sea near Cabo de Palos, namely the Dunas de Amoladeras. This recalls a vague mention of stone tools from the Santa Pola dunes,(Alicante), (Ibarra y Ruiz, 1895). More work needs to be done at the coastal dunes, especially in the light of sea-shells carried far inland to the Abrigo Grande and Cueva Ambrosio.

The open site of El Gárcel, Antas, (Almería), is usually cast in the rôle of type site for the earliest Peninsular neolithic agricultural community (Siret, 1893; Siret & Siret, 1887; Gossé, 1941). The original excavations reported shallow deposits. Trapezes, small unretouched bladelets, awls, polished stone tools, and three fragments

of copper were found (Siret & Siret, 1887, pp. 1-6), as well pottery including the well-known 'costrel' shape vessels. One might wish to be cautious in accepting a neolithic date, especially an initial neolithic date, for El Gárcel, therefore. There was no underlying later upper palaeolithic assemblage. The stratigraphical evidence for according El Gárcel a chronologically early position in the ceramic phases of Peninsular prehistory is not strong, when compared with the cave sites of the Abrigo Grande, Cocina, Llatas, Lagrimal and Hoyo de la Mina. The Sirets stressed the shallowness of the archaeological deposits at El Gárcel and the presence of considerable 'Argaric' material of copper and bronze age date (which is hardly surprising, since El Argar and El Gárcel occur on the same terrace of the Río de Antas and are geographically continuous with one another). What does give cause for concern, however, is that the El Gárcel assemblage apparently could not be separated stratigraphically from the later material, and the typological method was used for differentiating between them — a particularly weak tool in this case, since at the time of discovery there was no referent collection for the newly found El Gárcel or El Argar !

The flint-work from El Gárcel found by the Sirets included trapezes, unretouched slender bladelets, awls, backed bladelets, pyramidal cores, and discoidal scrapers (Siret, 1893, pp. 507 - 510). Later excavations by Gossé (1941) were undertaken, but apart from a vague reference to '300 excavations' having been made of 'silos' , there is no clear indication either of stratigraphy or any other geographical circumstances of the discoveries — not even a site plan ! There is, however, an inventory and good illustrations of the flints. Among the stranger features of the flint-work, particular mention may be made of transversely retouched blades, reminiscent of North African Capsian transverse points. He also illustrates discoidal scrapers, trapezes and backed bladelets. Some backed bladelets have been truncated and the

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truncated edge has been retouched, giving a rectangular implement with retouch along three sides. These may be comparable with Capsian flint-work also. Transverse retouch is also shown on otherwise unretouched blades.alMost of the pottery illustrated by Gossé seems to be taken from Siret (1893), apart from a clay or pottery incised object which recalls the 'pine cones' from rock-cut Portuguese tombs of the copper age (e.g. from Carenque: Savory, 1968, fig. 40, d), although the latter are usually of stone. A violin-shaped stone object was found at El Gárcel by the Sirets (Siret, 1893, p. 515, fig. 156) which was compared with Anatolian objects (ibid., figs. 157, 158). One may also compare it with a similar object from Hoyo de la Mina layer 1, as, indeed, did the excavator of that cave (Such, 1919, p. 46, fig. 42, no. 1) at which there were also found various triangular stones (ibid. p. 49). Layer 1 at Hoyo de la Mina is not necessarily early in the neolithic sequence at that site.

Gossé refers to a saddle quern from his excavations at El Gárcel, and to remains of wheat, rye, and olive stones.* The possibility of an early utilisation of olive in the Mediterranean neolithic has been discussed recently by Renfrew (1972, 280 -297). The mention of rye is rather odd, since rye was uncommon in Western Europe until the Bronze Age or later. However, Hernández-Pacheco (1959, p. 544) states that a wild rye (Secale montanum) which was not ancestral to the modern domesticated species (S. cereale)occurs in Spain. The possibility of an accidental confusion between 'centeno' (rye) and 'cebada' (barley) also remains.

Since so few excavated sites are published with a complete inventory of lithic pieces, it is convenient to publish Gossé's list for comparison with the Abrigo Grande, Cocina, and other early sites:-

*Siret (1893,p. 512) mentions cereals and olives, but Savory (1968, p. 79) also adds ' seeds of the vine ' for which there is no other published confirmation known to the present writer.

Flint, Quartz		Other	
Trapezes	523	Polished stone tools	77
Microburins	356	Diorite flakes	101
Transverse points	72	Schist polishers	61
Rectangular backed bladelets	116	Quern stones	50
Discoidal and end-scrapers	77	Grinders etc.	150
Side-scrapers	89	Stone 'idols'	7
Backed bladelets	13	Ochre fragments	76
Awls, punches	227	Marble bangles	15
Burins, pointed flakes	91	Pectunculus bangles	91
Notched flakes	117	Conus and other beads	70
Points*	120	Bone tools	47
Strikers	27	Spindle whorls	14
Worked blades	807	Pottery	80
Unretouched blades	67	TOTAL	839
Pyramidal cores	145	FLINT TOTAL	10856
Crushers	3	GRAND TOTAL	11695
Spalls of flint and quartz	8000		
Worked (?) quartz	6		
TOTAL	10856		

(Gossé oddly makes all this add up to 12668, which it does not, either here or in his article !)

* 'Points' are curious flake tools, resembling Mousterian points, and quite unlike either projectile points or awls.

In terms of the percentage of retouched implements to total chipped stone pieces the assemblage suggests a degree of efficiency greater than that at, say, the Abrigo Grande (less than 1.2% retouched items). In the absence of crescents, it is clearly different somewhat from Coveta de l'Or. The presence of transverse points is of interest from the viewpoint of possible North African relationships.

In an earlier chapter it was stated that Cocina I demonstrates similar proportions of the chipped stone pieces to Moita do Sebastião in Portugal, and that Cocina phase II resembles the preceramic layers at Cabeço da Amoreira. Fortea (1971) has placed Cocina I and

II together so as to contrast them against three Upper Capsian sites: El-Mekta, Sidi Mansour, and Aïn Khanga, taking his data from Balout (1955, p. 405). If we also add details from the Abrigo Grande (all layers 1 - 4), and El Gárcel, the proportions may be presented as the following table: -

(Percentage incidences of Retouched Pieces)

Artefact	Cocina I + II	Abrigo Grande	El Gárcel	El-Mekta	Sidi Mansour	Aïn Khanga
Backed blade	0.0	2.8	28.2	2.6	0.3	2.0
Angle burin	0.6	0.0	3.3	6.4	1.5	4.0
Backed bladelet	2.6	56.4	4.5	25.7	21.0	28.0
Notched piece	19.0	9.9	4.1	23.7	6.0	3.5
Scalene	10.0	0.0	(18.3)	4.8	6.5	15,0
Trapezes	21.0	0.0		4.8	16.5	3.0
Microburin	27.1	2.8	12.5	11.1	28.0	10.0

The proportion of large retouched blades in the preceding or 'Typical' Capsian phase is about 12% (Balout, 1955, p. 405), the proportion of angle burins about 16%, and the proportion of scalenes only 1.6%. Thus the earlier Capsian has no relation whatever with any Peninsular later upper palaeolithic assemblage. Fortea stresses the difference in proportions between the Upper Capsian and the earlier preceramic Cocina phases. As has been said, there are better parallels within the Peninsula at the Portuguese midden sites. The Abrigo Grande assemblage, however, is quite unlike any of the other assemblages shown in the table. El Gárcel, too, stands by itself rather, though apart from the various types of retouched blades and bladelets, it could be interpreted as showing some affinities to North African assemblages. The high 'backed blade' (i.e. non-microlithic) element is based on inclusion of the 807 worked blades referred to by Gossé. This inclusion, which serves to distinguish El Gárcel, may be unwarranted, since from Gossé's account and illustrations one might wonder if many of the 807 were not in fact unretouched blades with signs of use, and that the

large/

large retouched place which he called 'saws' may not have been included by him in that total. The backed bladelet category at El Gárcel has been defined so as to include Gossé's backed bladelets and also his rectangular backed pieces. Possibly some of the latter are too large to be really entered under this microlithic category, though it is also possible that transversely retouched points should have been entered (which would raise the backed bladelet percentage to about 7%).

Tixier (1963) points out that the Upper Capsian tends to have a striking proportion of strangulated blades, as, indeed, might be anticipated from assemblages with a high incidence of microburin spalls (ibidem, p. 40, fig. 8). The Upper Capsian has given radiocarbon dates (as published in Radiocarbon, uncorrected)of roughly 6,400 - 4,400 B.C.. At the Haua Fteah the neolithic Capsian variant makes its appearance around 5,000 B.C.. Further west, however, in Tunisia, it is said to be interrupted by the so-called Sudanese neolithic and 'néolithique Ténéréen', with the neolithic Capsian not reappearing until about 3,000 B.C. (e.g. at the Abri de Jaatcha : Hugot, 1963, pp. 71 - 168). At Columnata, the appearance of the neolithic Capsian is dated to about 3,300 B.C. (see earlier), although there is a very early Algerian neolithic date of about 5,500 B.C. from Ai Naga. At Méniet, the neolithic Capsian, which dates to around 3,500 B.C., has bifacial hollow-base arrow-points and pottery 'combs' (c.p. bone and stone 'combs' from copper age burials in the Peninsula). Decorated ostrich eggs and also stone carvings occur in both the Upper Capsian and in the neolithic Capsian. These items of the Capsian assemblages are not found at El Gárcel, as would be expected if that site were to be called Capsian, though they do occur in later assemblages of the copper age in Portugal, south-west Spain, and the Almerian and Levantine regions.

Hollow-base arrow-points are rare at North African Capsian sites (McBurney, 1960) and are said to be derived from Fayum A type

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The ceramic Fayūm A neolithic is dated to the latter half of the fifth millennium B.C., and it follows a later upper palaeolithic in which bifacial flint arrow-points occur (Wendorf et al. , 1970). Forde-Johnston (1959, pp. 72 - 73) proposed that bifacial flint-working ultimately can be derived from the Saharan hinterland, and that the hollow-base bifacial forms which characterise Fayūm A are a local development in the Nile valley. They continue to be found in Fayūm B, though in this phase there also occur the more typically Saharan bifacial types, notably rhomboidal and stellate shapes. Some hollow-base arrow-points are found in the Badarian and Amratian (Naqada I) of Middle Egypt, but as the pre-dynastic period progresses they become gradually less common. Leaf-shaped points are found in the Badarian, and are also confined to the pre-dynastic period. Tanged points, on the other hand, survive the first few dynasties (ibidem). Transverse points of Capsian derivation, presumably, appear in the Nubian Naqada I and the Egyptian Naqada II, and they linger on quite late into dynastic times (ibidem, pp. 73 - 74).

According to Forde-Johnston there are three elements in the North African neolithic :

(1) Capsian flint-work
(2) Saharan (Ténéréen according to French workers) flint-work
(3) Sudanese flint-work.

In fact, he describes a fourth element, from Algeria and the Maghreb, which he interprets as the Oranian facies of the Upper Capsian. Since he wrote, it has become clear that the Oranian gave rise to the Capsian, and not vice versa as was formerly believed, and consequently it is preferable to simplify his classification. The term neolithic Capsian might be retained, but with the comment that at many of the more westerly stations there is a strong backed bladelet (Oranian) element persisting. Possibly the most dubious element is the so-called Saharan (Ténéréen) neolithic. This may be 'neolithic' only in so far

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as it contains bifacial flint points of a wide variety of shapes (barbed and tanged, stellate, rhomboidal) together with a mainly backed bladelet type of flint-work. As McBurney (1960) points out, such bifacial arrow-points may be better referred to a hunter-gatherer economy rather than an agricultural one. The same comment may be made with regard to early Spanish bifacial arrow-points. (The Solutrean provides a parallel.) Forde-Johnston inclines to the opinion that the North African bifacial technique can originally be derived from Aterian traditions.

There are clearly difficulties in attempting to derive the El Gárcel material from a North African Capsian source. The pointed base pottery (costrel pottery) found by the Siret's have been likened to North African vessels (Savory, 1968, p. 79), and one cannot ignore that such forms are found not only in the Nile valley but further west as far as Algeria. Such vessels are uncommon in the Peninsula, but one example is known from layer II in Chamber 1 at the Cueva de Nerja (Pellicer, 1962, p. 36) along with 'almagra' wares. Hollow-based points are known from similar stratigraphical situations in other parts of the cave. Although this represents the first neolithic occupation following a later upper palaeolithic occupation sequence, it does not necessarily have to be in direct chronological succession to it. Savory (1968, pp. 73, 79) points out that costrel forms were borrowed by the cardial impressed wares at Coveta de l'Or, and that pointed base vessels occur in cardial layers at Châteauneuf-les-Martigues. None of this adds up to a major North African influence around the northern littoral of the Western Mediterranean. Moreover the non-cardial pottery tradition at Nerja and El Gárcel in which such forms occur cannot easily be related to the Coveta de l'Or sequence where plain wares only predominate later in the neolithic, after the cardial decoration phase. Indeed, the copper slag, violin 'idol',

and/
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and other aspects of El Gárcel might argue for a date contemporary with the Aegean early bronze age (say, 3,500 - 3,000 B.C.) and the neolithic Capsian of the North African coastal settlements also of middle or late fourth millennium age. One might envisage El Gárcel, as the Sirets suggested, in terms of a copper-producing and copper-exporting settlement, whilst not itself capable of mastering or utilising a copper technology for its own local economic exploitation. In terms of real, rather than radiocarbon years, the precise age is hard to determine, but perhaps a date of about 4,000 B.C. or earlier might have to be considered for this phase when calibration of radiocarbon dates at other Mediterranean sites to Bristlecone Pine curves has been satisfactorily achieved. The violin 'idol' from the superficial layer at Hoyo de la Mina probably testifies to a similar date for that layer, which was the one with decorated pottery and spouted handles. Such spouted handles are not unknown from El Gárcel. (Functionally, such vessels are no doubt analogous to the spouted 'botijo' which is still used as a drinking vessel in southern Spain. The present writer uses one frequently in his house for drinking water.* The glass 'porrón' is a similar principle, but used for wine.) It should be recalled that the superficial layer at Hoyo de la Mina was not the first ceramic stratigraphical layer, but the second at that site.

The point which is being made is that El Gárcel is not a good candidate for the earliest ceramic using culture of south-east Spain. It seems to belong to a later phase than the Abrigo Grande, and perhaps than the cardial ware traditions of Coveta de l'Or. Possibly it represents a developed neolithic, agricultural community (cereals, olives, textiles) with wide-ranging contacts (e.g. East Mediterranean; North Africa) brought about by the interest of early metal-using peoples in southeastern Spanish copper ores. There is no evidence for postulatin contacts between North Africa and south-east Spain in the Upper

(*Spouted vessels are known from 'Ubaid, Jericho, & Naqada)

Capsian of the sixth and fifth millennia, nor for interpreting El Gárcel in terms of neothermal period geometric assemblages bridging the later upper palaeolithic and earliest ceramic phases of south-east peninsular prehistory.

The Oranian backed bladelet tradition could be said to be quite lacking at El Gárcel. Indeed, the whole aspect of the El Gárcel lithic assemblage has remarkably little in common with microlithic neothermal assemblages of south-east Spain. The neolithic Capsian has quite high proportions of microlithic bladelets, whereas El Gárcel has also many large blades (a feature of Cueva de la Sarsa, too) . Large blades with or without retouch are a frequent occurrence in copper age collections from south-east Spain.The many crescents which are so characteristic of the neolithic Capsian (Forde-Johnston, 1959, p. 39) are not present at El Gárcel, moreover. In North Africa crescents and polished stone tools are said to have their origin in the Sudanese mesolithic. For instance, at the Tunisian neolithic Capsian site of Kef el-Agab (Bardin, 1953) there were 15 polished stone axes, decorated and plain pottery, bone tools, ostrich egg fragments with decoration, 40 crescents, 20 trapezes, 4 microburins, 178 notched or strangulated blades, 170 backed bladelets and a total chipped lithic assemblage of only 596 items. Crescents are a feature of the Coveta de l'Or, but they also occur in later upper palaeolithic assemblages in the south-east, as mentioned earlier.

One must assume that there is an important functional difference between North African assemblages and El Gárcel, and between these taken separately and later upper palaeolithic assemblages of the south-east. The greater efficiency of Coveta de l'Or and El Gárcel when contrasted against the Abrigo Grande, Llatas and Cocina has been remarked upon. There is also a difference in density of occurrence. It is, of course, possible that only a few flints were utilised near the

El Gárcel 'silos'. But if one accepts Gossé's account of '300 excavations' (presumably of such structures), then the total volume may have been of the order of 1200 m^3 of disturbed soil fill. Even if only one quarter of this represented the neolithic deposits, the density of El Gárcel chipped lithic material is a mere 40 items per cubic metre of fill, contrasting against between 100 - 900 items per cubic metre at the Abrigo Grande. The density at the Abrigo Grande is probably of the same order as at many other neothermal period rock shelters in southeastern Spain.

The division of Peninsular neolithic assemblages into ' Hispano-Mauritanian' (geometric, microlithic), and ' Ibero-Saharan (bifacial arrow-points), believed to succeed one another and to be related geographically through the occurrence of each on both sides of the Straits of Gibraltar, is neither accurate nor helpful. This view owes to Martínez Santa-Olalla (1946). There are no grounds for relating either the assemblages of Cocina or El Gárcel to the Capsian and its derivatives, nor for comparing Saharan neolithic assemblages with Peninsular bifacial collections. The absence of extensive bifacial assemblages from those parts of North Africa from which embarkation under sail for Spain is best undertaken (i.e. northern Tunisia and eastern Algeria : Jáuregui, 1949) underlines the point. Moreover, whilst it is true that hollow-base arrow-points do occur in Saharan assemblages, they are rather different from Fayūm A forms, tending not so much to have a deep U-shaped notch as a shallower ' Tour d'Eiffel' profile. Hollow-base points are widespread throughout southern Portugal, south-west Spain, Granada and Almería, and they also occur in the Levante, though less commonly. In Almería and Granada they are especially common in megalithic tombs of the copper age, whose date is uncertain, but probably falls between 3,000 - 2,000 B.C. in '<u>radiocarbon</u>' years, or somewhat earlier in absolute terms.

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To sum up, the chronology of the early neolithic may be stated as follows:

Absolute Dates	'Radiocarbon dates'	Sites
6,000 BC	5,500 BC	Later upper palaeolithic/ceramic transition: Abrigo Grande Cueva de la Cocina Cueva del Lagrimal Covacha de Llatas Hoyo de la Mina layer 2 ? Cueva de les Mallaetes ? Cueva de les Rates Penaes ? Cueva de les Meravelles ? Cueva Ambrosio
5,000 BC	4,500 BC	Decorated ceramic phase: Coveta de l'Or Cueva de la Sarsa Hoyo de la Mina layer 1 ? Cueva de la Carigüela (lowest ceramic layers) Cueva Ambrosio
? 4,000 BC ?		Developed agriculture: El Gárcel Hoyo de la Mina layer 1 ? Coveta de l'Or (plain ware layer Cueva de Nerja Cueva de la Carigüela Cueva Ambrosio

It is not really the intention to suggest that the boundaries are hard and fast between these 'phases'. The point is to bring out the early nature of some of the cave sites. This is rather to return to the view of Bosch Gimpera (1932, Chpa. IV, p. 64 ff.) of the 'Cave Cultures', divorced from the 'Capsian origin' which was postulated by him.

It is pertinent to enquire into the possible economic basis for the earlier neolithic sites, since it is clear from the foregoing that there is no evidence to date for taking the view that they represen no more than the acculturation of a hunter-gatherer society by virtue of contact with more advanced agricultural settlements nearer to the coast (e.g. Gárcel) with its implicit concept of 'neolithic colonists' Such a view has been said to represent the state of affairs in southern

Italy (Whitehouse, 1968). As long ago as 1953 (Fletcher, 1953) remarked that there were two opinions on this in south-east Spain, one which regarded some aspects of the neolithic settlement of the region as intrusive (e.g. cardial impressed wares) and another, favoured by Pericot and Jordá, and by the present writer, that sees a no less ancient tradition of ceramic-using at sites such as Llatas and Cocina, and which refutes the opinion that those sites are some kind of secondary 'acculturation' from a more advanced, intrusive neolithic colonisation, whatever might be the status of cardial impressed wares, El Gárcel, etc..

It is true that Plá (1958) points out that bifacial flint-work is not very common at the earlier cave sites in his list (his comparisons are between copper age cave burials and cardial ware caves such as l'Or and Sarsa). However, human bones have been found at most neolithic cave sites (Hoyo de la Mina, Carigüela, Sarsa, Nerja, Or, Ambrosio) and the extent of overlap between the neolithic and copper age phases, and the extent to which some of the caves were used for interments in neolithic times and reused in copper age times, are unknown quantities. Bifacial flint arrow-points occur stratified quite deeply at l'Or (precisely where is unclear), as well as being present as superficial finds at various sites (e.g. Cocina). They are clearly depicted at Levantine art sites such as the Cueva de la Vieja, Alpera (fig. 25) and Solana de las Covachas, Nerpio (fig. 16), and there is good reason to believe that even if some of the naturalistic paintings are late in date, nevertheless they ceded to schematic art by the first half of the third millennium B.C. at the latest.

Jordá (1953) proposed that there are two elements in the neolithic of the Levante:

(1) backed bladelets with cardial impressed pottery, the flint-work being derived from his 'Levantine' Epigravettian IIIA

(2) geometric microliths with plain pottery, the flint-work deriving from the geometric facies of his Epigravettian IIIB.

Cocina is, of course, placed in the second category. Mallaetes, where geometric pieces were said to be uncommon in the ceramic layers and where backed bladelets were a significant feature of the later upper palaeolithic is given as an example of the first category. It has already been stated, however, that cardial pottery is not totally lacking at Cocina, nor are geometric pieces totally absent at Mallaetes. Whilst his classification may not be very helpful, it is worth considering his reasons for proposing it. Bosch Gimpera's view of the 'Cave Cultures' has already been mentioned. The Cave Culture was held to be an inland phenomenon, by contrast to a coastal early neolithic with North African affinities. Martínez Santa-Olalla (1946) was at first sceptical of the Cave Culture notion, and put forward the idea of two successive waves of neolithic colonisation from North Africa, corresponding to an earlier geometric phase (e.g. Gárcel), and a later phase with bifacial arrowpoints, calling them Hispano-Mauritanian and Ibero-Saharan, respectively. This view was midified subsequently (Martínez Santa-Olalla, 1950) with a return to the Cave Culture concept and an indigenous Peninsular microlithicising neolithic existing earlier than either of the two waves. The latter wave was put very late, almost in the copper age.

San Valero (1948, 1950) stressed that regional differences in the pottery interfered with the view of two waves. Bifacial points occur in many areas, yet Andalusian ceramic assemblages show an almost complete lack of cardial ware. He suggested that either cardial wares were derived from an indigenous culture (Cave Culture, perhaps), and spread to several disparate areas of the Peninsula (e.g. Portugal, Catalonia and the Levante) , or that perhaps it was derived from North

Africa, or, at any rate, from outside the Peninsula. The discovery of Cocina and Llatas demanded a modification of those schemes, and gave rise to the notion of a microlithicising neolithic as an indigenous element. All that was now necessary was to point out that in Valencia there were sites with geometric flints and different sites with backed bladelets, and the stage was set for Jordá's proposal that both forms were derived from later upper palaeolithic tool types which he had christened Epigravettian IIIA and IIIB (Jordá, 1954). Earlier classifications, especially that of San Valero, made it natural that presence or otherwise of cardial pottery should be considered important.

It is easy enough to knock holes in the schemes, but it is important to remember that two strands which had been held to be diachronic by other workers were regarded as complementary and contemporary by Jordá, as well as indigenous. The views put forward by the present writer as to the origin of the earliest southeastern neolithic are therefore in some ways only an extension of Jordá's concept, but with the difference that assemblages of different facies are explained as functional variants .

To try to explain away such differences as there are between, say, Mallaetes, Cocina, Llatas, l'Or, Sarsa, Ambrosio, Hoyo de la Mina, Lagrimal, Gárcel, Abrigo Grande, etc. by implicating different cultural synchronic strands and the 'gavotte' view of the movements of primitive peoples, seems no more appropriate to the earliest neolithic than it did to the later upper palaeolithic. This view postulates a different 'cultural entity' (i.e. population group) for each tool-type known, those groups moving around from site to site, studiously avoiding one another, in a kind of mysterious geographical gavotte. Such a hypothesis cannot serve as a model capable of archaeological verification, since the problems are presented in terms of its own implicit assumptions. No one denies the possibility of such a picture; historical or ethnographic

parallels could no doubt be offered. What is undeniable is that such a model is unhelpful in the context of our present archaeological methodology. It should be put on one side as 'unproven', until archaeological investigations are either able to substantiate it or able to demonstrate simpler working hypotheses are not plausible.

A simpler working hypothesis, for instance, would be to say that the proportion of crescents, backed bladelets, geometric microliths, or bifacial points varies according to the purposes to which a particular site was put. According to such a hypothesis, there would be no good reason not to attribute many apparently different sites to a unitary early neolithic culture, each site representing a different functional activity. The roots of such a unitary concept must be sought in a similar unity in the later upper palaeolithic and in the artistic expression of the various groups participating. This view sees no major discordancy between the Abrigo Grande, Hoyo de la Mina, Lagrimal, Llatas, Cocina, and Mallaetes. Different sites close together, such as the sites without pottery of the Cueva Grande and Cueva Pequeña of Huesa Tacaña, Villena, (Alicante), might represent different but contemporary functional assemblages, indicating different types of activity carried out by the same social group. Much as the tool-kit of a kitchen differs from that of a greenhouse, despite a basic underlying unity (domestic pots and flower pots; dining forks and small gardening forks; serving spoons and trowels; etc.). Nobody would suggest such assemblages represented two different social groups with different versions of the same basic objects, each version subserving the same purpose precisely. One group with objects subserving different purposes is a more intelligent appraisa

One might investigate a modern dwelling in terms of the spatial planning of the various assemblages. The kitchen might be near the dining room, and the greenhouse in the garden. One might associate the activities therefore with different locational exploitations. This

is an approach which is not easily available where one is dealing with a single rock shelter with various occupation layers. In such a case it is nevertheless feasible to attempt an interpretation of the site which take account of its geographical situation in terms of possible territorial exploitation (Higgs & Vita-Finzi, 1972). If a number of carefully excavated sites were related to a possible palaeoenvironment which, say, excluded the possibility of extensive cultivation, one might consider interpreting different assemblages (whether in different layers or at different locations) in terms of different tool-kits representing differing aspects of a socio-economic activity based on, say, hunting and gathering or pastoralism, etc.. One tool-kit might be concerned with capture of animals, another with their dismemberment and preparation, another with plant acquisition, another with non-lithic implement manufacture, and so on. As yet, however, inadequate excavation and inadequate knowledge of the potential of the local areas around individual sites do not allow very firm conclusions to be drawn.

Nevertheless, an attempt has been made to interpret the Abrigo Grande in such a context. The large mammalian fauna, as has been seen above, does not represent more than trivial numbers (often only one) of individual animals. It is perhaps worth commenting that whilst lagomorphs and pig/boar occur in all layers, cervines and equines are only present in the second to fourth layers, whereas caprines and bovines were only found in layers one and two. Except for horse, most of the larger species were depicted in the art of the Principal Painted Shelter nearby. There may also be sheep depictions there.

Modern land utilisation within distances which can be walked in (a) 1 hour, and (b) 2 hours from the site breaks down as follows:-

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	1-hour +	1 - 2 hours	= 2 hour
huerta	3 km^2	5 km^2	8 km^2
uncultivated	22	21	43
rough pasture	4	20	24
arable	37	58	95
olives	7	5	12
Totals	73 km^2	109 km^2	182 km^2

As percentages, these give within (a) 1 hour of walking, and (b) 2 hours of walking :-

	1-hour	2-hour
huerta	4.1 %	4.4 %
uncultivated	30.1	23.6
rough pasture	5.5	13.2
arable	50.5	52.0
olives	9.6	6.6
Totals	99.8	99.8

This deserves a few words of comment. Most of the huerta is between 3 and 5 kms from the site (see map ~~fig~~ 10) even where it falls within the 1-hour walking distance. It is therefore probably too far away to give a useful yield (c.p. Vita-Finzi & Higgs, 1970; Higgs et al., 1967). In any case, the alluvial soils of which the riverside huerta is composed may not even have been laid down at the time the Abrigo Grande was occupied. It is most unlikely that this land area was available for cultivation in antiquity at a time before the establishment of the river-based towns of Cieza and Abarán (both within the 2-hour walking range of the Abrigo Grande). Most of the land described in the above lists as 'arable' is in fact thin soil, poorly watered and in reality given over to esparto grass. Cieza was an important centre of esparto cultivation in recent times. Such non-edible xerophyte however, do not indicate that the so-called arable land could support

cultivation/

cultivation of edible crops, and it is likely that in antiquity much of this 'arable' land was in fact rough pasture. Olives, too, are a very recent aspect of land utilisation. They have been established only following the sinking of deep artesian wells in an upland area to the north of Cieza.

The probability is that at the time of the occupation of the Abrigo Grande most of the surrounding land was what would nowadays be termed rough grazing. Small areas might have been available for cultivation, especially near the springs (see map) in the floors of small canyons which to-day are barren rock. Assuming such rough grazing to have been possible, it is of interest to speculate as to the densities of wild large mammals which might have been able to live in the catchment area.

Vita-Finzi and Higgs (1970) quote Scottish densities of red deer as one animal per 0.12 - 0.20 km^2 . The frequency of occurren of that species in Levantine art suggests that it was regularly sought by prehistoric hunters at all times of the year (see above). Such a density would give between 61 and 97 animals in the 73 km^2 of land within a 1-hour walk from the Abrigo Grande. A second assumption might be made that each red deer adult weighs between 150 kg (in adverse conditions) and 200 kg (in optimal conditions) (see Harris & Duff, 1970). Thirdly, one may assume that an annual kill of 0.167 of the herd size (or perhaps even less according to some recent Scottish data) may be made without causing the herd either to diminish in numbers or to expand in numbers.

It follows that 73 km^2 might support between 584 and 36 red deer. If 66.7% of the weight of each animal were assumed to be edible, and if an average venison intake per man per day were of the order of 0.250 kg, then the size of a dependent human population might

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be proposed as follows: -

Herd Statistics	97 deer @ 200 kg	97 @ 150 kg	61 @ 200 kg	61 @ 150 kg
Total wt meat	12,932 kg	14,550 kg	12,200 kg	9,150 kg
Man-days	51,728	38,800	32,528	24,400
Men per year	143	106	89	68

An average population size for the Abrigo Grande catchment area is 100 people therefore. If this were to comprise one-third adult men, one-third adult women and one-third juveniles, there would be about thirty individuals in each of the three categories. It is interesting that the two panels of the Principal Painted Shelter at the Barranco de los Grajos portray just thirty anthropomorphs, whose wearing of skirts has been said by some to be a female identifier. At any rate, the thirty anthropomorphs are engaged in activities not connected with archery or food acquisition.

A normal modern western diet consists of a daily intake of some 0.100 kg protein (equivalent to 410 kilocalories), 0.100 kg of fat (930 kcal.) and 0.400 kg of carbohydrate (1,640 kcal.). This gives a total caloric intake of about 3,000 kilocalories. The assumption made in the foregoing argument is that the daily protein intake might have been as high as 0.250 kg (1,025 kcal.), and as animal food contains a high fat content also, there would be ample room for a very reduced carbohydrate intake. It is possible for people not accustomed to such high protein and fat diets to accustom themselves to those diets. Comparable high protein and fat diets are eaten to-day by Eskimos (Weiner in Harrison et al., 1964, p. 416). Minimal carbohydrate might have sufficed to provide various inorganic and organic nutritional requirements for a healthy diet, without necessarily having to be responsible for the larger part of the daily caloric intake. Other animals no doubt contributed to the diet: ibex, wild cattle, wild horse, boar,

lagomorphs, birds, snails, frogs, etc., (though Davidson, 1972, 1972a, believes these small animals are unlikely to have contributed much to the dietetic requirements of prehistoric man unless they had been gathered in far greater quantities than are found at the Abrigo Grande, Cueva del Parpalló, Cueva Ambrosio, and so on - a view with which the present writer agrees) .

It is well known that in Scotland game-keepers can approach red deer, especially in Winter, and give them fodder by hand. It is also known that some wild animals, notably canines and suines can approach human communities and become partly domesticated without much effort by humans (Tringham, 1971). Possibly this occurred with red deer among some societies (c.p. Jarman, 1972). There is no particular reason to doubt that cattle, horse, caprines and deer might not have been fostered by humans, much as the present-day Lapps live in proximity to reindeer. If the human group became large, there might have had to develop a nomadic existence so as to follow the herds in their seasonal wanderings, steering them towards suitable pastures and water holes, and slaughtering them to maintain equilibrium sizes for both herds and humans. Such a way of life might involve the human group staying several months at one base camp, perhaps long enough to grow crops (as at Coveta de l'Or) since in south-east Spain crops grow very quickly. Pottery could have been manufactured at these sites and either discarded or left in a cache against a return visit. Since pots can be made in 48 hours, there is no reason to associate pottery only with permanent all-the-year-round stations. It is sometimes said that potting represents a mastery of cereal cooking, other receptacles being inadequate for that purpose. The spouted vessels of southern Spain appear to be more like the earthenware botijo used to-day for drinking water. The advantage of this vessel over a skin is that there is constant evaporation of the water which percolates the vessel and reaches the exterior, hence the

wall does not get hot in the sun, and the contents do not become warm. In a skin, on the other hand, water rapidly becomes warm. The botijo type of vessel is suitable at least for journeys of up to 1 hour in that it is not unduly awkward. Skin vessels are more suitable for wine since it is not desirable that wine should be unduly chilled. The skin bota used by Spaniards to-day is reserved only for alcohol, never for water. In other words, the uses of potting can be held to be wider than just cereal cookery. It is interesting that in the Ashmolean Museum at Oxford there are many spouted botijo type jars from Jericho. These were surely drinking vessels.

In short, knowledge of pottery does not preclude a way of life involving moves from time to time. To return to the matter of possible domesticates in Levantine art, both canines and ovicaprines have already been mentioned as contenders (Solana de las Covachas and Barranco de los Grajos, respectively). Dog was also reported from the animal bones at Hoyo de la Mina, and sheep from the Cueva de les Mallaetes. The presence of sea-shells at various stations (e.g. the Abrigo Grande; Cueva Ambrosio) also suggests geographical movements - whether of communities, traders, or sporadic trips to the coast.

Hopf and Schubart (1965) compared the Coveta de l'Or cereal species with Near Eastern profiles. Hopf (1966) gives the l'Or profile as:

Triticum monococcum	0.89%
" dicoccum	13.47%
" aestivo-compactum	20.20%
Hordeum vulgare	46.70%

and from a second sample:

T. monococcum	0.29%
T. dicoccum	20.15%
T. aestivum	57.82%
T. aestivo-compactum	7.62%
H. vulgare	14.12%

(T. aestivum is probably the correct designation for what is often called T. aestivo-compactum, which is a non-Linnaean usage.)

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Both admit (Hopf & Schubart, 1965) that local edaphic conditions might be responsible for such a spectrum of species, or a mixing of crops collected from different sites. The quantities of grain in any case are not very large. Only at El Gárcel do the silos suggest extensive cereal agriculture. El Gárcel, however, may be quite late in date.

The basic similarity between the lithic assemblages in aceramic and ceramic layers at La Cocina, Llatas, Mallaetes, Lagrimal and the Abrigo Grande argues strongly in favour of an economy more or less without change as the neolithic commenced. Presumably this was a hunter-gatherer-fisher economy. Incipient domestication and the purchase of domesticates from outside the Peninsula might have taken place, as may have some degree of cereal cultivation. It might have been the case that the beneficial effects of a high protein diet led to a population expansion which could not be supported by predation on herds alone, and to the exploitation for agricultural purposes of the consolidating alluvial sediments in the middle reaches of the river systems in the later fifth and fourth millennia B.C., or perhaps later still. Over-killing of herds might have a similar effect in forcing people to exploit alternative food sources. Perhaps the desiccation of the phase marked by aeolian sands was in part due to over-grazing and undue human reliance upon mammalian protein sources.

There is a lot of physical anthropological evidence pointing to the nutritional advantages of a high protein diet combined with some cereals when contrasted against a diet principally based on cereals. The latter brings with it deficiency deseases and avitaminoses, protein deficiency and retardation of infantile development, and the possibility that repeated natural disasters prevent harvest of crops, in addition to the attendant risks of infectious diseases in peasant village

settlements (notably, tetanus, malaria, tuberculosis) (see Weiner in Harrison et al., 1964, pp. 425 - 433; Wells, 1964; Brothwell & Brothwell, 1969; Fenner, 1971; Angel, 1971 esp. pp. 76 - 85 -- and see later chapter).

Levantine paintings sometimes show very many anthropomorphic figures: Solana de las Covachas 20; Fuente del Sabuco 30; Barranco de los Grajos 30; Minateda 131; Alpera 65. Other sites such as at the Valltorta and Gasulla canyons (Castellón) give similar values. Some of the sites, as was previously mentioned, show different types of large mammals. These may reflect the different habitats of those species, but in addition they may also reflect hunting specialisms of different groups. It is not necessarily the case that the same sites were occupied by just a single nomadic group and its descendants. There may have been very many groups of people who have left no trace. The population density at the Abrigo Grande site catchment area may have been of the order of 50 people per 100 square miles. Other sites may have had similar values. This is a high figure for hunter-gatherer communities. Braidwood and Reed (1957) quote figures for unspecialised hunter-gatherer peoples of between 1 - 8 people per 100 square miles (e.g. Australian aborigines, Caribou Eskimos, South African Bushmen), and for specialised peoples (fishing Kwakiutl, rice-gathering Ojibwa, seed-gathering Shoshone) of 12.5, 13 and 6 per 100 square miles. If the population density for the Abrigo Grande area is correct, and if the dietary sufficiency of the population were to be admitted, then if there were several such groups of people, it is not difficult to imagine that a disequilibrium between an expansion in human numbers and available protein sources might have been set up, leading to a search for alternative food sources and the exploitation of cereal cultivation.

Contact with other circum-Mediterranean peoples practising such cultivation could have led to its adoption, and internal pressures could

have led to the establishment in locations appropriate to such activity of settlements such as El Gárcel. Differences in the assemblages might have been dictated by different circumstances. Thus pointed base vessels are suitable for storage jars inside a permanent dwelling (c.p. the vast tinajas permanently set in many Spanish farmhouses to-day) whereas different shapes, perhaps based on hanging forms, might be more appropriate to a less sedentary household pottery kit. Perhaps the depositional phase began earlier in northern Almería than in Valencia, following an earlier or more severe sub-desert stage. After consolidation of the alluvial sediments of the Antas and Almanzora rivers these might have offered the best opportunities for practising the new economy.

DEVELOPMENT OF THE NEOLITHIC AND COPPER AGES IN THE SEGURA AND VINALOPÓ BASINS

Introduction

In which a traditional sequence is presented.

Limitations of the Archaeological Evidence

In which stumbling-blocks to interpreting the material culture are noted.

Developments in the Neolithic

In which a criticism is offered of a recent statistical treatment of grave goods, and of deductions about 'invaders' in the neolithic sequence.

The Neolithic and Copper Age Sequence

In which an absolute chronology is submitted.

The Post-Cardial Phase

An attempt is made to define the hazy boundaries of the final neolithic, and possible sites in the research area are listed and described briefly, with notes on the writer's own observations and collection of material.

Maps

In which the writer's use of distribution map is explained and justified.

Sites of the Copper Age from the Segura and Vinalopó Basins

In which are presented brief descriptions of the sites in the research area with the writer's observations and comments. Burial constructions are first described. These are followed by cave sites. Finally open sites and other graves are described and catalogued.

Discussion of the Sites

The chronology and cultural relations of the sites are discussed. Cross-dating attempts to establish some overseas reference points.

The Pottery Problem and the SE Spanish Copper Age

The outline of the problem is given in terms of the chronology established.

The Incised Tradition

It is proposed that this tradition has its origins in the final neolithic.

'Splendid Burial' Sites

Comparisons are made between 'splendid' burials both within and adjacent to the research area, irrespective of whether these are in tombs or in natural caves. These are interpreted also in terms of the underlying cultural traditions.

The Settlements

The settlements are re-considered in terms of a unified copper age culture in both time and space in south-east Spain.

DEVELOPMENT OF THE NEOLITHIC AND COPPER AGES IN THE SEGURA AND VINALOPÓ BASINS

Introduction

A traditional view of the cultural sequence following establishment of the early neolithic in southeastern Spain is something like this. Around the middle of the fourth millennium B.C. there was a non-metal-using, village-based agricultural society, practising collective burial of the dead in natural rock caves and artificial rock tombs. This burial practice is often held to originate overseas, though exactly where is not clear. About the middle of the third millennium B.C., defended proto-urban townships make their appearance, as well as other undefended settlements. At this time, copper metallurgy is present. The same baggy pottery (both decorated and plain) is found as before, but new elements soon appear, so-called beaker pottery. Collective burials continue to be used. At some time in the early second millennium B.C. proto-urban communities with a different kind of material culture are found, characterised by copper weapons fixed to hafts by rivets, burials in big jars or in cists of single individuals, and by ceramic forms which include some of the baggy and beaker forms of the earlier

type/

type, as well as new kinds of plain, often burnished pottery with strikingly severe, carinated profiles and also footed goblets. This is the "Argaric Culture" phenomenon. Its heartland seems to comprise the present-day provinces of Murcia, Almería and Granada. Outside that area, smaller defended settlements and collective cave burials appear to continue, and the pottery, whilst containing Argaric forms, also contains more baggy and globular vessels, although the metalwork is much the same as the Argaric metalwork. At first all of these communities use much more copper than bronze, though towards the second half of the second millennium, bronze becomes more common, and precious metals are also found. A third and final stage of the "Argaric Culture" is now sometimes defined which seems to bridge the remaining few centuries and to lead into the establishment of the Iron Age and Iberian Culture which had a very wide distribution in southern and eastern Spain. Sometimes foreign influences have been identified in the Argaric Culture, from the Unetice Culture, from Italy and the Central Mediterranean, and even from the East Mediterranean. It is possible that these really belong to the middle of the Argaric sequence. Certainly, beaker forms are found at Argaric sites, especially — those believed to be early. It is also likely that foreign influences occur in the cave burial assemblages contemporary with the earlier part of the Argaric sequence but outside the Argaric heartland.

The thesis which will be presented here contradicts many of these views. It will be proposed that the use of copper and the first proto-urban settlements made their appearance at a very early date, perhaps as early as 4,000 B.C., and that much of the material from collective burials belongs to this Copper Age and not to the Neolithic. It will be proposed that some of the Almerian copper-using townships are very much earlier than others. The origin of

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pottery will be sought in the Copper Age, and the development of the Argaric Culture will be explained as mainly a local evolution of the rather isolated proto-urban Copper Age cultures of south-eastern Spain, owing little to exotic influences in its earlier stages. The failure of the "Argaric Culture" to spread northwards and completely replace the more generalised Copper Age features manifested at sites outside the Argaric heartland, will be explained with reference to particular socio-economic models to be proposed as working hypotheses. Subsequently investigations into the ceramic technology and the skeletal palaeoanthropology of the region will be dealt with, in later chapters.

Limitations of the Archaeological Evidence

Whilst general accounts have been attempted within the wide framework of Peninsular surveys (Blance, 1960; Savory, 1968), there are no really detailed accounts which take cognisance of intra-regional variations in both temporal and geographical dimensions on the one hand, or of relationships with specific assemblages elsewhere on the other. When confronting the extensive literature, one feels a certain sympathy with the apocryphal Irishman whose reply to an inquiry by a newcomer to Dublin as to the best way of getting to O'Connell Street was, "Sure now, but you'd be best not to start from here at all." Put another way,

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one needs the imperturbability of those detective fiction heroes whose exploits involve an embarrassing quantity of supernumerary pieces of evidence which subsequently prove to be redundant to the inquiry. In archaeological terms, that is to say that there are many sites that have been dug (excavated would be too kind a word) to varying extents and have yielded up many artefacts in doubtful stratigraphic relationships. This has led to the more exceptional objects being pressed into service as type-fossils for so-called assemblages, which must be suspect in reality. There are other assemblages which cannot be classified meaningfully at all because they do not give a representative picture of the sites at which they were collected, owing to the whimsical predilection of the excavators for saving only artefacts of certain types, for instance decorated pottery and chipped flint implements may be collected, but undecorated sherds and unretouched flints may be discarded by the excavator. Even where archaeological collection has been thorough, excavation reports often do not allude to other than highly selected groups of finds.

Some assemblages seem to have been defined on intuition alone. Artefacts whose typology appears to conflict with the excavator's assignation of the overall cultural and/or chronological status of the assemblages may be attributed to unusual agencies ('colonists', etc.). Such typologically circular arguments do not explain the finds, they explain them away. They can in no way be tested by the verification principle. Scant treatment, too, is usually accorded to intra-regional geographical variation among artefact assemblages. Chronological variation between assemblages is hampered by the paucity of stratigraphically controlled excavations and the seeming abundance of sites of short occupation the inter-relationships of which are

accordingly/

accordingly difficult to establish. Where burials are concerned, not only is re-use of the burial site a possibility which must always be borne in mind, but moreover the presence of rare and unusual artefacts may have less to do with the cultural assemblage as a whole than at other sites owing to the heirloom phenomenon. This, of course, might lead to misidentification of the true chronological and/or cultural status of the more generalised artefacts of the burial assemblage.

The principal failure of all studies within the research field of south-eastern Spain has been the neglect of functional variation between assemblages and sites within cultural complexes. Rare and curious artefacts have been assigned to equally mysterious foreign influences instead of considered as integral functional components, irrespective of their indigenous or exotic inspiration as revealed by typological inspection. Indeed, often where exotic parallels are attempted for given artefacts, these lead to strange contradictions despite the otherwise similar background assemblages at different sites from which two different artefacts attributed to different foreign influences have been the objects of the study. But instead of counselling caution, such anomalous observations only seem to lead to yet a further frantic search among foreign cultures in order to explain the anomalies. In so far as investigations into the functional inter-relationships of the components (rare or common) of given assemblages are concerned, the literature is obstinately barren. Nowhere does one find reference to ethnographic parallels, for instance.

To compound the difficulties facing the investigator in south-eastern Spain, it must be remarked that assemblages from important excavations conducted over twenty-five years ago remain unexamined - and quite unpublished - often on the flimsy grounds that

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a well-known archaeologist has expressed his intention to examine and publish the material. Despite the failure to get round to doing so, the museums where the collections are held seem to feel justified in denying access to other investigators who are prepared to do the job. A system of totalitarian government and administration leads to fears and petty rivalries between minor officials who compete for favours from more important people against whose arbitrary dictates they have scant redress. A lack of skilled excavators has in the past meant that much fieldwork has been of depressingly poor standard. Some excavators even now prefer to use arbitrary horizontal spits to stratigraphically controlled excavation, so that assemblages produced may in fact be mixed, though there is no way of telling short of re-excavation. Open area excavations and a dislike of standing sections are all too frequent prejudices among Spanish excavators. Indeed, in the case of no single site have there been published a complete set of sections from all four faces of each and every trench and cutting, and site plans, if given, are usually poor and confused. The photographs of excavations and artefacts in the literature usually give the impression of having been taken at dusk in a fog and printed on blotting paper. Some archaeologists in Spain distrust absolute dating techniques and do not submit organic material for radiocarbon estimations. Some estimations which have been carried out have been performed on samples which might have been contaminated and the circumstances of collection of which are obscure. If such comments seem somewhat out of place in a thesis, it is necessary to make them nevertheless in order that the obstacles and limitations to the conclusions and hypotheses drawn from the archaeological assemblages be clearly understood from the outset.

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It has been the aim of the present writer to attempt to rederess some of the aforementioned deficiencies. In so far as possible samples for radiocarbon dating have been collected in a sterile 'no-touch' manner from excavation cuttings under the supervision of the present writer. Pottery has been submitted from these and other sites for thermoluminescence dating, though the results are not yet available. It is hoped that the radiocarbon dates, which are available, will help to calibrate the thermoluminescence dates for S.E. Spanish pottery of the Neolithic and Copper Ages. They also, as has been indicated, throw considerable new light on the absolute chronology of those periods in the research area.

In order that typological assessment should not have to rely too much on rare pieces from different assemblages, the drawbacks to which have been stated above, alternative parameters for an attempt to trace cultural changes have been sought. These include the mineralogical characteristics and manufacturing technique of coarse potsherds, and also human osteological studies. It had been hoped to study the petrology of polished stone tools, but museum directors were unwilling on the whole for their material to be sampled, despite ministerial permission having been granted to this investigator. Metal weapons were not studied, both so as not to duplicate other studies in this field, and also because of the possibility that grave assemblages would be over-represented in such a survey at the expense of settlement sites. Human skeletal material, of course, is drawn from burials anyway, so it seemed unwise to put further emphasis on burial artefactual assemblages. Sherds were collected by the present writer from burial and settlement sites, both in the field and at museum and private collections. Thin sections have been made from samples of the sherds taken by the writer from different sites in the nature of a preliminary, but statistically non-significant test

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to determine differences of petrological and mineralogical origins and composition in sherds. Some firing experiments have also been carried out, and X-Ray emission investigations on trace elements present in the clays used at different places. The promising results of these studies will be followed up in greater detail at a future date in an attempt to get statistically significant results which can be used in computer programs on culture change within the research area, and hopefully related to differences in human populations in time and in space, or not, as the case may be.

At a more mundane level, collections which could be studied were wherever possible drawn, since very, very few collections within the research area have been drawn and published. In the few cases where this has been done, these have not been duplicated in this work. One large Argaric collection made by P. Furgús, S.J. at the beginning of this century from his excavations near Orihuela (Alicante) has been the study of statistical computer studies on ceramic profiles. Of course, museum collections in Spain rarely offer more than the most 'interesting' of the finds from any given site, and the writer has had to visit scores of sites to collect discarded sherds from spoil heaps and the surface of the ground. The work involved in this field collection has been considerable, over and above the time spent studying museum and private collections.

The importance of geological changes in the distribution of riverine alluvial terrace deposits will be seen to have affected quite markedly/

both site locations and in some cases assemblage locations throughout the Neolithic and Copper Ages, and the implications of these changes will be considered, especially with regard to environmental exploitation of plants, animals, clays, rocks, etc..

It should be clear from the foregoing that the accounts which follow are preliminary syntheses, more in the nature of working hypotheses against which subsequent laboratory and computer investigations may be tested. The aim has been to try out several methodological techniques all together in the collection and study of material of possible use in future statistical studies. The danger in attempting to publish such statistics on inadequate material is very great. At all costs a simplistic review of sites and collections which merely indicates the presence or absence of a particular type of artefact and then carries out ~~chi-square~~ statistical tests to determine the probabilities of particular associations occurring by chance or otherwise, must be avoided. This was the approach of Blance (1960). It suffers serious methodological drawbacks. Particular types of sites tend to be unduly represented for reasons which have more to do with the intentional deposition of artefacts or otherwise by prehistoric people (e.g. compare burials with settlements), and thus reflect functional differences, yet may be taken by the unwary as demonstrating wider 'cultural' differences. There is also the well-known zero phenomenon, due to the exaggeration of differences between 0 (absence) and 1 (presence) at the expense of differences between 1 type-fossil of type X and 20 examples of type X when the matrix comparing different sites for presence or absence of type X is studied. The material is not yet available to the present writer which will allow a better statistical treatment to be used, though as has been said, it is being assembled and will be used in future studies by him. However, for the present

time/

time it must serve to point out the places where previous studies are clearly mistaken or correct in more traditional archaeological terms -- that is to say, using absolute and cross dating and non-statistical typological assessment. This should highlight those areas where detailed statistical work is required. Hence the attempt of the present writer to begin his investigations on the basis of a low-level multi-pronged attack over an entire geographical region using every aspect of its archaeology and palaeoanthropology available to him, rather than on the basis of concentrating on just one aspect of its artefacts, say beakers, or metalwork, or ceramic technology, or human osteology, or whatever. The detailed synthesis based on valid statistics must await a subsequent publication to thie present thesis. Here are presented preliminary thoughts which should serve to direct those subsequent investigations to particular problem areas. The collection of field material and trial experimental techniques in a variety of disciplines prior to the total synthesis are what are presented here.

Developments in the Neolithic

Before attention is directed to particular sites and stratigraphies, it is necessary to continue the account given in the previous chapter with regard to typological variation in the Neolithic. One of the most recent workers in this field has been Blance (1960, unpubl., and 1971, publ.). She took as her starting point the conclusions of the Leisners (Leisner and Leisner, 1943) from the tomb assemblages of the provinces of Almería and Granada, which she interpreted as having an initial phase of small round graves or rectangular cists containing simple trapeze flint points, beads, shell bracelets and polished stone tools, followed by a later phase in which flat idols, bifacial flint points, asymmetric trapeze points, beads, pottery and polished stone tools occur together. Blance attempted to verify this division statistically. Unfortunately it is necessary to present some of her figures at this stage in order to demonstrate the errors which entered into her analysis.

There ~~were~~ was a maximal total of 151 tombs in Blance's study. The following artefacts were investigated for their associations with each other: -

	Artefact	No. of graves		Artefact	No. of graves
	Tanged point	19	G	Asymm.trapeze	34
	Flat idol	14	H	Hollow base point	8
	Callaïs	5	I	Blade	48
	Shell bracelet	24	J	polished stone tool	26
	Bone point	35	K	bowl	29
	Symm.trapeze	17	L	amphora	9

A table of association indicating the number of graves occupied by any pair from the above list was then presented as a diagonal matrix:-

A/

A											
9	B										
4	3	C									
2	3	-	D								
11	10	3	7	E							
3	4	-	4	5	F						
10	12	4	5	11	5	G					
-	3	-	-	5	2	5	H				
12	11	5	9	27	6	14	4	I			
10	5	2	6	5	8	7	5	11	J		
10	8	3	6	17	6	11	6	18	12	K	
4	2	1	1	5	3	3	4	6	7	6	L

What one needs to know now is: Out of 151 possible addresses (tombs) what is the probability that out of a total of , say, 14 flat idols and 29 bowls, these two types of artefact might occur in 8 tombs purely by chance allocation of all the flat idols and all the bowls randomly among the 151 addresses ? Clearly, the number of such addresses having both objects cannot be greater than 14 . The problem cannot be solved other than by using the chi-square statistic and referring it to probability tables. Curiously, Blance did not do this.

Instead, she calculated a ratio of the actual percentage occurrence among the 151 addresses of each combination pair to the expected occurrence on the assumption of random distribution of each member of each pair. She then chose arbitrary cutting points for the resulting proportional statistic which she called 'strongly associated', 'moderately associated', 'weakly associated', and 'not associated'. Her conclusions were rather complicated, but they may be summarised briefly as the identification of one strongly associated group of '(tanged points with callais beads with flat idols)' and another group of more weakly associated artefacts identified mainly by its 'repulsion' from the first, viz. '(shell bracelets with

trapezes/

trapezes)' . She also observed that flat idols showed associations with hollow base arrow-points. bone points and asymmetric trapeze points. She concluded, "Flat idols, bifacially-worked arrowheads, and callais cannot be considered as indigenous elements. They are not known from the earlier impressed ware sites." Vague East Mediterranean parallels were proposed for this 'intrusive' assemblage. She then compared round and rectangular tomb burial customs and assemblages (both tombs with and without passages separately considered). Single inhumation was found to occur in round graves and the 'intrusive' assemblage. But collective burials and the same type of assemblage seemed to occur in both tomb types, though perhaps especially collective burials showed some slight preference for rectangular graves. (It should be stated that the passages were believed to belong to subsequent phases in the Neolithic and Copper Ages by the Leisners and by Blance.) The interpretation put on this was of a coastal Neolithic 'intrusive' culture spreading inland and moving from single to collective burial, and from passage-less tombs to passage graves. The presence of simple and asymmetric trapezes in inland Granada rectangular passage graves was explained away as indicating the strong hold of the pre-existing Neolithic (of which she believed them to be characteristic elements) even at quite a late date.

Unfortunately, this statistical treatment is unsatisfactory. Hence the conclusions are probably wrong. Apart from the danger of all presence/absence surveys, which takes no account of the different numbers of artefactstypes present at sites having that artefact, the unsquared coefficients used by Blance minimise the differences between the associations and lead to spurious 'associations' . The association matrix may be re-worked using chi-square probability

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values, as previously described. The difference from the association 'coefficient' matrix of Blance is striking when this is done. But first one artefact type must be excluded from serious consideration, namely the callais beads, which occur at only five sites, giving too small a number for the chi-square to be used on. The low numbers in some of the cells of the brute data association diagonal matrix given earlier might also be suspect, and certainly cannot be used to demonstrate 'repulsions' .

Probabilities of Chance Association
of Pairs, based on Chi-Square Statistics

100 = 100% probability of random result
1 = 1% probability of non-random association

A											
0.5	B										
0.1*	1*	C									
100	100	-	D								
95	65	40*	100	E							
100	90	-	100	100	F						
100	2.5	0.5*	100	100	100	G					
--	50	--	--	60	100	65	H				
100	75	10*	100	95	100	100	100	I			
75	100	100*	100	100	100	100	20	100	J		
100	65	40*	100	95	95	100	7	95	100	K	
30	100	100*	100	80	35	100	10	90	1	30	L

* = insecure values, to be rejected

Usually in scientific work probabilities of randomness greater than 10% are held to indicate a fairly strong element of chance in the observed phenomena, and sometimes even a one-in-twenty chance of randomness (5%) is not held to be necessarily significant of a departure from a distribution which might occur quite by chance. Given

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the many factors, both random and selective, which can determine the composition of an archaeological assemblage before it becomes the object of a particular archaeological inquiry, it seems reasonable to accept similar limits. An artefact type occurring only a few times (e.g. the callais beads, which occur 5 times in 151 tombs) stands a good chance of being randomly found alongside another artefact type occurring many times in at least 3 or 4 of the five occurrences, and so must also be excluded. This is important, since these beads were to become the lynch-pin of Blance's conclusions from her statistical inquiry.

We can then deduce from the probability table that the only strongly non-random associations seem to be two separate groups of, on the one hand, flat idols and tanged arrow-points, and on the other, asymmetric trapezes and flat idols. The two kinds of arrow-points do not occur together, however, more than could be due to chance. The occurrence together of polished stone axes with so-called amphora pots also shows striking non-random association, but there are fewer reasons for thinking that this is of particular archaeological interest, as should become clear as this section develops. Other possibly non-random associations include hollow base points with both bowls and amphora pots.

Taken together, these conclusions hardly support those of Blance, deduced from the same data set. Admittedly, even she wrote that her two groups were far from being "water-tight compartments" and probably represented overlapping contemporary cultural strands. It seems that these strands are really so tenuous as to be discounted from serious consideration in any investigations into developments within the Neolithic. Indeed, Blance seems to hold the view that there was a considerable pre-Argaric 'Early Bronze Age' or metal-

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using stage, contemporary with the development of passage graves and corbelled vaults in chambered tombs. Since she is of the opinion that foreign influences were responsible for the establishment of this phase, one wonders why it was held necessary to interpose a phase of 'intrusive' Neolithic artefact assemblages between an originally indigenous Neolithic and that meta-using stage, especially as some of the tombs used in the study seem likely to belong to a metal-using cultural phase on the basis of comparative assemblage studies, as will be proposed later on. Presumably it was felt necessary to attribute to a pre-metal-using (i.e. Neolithic) stage barbed and tanged flint arrow-points and hollow base flint arrowpoints. The fact that such forms often out-number metal objects at burial sites which must presumably belong to a cultural stage at which metal-using was practised, as will be demonstrated, must surely make it very hard to argue for such an intermediary phase on the basis of similar collections whose only distinctive feature is an absence of metal ? There are also grounds for questioning whether bifacial flint arrow-points might not in fact represent an early element in some Neolithic assemblages, which, like trapeze points, continued until well into the Copper Age, and even its Argaric phase (as also continued polished stone tools, bone points, plain bowls, globular and baggy necked vessels, and many other elements of Blance's artefact list).

It is necessary to consider the development of the Neolithic, and then of the Copper Age, from the standpoint of stratified sites and absolute chronology, and this more traditional line of argument will now be presented.

The neolithic and copper age sequence

The following dates represent all those available including new unpublished dates carried out for the present writer by the Harwell laboratory (coded 'S'). For the sake of brevity, the code letters of the laboratories will be used wherever possible to avoid overloading the list with detailed bibliographical references. Dates are given B.C. by subtraction of 1950 from the B.P. date, based on the dates as published in Radiocarbon without further correction.

5,400	(±350)	Sa-16	Moita do Sebastão,Portugal: aceramic layer of midden
5,250	(160)	S-179	Abrigo Grande, Murcia: ceramic layers of cave occupation
5,080	(±350)	Sa-195	Cabeço da Amoreira,Portugal: aceramic layer of midden
4,560	(±160)	KN-51	Coveta de l'Or,Alicante: ceramic cave occupation
4,480	(±300)	Sa-197	Cabeço da Amoreira,Portugal: aceramic layer of midden
4,315	(±75)	H-1754/1208	Coveta de l'Or,Alicante: ceramic cave occupation
4,100	(±300)	Sa-194	Cabeço da Amoreira,Portugal: ceramic layer of midden
4,180	(±300)	M-754	Ereta del Pedregal,Valencia: sterile 'natural' below ceramic occupation level
3,984	(±109)		Cueva de Muleta, Mallorca: earliest human occupation (Waldron & Kopper,1968)
3,420	(±350)	S-155	Terra Venturas,Almería: copper using settlement
3,200	(±300)	Sa-196	Cabeço da Amoreira,Portugal: ceramic layers of midden
3,170	(±620)	S-180	Abrigo Grande, Murcia: inaccurate date from lowest, aceramic levels
3,110	(±50)	GrN-4924	Frágoas,Pavia,Portugal:passage grave (Kaelis Cantabricus)
2,660	(±50)	GrN-4925	ditto
2,530	(±250)	M-1022	Cueva Encantades, Gerona:bronze age layer
2,430	(±120)	KN-72	Los Millares,Almería: grave 19, passage,dry stone wall,port-holes
2,345	(±140)		Sabassona, Barcelona:fosa grave (Munoz,1965,1965a)

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6:17

2,340	(±85)	H-284/247	Los Millares,Almería: burnt wood under collapsed settlement wall
2,210	(±110)		Praia das Maçãs,Portugal: early chamber later converted to tholos passage grave (Leisner et al.1963)
2,200	(±120)	KN-73	Almizaraque,Almería: copper using settlement
2,130	(±130)	S-146	El Prado,Jumilla,Murcia: copper using settlement
1,980	(±250)	M-753	Ereta del Pedregal,Valencia: ceramic layer,beneath copper using phase
1,970	(±100)	I-3985	Cueva de los Huesos I,Álava: bronze age deposit
1,850	(±200)		Anta dos Tassos,Portugal: tholos passage grave(Leisner,1963)
1,840	(±115)	S-160	Cueva de los Tiestos,Murcia: copper using cave burial, painted and Argaric pottery
1,760	(±130)	L-3153	Cueva de las Majucas,Vizcaya: eneolithic deposit
1,700	(±100)		As Conchadas e Trigache,Portugal passage grave(Leisner et al. 1963)
1,690	(±100)	KN-115	Zambujal,Portugal: copper using settlement
1,620	(±250)	M-1021	Cueva Encantades,Gerona: eneolithic deposit
1,600	(±55)	H-2277/1694	Cabezo Redondo,Villena,Alicante: Argaric settlement
1,710	(±100)	I-3984	Gobaederra cave,Álava: bronze age
1,580	(±100)		Pic dels Corbs,Valencia: copper using settlement(Schubart & Pascual,1966)
1,550	(±150)	Birm-199	Catí Foradá,Alicante: copper using settlement
1,370	(±200)	Sa-199	Anta dos Tassos,Portugal: tholos passage grave
1,140	(±100)	I-3197	Cueva Guerrandijo,Vizcaya: eneolithic
990	(±140)	S-177	Cerro de Juan Climaco,Murcia: copper using settlement

(Other dates are currently being determined for the present writer by A.E.R.E.,Harwell.)(Postdates on Almagro Gorbea, 1971, quotes unpublished dates from Praia das Maçãs 2300 ± 60 BC, 1700 ± 100 BC, 1690 ± 60 BC; from Carapito I, Viseu of 2900 ± 110 BC & 2640 ± 65 BC, & Penha Verde W-656 of 1470 ± 130 BC)

Approximate corrections for ther radiocarbon dates determined for the present writer by the Harwell laboratory based on the Suess-Bristlecone Pine calibration curves mean that in absolute terms dates of about 1,000 A.D. are some 200 years too early, whereas on the other hand dates of about 2,000 B.C. require correcting by some 500 years in the opposite direction (i.e. to ca. 2,500 and dates of 3,500 B.C. are about 700 years too recent. It is not possible to obtain corrections before about 5,000 B.C., although perhaps a reasonable guess might be that a date of 5,000 B.C. ought in fact to be close to 6,000 B.C. in absolute terms. This needs to be pointed out not from the standpoint of comparisons with radiocarbon dates from elsewhere in Europe, but from that of making chronological comparisons with Egyptian material of known dynastic ages.

The radiocarbon dates from the Coveta de l'Or (Alicante) come from layers said to contain cardial impressed and also incised pottery, and to be earlier than higher layers at that cave which are characterised by plain wares only. However, it should not be thought that the lower layers do not have plain wares. Evans (1958) has emphasised that in the Peninsula there is by no means a clear-cut division - neither geographical nor chronological - between impressed and non-impressed wares. He observed that the impressed ware phase, however, seemed to recede and give way to undecorated, and, one might add, incised and relief-ornamented ware, at some sites. This is not unique to Spain, of course, as Evans pointed out. In southern France and in Italy cardial impressed pottery appears at about 5,500 B.C. in terms of uncorrected radiocarbon dates (c.p. Escalon de Fonton, 1970; Guilaine, 1970) and at Châteauneuf-les-Martigues in these lower layers (F5, F6) there is even a slightly pointed-based amphora type of pot, similar to one from Coveta de l'Or, and both vaguely recalling El Gárcel costrel pottery, though, as has

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been said earlier, El Gárcel is not necessarily earlier than l'Or. Comparisons are sometimes made between the Coveta de l'Or cardial pottery, which includes sherds with random cardial impressions, and the earlier phase of the Italian cardial impressed wares, and between the Cueva de la Sarsa pottery and the later Stentinello phase on the ground that the impressions are organised into patterns. The Abrigo Grande sherd, admittedly unstratified, seems to be of the latter type. The Abrigo Grande and Coveta de l'Or radiocarbon dates seem to agree well with dates of between 5,500 - 4,500 B.C. for cardial impressed pottery at southern French and Italian sites.

The cardial impressed stage in those countries gives way between 4,500 - 3,500 B.C. to Chassey forms and Ligurian plain wares, respectively. A new feature is the appearance of square-mouth vessels, curly motifs, and Spondylus bangles, indicating Danubian traditions. Dates from northern Italy for this stage fall between 4,000 - 3,500 B.C. (Barfield, 1971; Shotton & Williams, 1973). Square-mouth vessels are very rare in Spain; and the curly or spiral motif on pottery is not met with. Pellicer (1964) refers to a square-mouth vessel from a Granada cave site (apparently either the Cueva de la Mujer or Cueva del Agua) and Munoz mentions examples from Catalonia, whilst pointing out that Fayum A, Badarian or Amratian parallels for square-mouth forms may be relevant.

At the Cueva de la Carigüela, the lowest cardial impressed layers soon give way to layers with incised and impressed ware pottery. This pottery has a red lustre surface ('almagra'), and the decorations are picked out in white incrustation (Pellicer, 1964). Savory (1968) describes it as zonal decoration, seeking beaker precursors. This is not strictly true, however. There are more complex patterns involving grids, hachured triangles, chevrons, and dots.

This is more like Chassey pottery. There is burnished ware, too, from the same layers at the cave. Perhaps there was a reciprocal influence between incised and impressed ware potters, the latter adopting geometric patterns, the former edging their designs with dots. Incised wares are generally commoner than cardial impressed wares in the Andalusian region, but they may often be later in date as the Carigüela stratigraphy suggests. It should be remembered, however, that cardial impressed pottery is by no means a feature of all the later upper palaeolithic-early neolithic transitional sites considered in the last chapter. One might prefer to conclude that other ideas of how to decorate pottery (or not, as the case might be) have an equal antiquity to that of cardial ornament. At the cave of Hoyo de la Mina the geometric incised ornament is again encountered, and there is also dot-ornamented and cordon or relief ornamented pottery. One sherd might perhaps be comb decorated (Such, 1919, p. 29 fig. 30b) and comb decorated ware is known from the Cueva de la Cocina (Fortea, 1971, Pl.II). However, there is one sherd of cardial impressed ware showing a pattern at the last-mentioned site (ibidem, Pl. XIV), not unlike that from the Abrigo Grande, whereas at Hoyo de la Mina there was no cardial ware.

One sherd from Hoyo de la Mina, however, seems to be a sherd with scratched decoration (Such, 1919, p. 34, fig. 37) with a grid design similar to that incised on other sherds at the cave, though cruder in execution. Scratched wares are known from Malta and Italy (Evans, 1958), perhaps having their origin in southern Italy and representing an attempt to copy the neolithic painted wares of Italy on pots of a dark coloured body by means of filling the scratched pattern with white material (Trump, 1966). Scratched wares are not otherwise known from Spain, and the encrustation of the Carigüela pottery can hardly refer to any

contemporary painted wares in the Peninsula with which the potter might have had a superficial familiarity. As will be seen in due course, incised pottery using dot impressions continues very late in south-eastern Spain. Apparently scratched wares linger late in Italy also, since Trump (1966) states that they are found in cave burials dated to 3,000 - 2,800 B.C. with trepanned skulls. Trepanation is a feature of Spanish copper age cave burials, but scratched pottery is not present. The burials often have incised pottery, including the queer plaster vessels ('gipsekeramik') which are also found in Almerian passage graves. But these splendid burials contain many other exotic objects which distinguish them from those of Italy quite firmly.

The cardial impressed phase at Coveta de l'Or gives way to layers with plain vessels. Neither there, nor at the Carigüela, nor yet at any other south-east Spanish cardial ware site is found the kind of painted ware which succedes cardial ware in Italy (Bernabò Brea, 1957). Pottery with broad red painted bands in Italy is associated with the close of the cardial impressed ware period, and is dated to before 4,000 B.C. at the Piccioni cave (Bray, 1966) where it occurs before the appearance of Lagozza wares, and where, in turn, copper age material only makes its appearance at around 2,500 B.C.. Another common motif on Italian painted wares of the neolithic, and also known from Sesklo in Greece, is the 'flame' which spreads up the side of the body from the base. The flame is found on one Spanish painted vessel, namely that from Los Millares grave 40 (fig. 119 no. 1) but is otherwise not met with in the Peninsula.

There is very little in the Peninsula recalling the fourth millennium B.C. neolithic of Italy. A painted vessel from Mesas de Asta (fig. 119 no.11) has been likened to Serrafer-

lichio painted ware, and another published by Laviosa-Zambotti (1951) of uncertain 'Almerian' provenance (fig. 119 no. 15) might also be vaguely capable of comparison with Sicilian copper age wares. In making the first comparison, Evans (1958) also mentioned the similarity between painted sherds from Gar Cahal in Morocco (Tarradell, 1958) and Serraferlichio painted pottery. Brea (1957) and Evans (1958) derive the Sicilian painted wares from Greece and in terms of radiocarbon years a date corresponding to the later part of the Sesklo culture towards 4,000 B.C. or the early Dhimini sequence shortly after that date.

The post-cardial phase of the south-east Spanish neolithic is ill understood. Almagra ware was found by Pellicer (1962) at the Cueva de Nerja near Málaga, and the usual Andalusian incised and dot ornamented pottery, including vessels with spouted lugs. Hollow base arrow-points were also found. The neolithic layers were said to be above 'epipalaeolithic' deposits. One ostrel jar with two handles was found in the neolithic layers. They were followed by copper age deposits with similar incised and dot ornamented pottery. Pellicer tentatively compared the almagra surface ware to Diana ware. Trump (1966) is of the opinion that the Lipari type of red slip pottery has its parallel on Malta about 3,200 B.C.. Bernabò Brea (1957) states that spiral meanders occasionally are found incised on Diana pottery. The motif is not found in Spain on almagra wares. The trumpet lugs and lipped rims of the Diana wares are also not features of Spanish red slip vessels. These comments on vessel forms are also true of the preceding cardial phase in Spain, where the open vases (see Bernabò Brea, 1957) of the Sicilian cardial impressed pottery are not found. Nor are the painted vessels of south-east Spain particularly similar in profile to Serraferlichio forms.

The reference to grave 40 at Los Millares suggests another, rather different group of influences from those of Italy or Provence. This passage grave with a circular chamber contained one hundred skeletons and 126 intact vessels, both plain and incised. The incised vessel illustrated by the Leisners (Leisner & Leisner, 1943) has concentric hanging semicircles below the rim with lugs placed as if they were 'eyes' in an oculus motif. There are globular vessels with lugs and diminutive handles, and vessels with a convex base and either straight walls rising vertically or sloping slightly inwards, or slightly convex walls forming a light carination with the base in profile. There were also an ivory comb, a piece of ivory with criss-cross incisions, two slate plaques with three perforations at one end and two groups of three curving incised lines beneath the holes, round idols of ivory, aragonite and alabaster, an alabaster vessel with criss-cross excised decoration, a flint dagger, 85 flint arrow-points of which 71 were hollow-based, polished stone tools and copper tools. The flame painted vessel is a globular amphora with a neck, and the painting comprises a group of radiating dark brown-red triangles touched up with bright red chevrons.

It will be argued later that many of the exotic artefacts (clearly, in this case, not the flame painted vessel) of the Almerian passage graves and the Murcia-Alicante-Valencia caves are early, middle and late pre-dynastic Egyptian in inspiration. Others, perhaps in this case the painted vessel, represent Aegean influences. To jump ahead a little, one might propose that the many bowls and plates decorated on the inside, especially of the rim, with chevrons, hachuring, and criss-cross patterns are inspired by Amratian (early pre-dynastic) forms, and possibly the occasional use of encrustation, as at the Carigüela cave, was inspired by

the use of encrustation in the Egyptian predynastic periods. Moreover, almost all the ceramic forms of the so-called Almerian culture have their parallels in pre-dynastic Egypt, including those mentioned above at grave 40. Another curious vessel from that grave has a convex base, vertically rising sides, and a queerly convex outward bulge as the walls continue to rise upwards to a mouth wider than the lower part of the vessel, ending at it without any lip. This kind of tall vessel is not uncommon in Egyptian contexts. Nor is the handled costrel amphora, the occasional presence of which in southern Spain (Gárcel; Nerja) has already been referred to.

One might almost wish to go further still and to wonder whether the linear ornamentation on vessels of this type does not perhaps underlie the entire Chassey decorative tradition. These speculations are prompted by the unsatisfactory nature of French and Italian parallels for the southeastern Spanish post-cardial cultures, in so far as the former do scant justice to the richness and complexity of the latter. Tarradell (1959) has argued convincingly that the evidence for late neolithic and copper age relations between the Peninsula on the one hand, and Morocco, Algeria or Tunisia on the other, is so slender as to make it unlikely that there was much contact. This may well have been so. This is not to say necessarily that there were no contacts with lands further east. Correctly, in the opinion of the present writer, he denies that the Almerian culture is neolithic, making an exception for El Gárcel which itself may even be unwarranted, and states baldly that it is eneolithic, i.e. copper age. This brings us to the heart of the matter, namely that apart from the transitional later upper palaeolithic-early neolithic sites, apart from Coveta de l'Or (and probably Sarsa), apart from the caves of Carigüela, Nerja and Hoyo de la Mina, there are no sites

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in the provinces of Málaga, Granada, Almería, Jaén, Murcia, Albacete, Alicante, and Valencia which are unequivocally distinguishable from sites with copper technology in those provinces. In other words, much of what has been declared 'neolithic' in the past has been so declared on the basis of default - absence of copper or bronze. If this archaeological solecism has gone unnoticed for so long, it is for no other reason than that there was nothing to put in its place, and the sloppy argument was accepted faute-de-mieux.

Fortunately, this state of affairs is being rectified. A radiocarbon date on a collected sample of burnt soil and charcoal taken from about -0.500 metres below the present ground level from the side of Cuadrado Ruiz's still unpublished 1947 excavation, and about half-way down the section has given a mid-fourth millennium B.C. radiocarbon date from Terra Venturas, Tabernas :

3-155 (18g charcoal giving 29 cm CO_2)
5370 ± 350 B.P. or 3,420 B.C.

A calendrical age by reference to the Bristlecone Pine calibration curves suggests an absolute date of 4,230 ± 360 B.C.. The sample was collected in sterile conditions by the present writer and sr. F. García Jiménez, and the data has been supplied by Dr.R.L.Otlet of A.E.R.E., Harwell.

Since taking the sample, new excavations have been undertaken by sr. F.F. Gusi and three archaeological layers have been identified at the settlement, the lowest yielding painted pottery, with beakers appearing in the upper layer (Gusi, personal communication). More radiocarbon samples are to be submitted shortly. Some material from the earlier excavation is illustrated in fig. 60, including the well-known painted sherd. One must assume that the

sherd dates from about 3,500 B.C. or earlier in radiocarbon years. The form of the vessel is probably a lightly carinated round based pot with convex walls rising inwards. It seems reasonable to accept that the Almerian settlement of Terra Venturas, Tabernas is roughly contemporary in the fourth millennium B.C. with the nearby passage graves. The only date of such antiquity for a Peninsular passage grave, however, is that given earlier from Frágoas in Portugal, a date somewhat devalued by another third millennium date from the same grave.

When the Murcian sites are discussed, it will be seen that cross-dating provides other circumstantial evidence for a fourth millennium dating for some at least of the copper age cave burials which it will be proposed belong to the same generic group as the Almerian burial constructions. Other Murcian sites have given third millennium dates for the copper age. The open site of El Prado, Jumilla, Murcia , and the nearby cave burial at the Cueva de los Tiestos have given the following dates:

S-146 (371 g bone giving 61.4 cm CO_2)
4 080 ± 130 B.P. or 2,130 B.C.

S-160 (9g burnt barley giving 72.5 cm CO_2)
3790 ± 115 B.P. or 1,840 B.C.

The corrected,Bristlecone Pine calibrated dates are respectively

2,710 ± 170 B.C.

2,330 ± 160 B.C.

These dates were based on samples collected by the present writer and collected in sterile conditions, estimated by Dr.R.L.Otlet of A.E.R.E., Harwell, who carried out the calibration computations.

The burial cave contained Argaric carinated pottery as well as painted and incised wares. The implication is that the copper age began in southeastern Spain in terms of radiocarbon

years about 3,500 B.C. and continued at least until 2,000 B.C. when the occurrence of so-called Argaric forms of ceramic and metal were added to it.

The Argaric phenomenon seems to have been geographically very localised (Tarradell, 1950). No Argaric forms have been found at Cati Foradá, Petrel, (Alicante) where a radiocarbon estimation gave a date

Birm-199 3502 ± 150 B.P. or 1552 B.C.

on a sample of burnt barley (no further details were given by the laboratory at Birmingham University: see Shotton & Williams, 1971). The site is in the hills on the north side of the Vinalopó valley. However, the Argaric settlement at Cabezo Redondo, Villena in the same valley has given a date of 1,600 B.C.. The Argaric phenomenon marks the transition from copper metallurgy to the use of tin bronze, with which latter phase the present writer is not concerned in this thesis. It will be proposed that the significance of the Argaric phenomenon lies less in its tool-kit, which was probably drawn from many regions including Central Europe, Italy and indigenous traditions, as in social and economic pressures to exploit new agricultural environments and so to permit the continued proto-urban way of life which had been developed during the preceding phase of the copper age. It will be seen that the problems were acute and localised, and this, no doubt, is why the Argaric phase of the southeastern copper age appears to be rather an inward-looking cultural phenomenon, not reflecting cultural changes which have been identified further north in Europe.

The Post-Cardial Phase

As has been said above, if there is a truly neolithic phase which precedes the knowledge of copper metallurgy in south-east Spain, it is very hard to define, at least in Almería and in the Segura and Vinalopó region to the north of that province. Ballester (1928a) and Tarradell (1959) have drawn attention to the impossibility of attributing all sites in Spain at which there is cardial impressed pottery to a wholly neolithic cultural phase, since there are sites at which it occurs associated with beaker pottery. At El Pany (Marti Grive, 1936) it is even said to be stratified above beaker pottery. Cardial ware and beakers together are reported from the Coveta del Barranc del Castellet, Carrícola (Plá, 1954) and the Caseta del General, Atarcó, Albaida (Ballester, 1928a). These two sites might, of course, be no more than instances of the heirloom phenomenon.

Casa de Lara

In the Segura Vinalopó region there is cardial ware from the open site on the Villena flood-plain of Casa de Lara (Soler, 1961). The present writer has visited the site from which the surface collection was made, and has collected a sample of plain sherds. It appears that these sherds were manufactured using very fine grit filler, and this is not characteristic of copper age pottery in the area. A backed bladelet (fig. 120) was also found. The sherds lie in aeolian sands in the flood-plain of the Vinalopó, and their geological situation is hard to interpret (see above, and Cuenca, 1973). Possibly they represent squatting on sands through which the river ran in a series of marshy lakes during a period following the aeolian deposition. If that deposition were the same as that at the Abrigo Grande, then it would have to be dated before 5,000 B.C., or even before 6,000 B.C.. However, the absence of

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later aggradations is an old feature which can only be explained by postulating a rapid fall in base-level of the river, such as might have taken place if the rocky barrier to fluvial drainage about 20 kilometres downstream at Monastil, Elda, had been eroded through. Cuenca (personal communication) favours such a view. He feels that the Villena basin was an 'endorheic' river basin, much as the Jumilla valley in Murcia is still. He believes the erosion of the higher mountains in the Elda region, such as the Sierra de Maigmó and El Cid, which are higher than the hills around Villena, was the cause of the rejuvenation of a short Vinalopó valley whose source lay in those mountains. The fall in base-level led to capture of the enclosed Villena swamp, the waters of which cut through the Monastil obstruction. There were thus not the conditions for post-glacial swamp formation after the close of the final pleniglacial in the region of Villena. Such conditions were, however, present upstream from the Tabayá rocky barrier (Elche), hence the sediments earlier described at the Rambla de Bateig, Elda, below the Monastil barrier. Thus the subsequent aeolian sands lie above these lacustrine sediments at the Rambla de Bateig, but directly above earlier, pleniglacial age lacustrine sediments at Villena, since at Villena the river had been flowing freely during the post-glacial phase of sedimentation downstream. The lower hills around Villena meant that following the wind-blown sub-desert stage, the subsequent thermoclastic processes, which carried down screes from the Sierra de Maigmó and deposited them above the aeolian sands at Elda, were less pronounced and the screes less extensive, failing to cover the Villena sands. Presumably the recent swamps, present at Villena in mediaeval times, protected the sands without the river feeding them being much able to transport alluvial sediments to the swamps and cover the sands.

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This theory is attractive, since the alternative, which implies that the water mixed material from hypothetical later sediments such that it penetrated the underlying sands, before in turn removing those later sediments, is less easy to square with the alluvial sedimentology of the Vinalopó system downstream. However, the theory does not answer the crucial question for the archaeologist, which is, Is the Casa de Lara assemblage neolithic or is it copper age in date ? If the sands were exposed and settled, it could be either or both. The same is just as true of the alternative theory. Some of the pottery published by Soler shows carinated forms. There are also pottery arcs with a perforation at each end. There is incised, dot ornamented, and cordon decorated pottery. There are sherds of colander vessels. There is at least one sherd which has incised lines edged with dots. There is a flint plaque retaining much cortex and many bifacial flint arrow-points of diverse forms. There is a gold bead, and there are copper objects, mainly rods and punches, but also one blade fragment (of a knife or dagger, perhaps) which Soler admits is late in date on account of what he describes as a high percentage of nickel. Nevertheless, for Soler the assemblage is basically neolithic. Now it must be remembered that this is a surface collection, and therefore caution must be shown before assigning it to any one period. It may represent a long period of occupation, using the word in its loosest sense. Or it may be copper age in its entirety. Many of the features listed above suggest the latter, although,as has been stated, the ceramic technology might suggest earlier features. Since the Soler collection is partly published, and further publications are intended, it is not drawn here. Two globular vessels published by Soler (1965) are given, however, (fig. 97). They are not cardially decorated (contra Soler), but in what might be

called cardial-type tradition, viz. incised and impressed zone decorated amphorae. Perhaps this kind of ornamentation is to be related to incised and impressed bands on pottery from Andalusian cave sites.

Cueva de los Toyos, Ifre, Mazarrón

This cave is near to the Murcian coast and contained a vessel of amphora shape not unlike those just mentioned (Siret & Siret, 1887, pp. 18-19). The present writer visited the area but could not find the site. The vessel contained a semiprecious polished stone axe and many complete and incomplete beads made out of sea shells. A trapezoid flint piece and a possible barbed and tanged bifacial arrow-point are illustrated (op. cit.), the latter away from the vessel. A bone or ivory point, a sherd of 'Argaric' ware, and various small blades and flakes, including a blade with flat pressure flaking, are also described. Human remains were not reported.

Cueva Ambrosio, Vélez Blanco, Almería

This site (Plate LXIX) lies in the headwaters of the Guadalentín-Sangonera tributary of the Segura. The present writer visited the site, but the occupation levels at both the main cave and the 'hidden' cave beside it were so disturbed that no useful observations could be made. However, a collection of surface sherds was made for future investigation, mainly plain, lugged and cordon decorated wares, but also from the 'hidden' cave, a sherd of beaker ware. The excavations of Jiménez (1962) show many pieces of incised and cordon decorated ware, and these are described by the author. There is also one sherd of excised ware (op. cit., fig. 10 no.1 p. 29) There are zones of dots and hachuring which have been compared with beaker forms (Savory, 1968:'Pre-Beaker ware, p. 173). Many of the sherds have the 'almagra' slip which

is characteristic of Andalusian cave sites. Polished stone axes and two fragments of stone bangles, one with incised lines painted in red, were also described, and human remains were found in the ceramic layers. Bifacial flint points are not shown. Five retouched blades (Jiménez, 1962, fig. 24 p. 44) are illustrated, but it is not clear where they were found, and three points showing pressure flaking in the same figure seem to refer to Solutrean-like points described as having been found on the spoil heaps and elsewhere. The cave has earlier, palaeolithic deposits. Millán (1950) compared sherds from Ambrosio with beaker sherds from the Cueva Mongó, (Alicante), presumably referring to sherds such as no. 8 in my fig. 59 from that last-mentioned site. The sherd of beaker pottery found by the present writer at Ambrosio has not been drawn, owing to an oversight which caused it to be left in Spain, but was of polished dark ware incised with horizontal lines separated by chevrons and 'x' incisions. It is hard to argue that beaker pottery is earlier than the copper age in the Peninsula, and it would be unwise to locate Ambrosio in the neolithic merely because no metal has been found, in the absence of absolute dates. The rest of the decorated pottery shows affinity with Andalusian cave pottery in general (Hoyo de la Mina, Cueva de la Mujer, Cueva de la Carigüela Cueva de la Victoria, Cueva de Nerja, Gibraltar caves, etc.) and the situation of the Cueva Ambrosio close to the main routes to the Guadalquivir basin is explicable in terms of such relationships.

The three sites are functionally different. Casa de Lara may represent no more than a popular area for hunters and sportsmen. Several thousand flint arrow-points have been found, and the Villena basin provided excellent hunting even in mediaeval times (see Boessneck, 1969). On the other hand, it may represent a more per-

manent station. The Cueva de los Toyos seems to have been a hoard, or perhaps a burial, though no human bones survived. The Vueva Ambrosio was most likely an occupation site, although it contained a burial. It is by a stream, and the absence of arrow-points suggests a domestic function.

Maps

The difficulty of assigning sites in the Segura and Vinalopó region to particular cultural stages or precise chronological periods, and the pitfalls inherent in distribution maps of type-fossils, make it advisable to present only three distribution maps. Maps 11 and 12 refer to burial constructions. It will be seen that these are sparse in the Segura and Vinalopó basins, but common in Almería and Granada provinces. The following categories are indicated: constructions of uncertain type, passage graves with circular chambers, passage graves with angular chambers, round (including oval) graves, tumuli. 'Splendid' burials are indicated. This is a subjective assessment. 48 sites or cemeteries are listed and bibliographical references given in the key to the map in the appendix. The map represents various diachronic sites in addition to synchronic ones. Burial constructions are the only sites whose function seems clear-cut. Other sites, either because they have not been excavated, or because excavation has been inconclusive, present greater problems.

Maps 13 and 14 represent cave sites. Should one call Cueva de los Toyos a burial site or an occupation site; it falls clearly into neither class ? Should the Cueva Ambrosio or Coveta de l'Or be denied a burial function, despite human remains from each cave, because they 'seem' like occupation sites ? The difficulty of ascertaining the cultural/chronological situation is even greater. Hence the escape route has been chosen of putting all cave sites

on the map, irrespective of diachronicity. Human remains are indicated by a symbol and the subjective assessment of 'splendid' burial caves has been made and indicated by a different symbol. One hundred and twenty-eight caves are shown, and bibliographical references given in the key to the maps in the appendix.

Open sites present the greatest problem of all, since sometimes they are no more than a handful of sherds from a surface find spot. All other sites, which are clearly not either caves or burial constructions, from which ceramic and/or bifacial flint points and/or metal objects are known, are on Maps 15,16. Cists not under tumuli have also been entered; these are usually 'Argaric', and because they occur at settlement sites often (in which case they are not separately mentioned) it seems appropriate to enter them on a map mainly concerned with open sites. Sites with finds characteristic of the Argaric cultural phenomenon are indicated by a special sign. Find spots of polished stone axes by themselves are <u>not</u> given. Bibliographical references to the 310 sites on this map are given in the key to the map.

The maps do not confine themselves just to sites in the Segura and Vinalopó basins, but include parts of the provinces of Valencia, Albacete, Granada, and Almería outside the research area. This will enable comparisons to be made with adjacent areas. Sites in Jaén province where it occurs on the map are given for Maps 13 and 14 only, since data was not available for the other maps.

For bibliographical details of sites, reference should be made to the aforementioned keys in the appendix where they have been omitted from the text in the interests of economy of space.

Sites of the Copper Age from the Segura and Vinalopó Basins

This section is fundamentally descriptive. Material which has been well published elsewhere will not be repeated, and material under study currently is also treated only very briefly. The aim of the survey is to present a corpus of unpublished or badly published material so that comparisons may be made with sites outside the area. The limitations to this have included inaccessibility of particular collections (e.g. La Bastida material), or in some cases their dispersal or even disappearance! Detailed treatment of ceramic technology and prehistoric human remains will follow in later chapters. The aim has been to focus attention on the actual material available in the Segura and Vinalopó basins, so as to allow comparisons to be made with the better publicised archaeological remains of Valencia or Almería. Material has been drawn wherever suitable and references are made to the appendix of illustrations. A few sites may be mentioned which have been referred to in earlier chapters. This is because of the difficulty in precisely ascertaining the cultural status of some sites, and to allow an open mind to be kept wherever there is reasonable doubt. The cave sites will be discussed first.

Cueva Santa, Caudete,(Albacete) Maps 13,14 no. 65

This cave site has yielded various human skeletal remains and was probably a burial cave of some importance. It has been repeatedly plundered by amateur excavators. Some material is in the Museo Provincial, Albacete (fig. 75, Pl. LXXVI,LXXVII). Illustrated here are an impressed ware bowl of impressed and incised ware similar to cardial-type decoration, and various sherds including one with incised lines and a curious handle (fig. 75 no.2). Pl.LXXVII shows plain sherds of baggy vessels, bowls and an Argaric-type rim sherd. The impressed decorated bowl is of red to buff colour, and

was/

was polished and burnished. There appears to be little mineral filler. Samples of other sherds were taken for analysis. There is also some material at the collection of the Centro Excursionista de Petrel, (Alicante), including a sherd which seems to be of the same impressed bowl, and the aforementioned incised sherd with a handle. Both collections have human skeletal material. The site has not been published. Cuenca (1973) reports that the archaeological material occurs in a layer of thermoclastic soil and scree lying on top of a bed of aeolian sands. Either the site is a 'post-cardial phase' site, or else a copper age site, the latter being perhaps indicated by sherds which have an Argaric-type profile. The site overlooks the upper reaches of the Vinalopó flood-plain just north of Villena, (Alicante).

Cueva de las Lechuzas, Villena,(Alicante) Map 13,14 no. 52

Some of the material from this burial cave has been published by Soler (1951), and the skeletal material has also been examined by the present writer. The artefacts are shown in fig. 100 nos. 1-33. Although no metal was found at the cave, the material so resembles other cave burials of the copper age (see below) as to warrant inclusion here. The material is in the Palacio Municipal, Museo Soler, at Villena. (1 sherd looks like beaker ware: M.J.W..)

Cueva del Cochino, Villena, (Alicante) Maps 13,14 no. 54

Soler (1956) refers to a few bifacial flint arrow-points and sherds from the upper layer at this cave and has illustrated them. Most of the deposit contains Mousterian remains.

Cueva del Alto, Villena, (Alicante) Maps 13,14 no,55

An unpublished cave with human skeletal remains. Copper ear-rings are illustrated in fig. 102.

Cueva de las Delicias, Villena,(Alicante) Maps 13,14 no.56

An unpublished cave with copper ear-rings, a flint arrow-

point, V-perforated toggles, a perforated whetstone/bracer object, bone punches, and three vessels (fig. 98). Material in Palacio Municipal, Villena.

Cueva del Font Calent, Alicante,(Alicante) Map 13,14 no.57

Erratum and Addendum

Cuevas de la Serreta la Vella

The skulls from this site are at the Centro Excursionista Eldense, not the Museo Provincial. The Elda collection has 3 polished stone axes from the site. Ballester (1928) refers to horse and deer bones and teeth, snail shells, Pectunculus shells, flint knives (i.e. long blades), 'una hacha gubia de petrosílex', and a copper lance point. There were various small caves or fissures.

The burial caves overlook the Vinalopó valley at Elda being situated on the mountain called Bolón. The material is in the collection of the Centro Excursionista Eldense,Elda, and is unpublished. There are two caves. The Penón del Trinitario is the spur which juts out from one end of the mountain, and at its peak is a small cave. Two female skeletons were reputedly buried here, and it is said that when they were found their hair was preserved and was red in colour, (dyed with ochre ?). The material from this cave (fig. 68 - 2 nos. 1 - 5) is of great interest, including the two copper rings illustrated and the two glass beads. Glass bead no. 4 in the fig. 68 is shiny and broken, such that it can be seen that in cross-section the glass is black, although from the outside it has white bands. The other bead is duller and has a spiral white band. There are also 69 very small beads of a discoidal shape made from shells, varying from 5 - 10 mm in diameter.
In addition the burial cave produced a piece of cloth with (?) tassels, a pine cone, 11 hazel nuts, some twigs embedded in earth (? basket), a piece of esparto twine with a thumb knot tied in it, a pile of small nuts and seeds which await identification, six burnt human teeth, a pile of 132 human teeth (including some milk teeth), 9 large snail shells, 62 Conus shells pierced at one end,

four/
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four fruit stones and 22 pieces of what look like bird droppings(?). In addition there were numerous small bones, some 70 small phalanx bones, 12 larger metatarsal or metacarpal bones, and 13 vertebrae of a small animal.

The second cave is some way down the mountainside below the one just described. The material is illustrated in fig. 68-1 nos.1-24. The cave was described as having a 250mm thick layer of ashy earth, deep to which the burial of a child was encountered. The skull is shown in Pl. CLXXIX. The one intact vessel has an angular profile and flared rim. The base is flat. Its wall is about 6 mm thick, and gives the impression of being rather more massive a form than is characteristic of Iberian iron age wares. However, it is hardly very like the other coarse sherds, nor are there any immediate parallels among the copper age sites of the Vinalopó valley, and the decorated bone or ivory pin is perhaps iron age.The pieces in the collection have acquisition numbers attached, but some pieces seem to be missing as there are gaps in the sequence.

The intact vessel is smoothed and well-made, being reddish-buff in colour. The other sherds are baggy in profile, some have lugs, and the rims are lightly pinched out. They are mostly buff or grey in colour. There are 8 sherds in all. Very small polished stone axes and larger axes occur, five altogether , a stone disc, and a stone pestle or hammer. A curved bronze or copper pin is present, and a crudely made flint point (fig. 68 no.6). There are 14 serrated flint flakes and blades, a serrated limestone flake, 4 flint blades without retouch, three pieces of chert, 16 unretouched flint flakes, a flint core, a boar's tusk, and a horse's molar, as well as 8 perforated bivalve sea shells.

Attention must be drawn to two curious objects, namely a hat-shaped,very small,hollow glass object of grey opaque colour,

and/
6:40

and the small,incised,polished bone pendant (fig. 68-1 no.10). This will be referred to subsequently as it is extremely important; it gives a clue as to the very early copper age date of this burial, and helps to explain the glass beads and other strange objects.

Cueva del Hacha, Petrel,(Alicante) Maps 13,14 no. 61

This small cave lies on the north bank of the Vinalopó opposite the Monastil rocky barrier (on top of which is an Iberian iron age settlement). A frontal bone and maxillary fragment, and a mandible (Pl. CLXXX) were found there, as well as two polished stone axes, a bone 'spatula' blade, and a copper rod. The material is in the collection of the Centro Excursionista Eldense.

Algorfa, (Alicante) Map 13,14 no.62.

The site was described as a burial below an overhang of rock (Furgús, 1905 rep. 1937) and will be referred to in a description of the Furgús collection material. The bifacial flint arrow-points of fig. 88 are from this burial site. Many of the finds seem to have become mixed up with those from other sites excavated by Furgús. Polished stone axes and a bone 'spatula' blade are illustrated in the 1937 publication referred to.

Cueva de la Murada, Peña Roja, Orihuela

This is mentioned in Furgús 1902a, but no details are given

Cueva de Roca, Orihuela,(Alicante) Maps 13,14 no. 63

This is the most important of the three Orihuela caves in the lower Segura basin. There was a human mandible, 14 perforated *Pecten maximus* shells, 15 *Conus* shells, and 16 *Cyclostoma elegans* shells (Vilanova, 1893). There seems to have been much other material in addition, of which there is no record.

The aforementioned three caves are near the mouth of the Segura. The mountains come close to the coast between the Vinalopó and Segura rivers, and contact between the valleys is via the coastal strip. Before considering the cave sites further up the Segura basin, mention must be made of the cave burials to the north of Alicante.

Cueva del Morro de la Barsella or del Monte de la Barsella, Torremanzanas, Jijona,(Alicante) Maps 13,14 no. 50.

This is an important cave burial a few miles north of Alicante which was investigated by Belda (1929,1931). The material is in the Alicante Provincial Museum (in the Diputación building). Apparently there were two stratigraphically consecutive groups of interment (Belda 1931). It is worth commenting in this connection that in contrast to passage graves, burials in caves were often sealed by earth, sometimes perhaps intentionally, sometimes due to natural causes, and that although many caves have been horribly excavated (and the one under consideration was no exception), nonetheless, the cave burial sites are less likely to have suffered from mixing of material due to later interments than the burial constructions of Almería, Granada and Portugal. The inventory of material at the Monte de la Barsella published in Belda's two articles is confusing, sometimes contradictory, and suggests a more extensive collection than that available to-day at the museum.

The upper series of burials contained an ivory comb, two ivory astragaloid beads, 2 V-perforated buttons of bone, 3 segmented bone pendants and 1 plain pendant, 2 bone bitriangular 'idols' and 4 fragments of others, several bone 'spatula' blade fragments, 6 bone awls or punches, 2 bangles made of crescentic pieces of Pectunculus shell, 2 retouched and 9 unretouched flint blades, and 2 or 3 blade fragments, a diorite polished stone axe, a silver ring, a copper ring, 2 copper chisels, 2 copper knife blades each with a single

rivet/
6:42

rivet hole and various globular and baggy pots and bowls, some with lugs. This is described in Belda (1931) as from the upper burial series. However, Belda (1929) referring to the campaign of excavation of that series reports 4 retouched flint knives (i.e. long blades), 1 silver and 1 copper ring, 1 lance point and 2 copper chisels, 3 polished stone axes, 2 segmented bone pendants, 2 bone awls, and fragments of one other, 1 bitriangular bone 'idol', the bone comb, 2 perforated stone pendants, a perforated bone discoidal button, 2 bone 'spatulae', 1 V-perforated bone toggle, and 1 astragaloid ivory perforated button. He also mentions a knife or halberd blade which has a heel plate and three rivet holes, of typically Argaric type from the illustration, and shows a wide range of pottery, some said to be from the 'lower caverns' . Four beads are mentioned, two of white stone, one of steatite and one of malachite, as also 2 deer teeth, a Columbella shell and 2 Cyprea. Goat, (?) gazelle*, deer, small mammal, (?) bird remains are mentioned, and snail shells. The skeletons were said to be sitting against the wall from the position of the lower post-cranial bones in the soil, though dispersal of the upper skeleton suggested that they had not been covered by soil above the waist. One skeleton was orientated E-W . Copper and silver artefacts were said to have been close to the skeletons, as also the axes and beads. The accounts are clearly most confusing.

Belda (1931) reports also on the lower series of burials, stratigraphically separate apparently (a section is given, op. cit., p. 56). A flat stone plaque with shoulders and a neck is shown, 12 flint knife blades are referred to, one with retouch and one with serrated retouch, ogival, rhomboidal and barbed and tanged flint bifacial arrow-points are illustrated, and one hundred and fifty-two are/

* This is not impossible: the extinct faunal atavism Myotragus balearicus (an antelope-gazelle form) was present until time of human occupation on Mallorca and Menorca, at the Cueva de Muleta (see C-14 table, and Waldren & Kopper, 1967)

two are mentioned in all. A retouched blade seems to have been worked to a crude point along one edge. Two small retouched bladelets were found, and 2 fragments of large unretouched blades, as well as a dubious burin, an unfinished flint point, 2 flint scrapers, 8 diorite and 1 fibrolite polished stone axes, and many thousands of stone beads, one being made of callais. 3 bitriangular bone 'idols' a bone 'double anchor' pendant, 4 segmented bone pendants, a segmented bone 'phallus' pendant, 2 segmented bone pin-heads, and 24 bone awls. (There appear to have been 2 segmented bone pin-heads in the upper burial series, with fragments of pins attached - deduced by a process of exclusion by the present writer!). A pendant axe is described from the lower burials, which is a miniature perforated polished axe with a sharp cutting edge. There were two metal pieces. A copper knife is mentioned and a leaf-shaped copper arrow-point. A bead with two holes was described as 'possibly glassy'. A malachite bead is mentioned, and one made from an olive stone.

Thirteen individuals were represented originally in the upper burial area, mainly adults, but one adolescent and 2 children were referred to. Eight individuals were buried in the lower area, presumably adults. The extant skulls have been studied by the writer (see Chapter 8).

The skin of pressed grapes and vine shoots were found, a grain of barley, wheat grains, leguminous seeds, and the olive stone bead.

The sixteen more or less intact vessels displayed at the Museo Provincial seem to have come mainly from the lower burial series, being black-grey or reddish in colour with large mineral filler crystals. They range from shallow bowls to ovoid bowls with lugs, globular vessels, and baggy pots with strangulated necks.

A few sherds were found in the upper burial series.

A polished whetstone/bracer object perforated at each end occurred in the upper burial series.

Belda (1931) mentions bones of cat, dog, boar, rabbit, goat and a pendant of deer antler.

The collection in the Museo Provincial has four astragaloid bone buttons, and four discoidal bone buttons, 43 retouched flint blade knives, and 142 bifacial flint arrow-points.

Since the material has been illustrated after a fashion, it is not illustrated here.

Alcoy caves

These are not dealt with in detail since they have been published elsewhere (see list of sites to Maps 13,14 for bibliographies) although the material from the Les Llometes cave and fissure (Pascual, 1963) is illustrated in fig. 67. Note the segmented pin-head. The Alcoy caves geographically belong with those of the Serpis valley which extends to the coast at Gandía. They are outside our area, but the skeletal material has been studied by the present writer for comparative purposes. Mention will be made of the archaeological material in the discussion of the Segura-Vinalopó burial caves shortly.

Sima de los Tiestos, Riopar,(Albacete) Maps 13,14 no. 70

This pothole is on a hill overlooking the Río Mundo tributary of the Segura close to the source of the former river. It was explored during the Operación Río Mundo of the Comite Nacional de Espeleología at which the present writer was present in 1970. Whilst he did not descend the pothole, he studied the pottery retrieved (fig. 73). Two Argaric carinated rim sherds, one of light brown straw-tempered ware, the other a dark burnished sherd are shown (nos. 1,2), and another sherd is probably Argaric also (no.3). The other sherds are of smoothed ware with prominent

mineral crystalline filler. Some sherds are lugged and some have lightly pinched out rims. A polished stone axe of granodi rite was found, also a human ver ebra. The material seems to have been tipped down the shaft, as it lay on a mound of scree at its foot.

Caves near Létur and Férez, (Albacete) Map 13,14 nos. 71-73

Little is known of these caves which lie in a region close to the upper reaches of the Segura. They are mentioned by Sánchez (1948), and two vessels in the Albacete Provincial Museum are shown in Plate LXXIV.

Other Albacete Caves Map 13,14 nos. 66 - 69

Equally little is known of these. A few sherds of coarse ware were found by the present writer at the Cueva del Queso, Alpera, and a bifacial flint arrow-point is reputed to come from the Cueva de las Calaveras (Cave of the Skulls), which may or may not have contained a burial (Zuazo,1916; Sánchez, 1948). A few nondescript flint flakes were found , and two sickle flints at the Cueva la Bella (in the collection of the Centro Excursionista, Petrel, Alicante) and are not illustrated. The Camarín cave at Pozo Cañada was visited by the present writer and few coarse sherds were found on the surface.

Cerro del Cuchillo, Yecla (Murcia) Maps 13,14 no. 74

A skull was found in a cave here (Plate CLXXVIII)and sherds of baggy vessels (fig. 79), now at the Museo Arqueológico, Murcia.

Cantos de la Visera, Monte Arabí, Yecla, (Murcia) Maps 13,14 no. 74a

Breuil & Burkitt (1915) refer to sherds from this cave and later upper palaeolithic flint implements. The cave has Levantine art.

Cueva del Peliciego, Jumilla, (Murcia) Maps 13,14 no. 75

Some grooved sherds from this cave are at the Museo Arqueológico, Murcia (fig. 61 nos.1,2,3). They may be late in date (e.g. Roman). A bifacial flint arrow-point and a curious polished stone pointed object of similar size are displayed

at the Museo Municipal, Jumilla, along with 14 sherds of what also looks like Classical period pottery and 16 of coarse plain wares which look earlier. There are bundles of wooden rods or twigs, 10 unworked flakes, 30 unworked blades of flint, an unfinished bifacial foliate arrow-point, 2 perforated long bones of a lagomorph and fragments of 3 other bones, and two white stone beads. There is a sliver of a bone of a larger mammal. The site is said to be at Alquería, Jumilla, and may be the cave with Levantine art.

Cueva del Poniente, Jumilla,(Murcia) Maps 13,14 no. 76

This site is also called Cueva del Peliciego. Possibly it is the same as the foregoing. There are six slivers of flat bone with oblique notches along one edge displayed at the Museo Municipal, Jumilla.

Cueva de Jaime el Barbudo,Carche, Jumilla,(Murcia) Maps 13,14 no. 77

Eleven coarse sherds, 2 perforated Pecten shells, a polished sandstone object, and piece of Iberian painted pottery are displayed at the Museo Municipal,Jumilla.

Cueva del Cabezo de los Yeseros,Jumilla,(Murcia) Maps 13,14 no. 78

This cave is spotted on a distribution map in the Museo Arqueológico,Murcia. Little is known of this site.

Cueva de los Tiestos, Jumilla,(Murcia) Maps 13,14 no. 79

This is an important cave burial site (see figs. 57, 105, 61, Plates LXXXIV,LXXV LXXVI). The material is at the Museo Municipal, Jumilla, and a full account is to be given in Molina (in press). The cave seems to have been first explored by Vilanova who reported on a cave burial at the Cabezo de las Salinas in the Boletín de la Real Academia de la Historia, 1891 (which I have not been able to consult at the time of writing), although it is possible this is a different cave. Recent excavations have been undertaken sr. and srta. Molina of Jumilla. The site is near the top of a hill where there is a tectonic cave (fig. 57). A side gallery near the entrance,

nce contains the burial. The section reveals that the burial was in sandy soil covered with a layer of rocks among which there was broken an Argaric vessel of black ware containing cereal grains. The grains were charred and comprise Triticum aestivum L., Hordeum vulgare (var. nudum) L., and 1 possible grain of Avena sativa (dubious) from a sample studied by Mr. G. Chadwick of the Seed Testing Dicision of the Dept. of Agriculture for Scotland. The vessel appears to have been broken over the soil of the burial and before subsequent deposition (whether by natural or artificial means) of scree. There were wood fragments of Pinus sp., and an (intrusive?) stone of Oliva europea.

Radiocarbon estimation of the charred grain by A.E.R.E., Harwell (9g giving 72.5 cm CO_2) gave 3790 ± 115 B.P. or, by subtracting 1950, 1840 B.C.. Calibration using the Bristlecone Pine calibration curves suggests an absolute date of 2,330 ± 160 B.C. (courtesy of Dr.R.L.Otlet). The date is roughly contemporary with a perhaps slightly earlier copper age open site nearby (see below).

A human mandible of a young person with a curiously vertically rising mandibular ramus was found, also some post-cranial bones.

The interesting feature of the burial is the presence of painted pottery (see fig. 61), mainly triangles and chevrons in red on buff, but also black schematic and 'oculus' motifs on buff. This last mentioned piece is unique. A sherd of incised ware and a sherd of impressed ware of pseudo-cardial type was found, and a rim with dot ornament in two parallel lines. Other plain sherds were present, and two ovoid cups, one with a long protruding lug handle with no perforation. A neck sherd of presumably a globular vessel was found with a lug placed vertically on the neck pierced by two holes. Some forty-five sherds of plaster vessels with criss-cross decoration were present. Some of the sherds of pottery have much

micaceous/
6:48

micaceous mineral crystal filler. About 44 plain sherds are in the assemblage, some of dark, some reddish, and some buff colours.

There is an extensive bonework assemblage, including 65 pieces of spatula blades. One has an end of neck-and-shoulders type, and two have notched or serrated ends. There is also a bone barbed arrow-point. About 103 lagomorph long bones with perforations, and 22 discoidal stone beads seem to have formed a necklace. There are also a perforated rectangular stone pendant, and 13 perforated Conus shells. A varied flint collection includes three retouched trapeziform pieces, a crude tanged point, 22 rhomboidal, 2 foliate and 1 barbed and tanged points, a long flint blade, retouched crescentic flint blade, a battered back retouched flint blade, 6 blades or fragments of blades, and 27 flint chips and flakes. A polished stone axe, part of a saddle quern, a snail shell, a boar's tusk, and a perforated boar's tusk were also found. Part of a bone awl or punch was present. Two cylindrical stone beads were also found.

While the section of the unexcavated part of the chamber was being cleaned for photography and drawing, further material was found (Plate LXXXV) including a copper point with a single rivet, 3 flint arrow-points, a sickle flint, 2 spatula blades, and more lagomorph, Conus and stone beads, as illustrated.

A section of the cave remains to be excavated.

Cehegín caves, (Murcia) Maps 13,14 nos. 84-88

These caves on Peñarrubia, Cehegín, overlook the Argos tributary of the Segura. The writer has visited the hill, but failed to locate the caves (or else the ones he found had been cleared utterly of archaeological material and fill). A skull was found in the Cueva Amador, which had an extensive collection of incised plaster 'sherds' (fig. 56 nos. 1 -59) and 1 of pottery (no.60),

bifacial flint arrow-points (nos. 65, 66), a segmented bone pendant and fragments of two others (nos. 62-4), a piece of polished bone, stone beads, and a small stone ball or pebble.Material from the other caves is shown in figs. 55 and 53. One of the stone beads from the Cueva de los Siete Pisos is of barrel shape, and that cave also yielded two small troncoconic vessels and three polished stone axes, as well as a bifacial rhomboidal point and sherds of baggy plain pottery, (see fig. 53).

The Cueva Amador contained a necklace of 367 cowrie shells, and 139 stone beads, mainly discoidal, though one was cylindrical and 1 cuboidal. It also yielded 5 animal phalanx bones, smoothed on one side. A collection of 60 stone beads of kidney or tear-drop shape from 'Cehegín' may have come from these caves. All the material is in the Museo Arqueológico, Murcia.

Cueva del Gato, Sierra del Roble,Moratalla,(Murcia) Maps 13,14 no. 80

This has been described earlier.

Abrigo Grande, Cieza,(Murcia) Maps 13,14 no. 81

This has been described earlier.

Cueva de la Loma de los Peregrinos,Alguazas,(Murcia)Maps 13,14 no. 89

This 'artificial burial cave' has been well published by Nieto (1959) . It has been considered part of a generic series of such caves by Berdichewsky (1964). Suffice it to say that the copper rods and needles, bifacial flint points, dagger and plaque, polished stone axes, stone beads, segmented pendant and coarse pot bowls would not be out of place in the other cave burials

Cueva de la Moneda,Alhama de Murcia,(Murcia) Maps 13,14 no.90

Archaeological remains of uncertain character are reported from this cave. Possibly it is the cave from which Pericot (1928) referred to a Pectunculus bangle.

Cueva de los Blanquizares de Lébor,Totana,(Murcia) Maps 13,14 no. 91

This cave has been very well published by Arribas (1953) and/

and it will suffice, therefore, simply to comment on the trepanned skull (Plate CLXXVII), the elaborate bonework, including a 'double-anchor' pendant (Plate LXXIII), painted alabaster vessel (Plate LXXII), flintwork of all types of bifacial points (including hollow based forms), violin-type stone 'idol' with arms, and cruciform stone idols, bone 'hook' pendant, bitriangular bone 'idols', wooden combs, beads of amber, alabaster and other materials, double cup with communicating hole (Plate LXXII - c.p. Sarsa), bell beaker, baggy wares (including incised vessels), and some carinated vessels which recall Argaric profiles. Metal was rare; a trace of metal slag was found in a pot. The reader is referred to Arribas' article for a detailed inventory and for illustrations.

Cueva del Campico del Centeno, Totana, (Murcia) maps 13,14 no. 92

A polished stone axe and two bifacial points are in the Museo Arqueológico, Murcia. The cave is mentioned in del Val (1948) and Martínez Santa-Olalla et al. (1948), the material presumably coming from their explorations in the region. No details are published. (See fig.74.)

Cueva de la Jabonera, Totana,(Murcia) maps 13,14 no. 93

This burial cave yielded burnt remains, 9 flint arrow-points, 2 flint blades, bone points/awls and beads (Leisner & Leisner,1943).

Cueva del Palomarico, Totana,(Murcia) maps 13,14 no. 94

. Presumably it is the cave referred to earlier in connection with the flint illustrated by Siret (1893, p. 503 fig. 41 no. 46), which may be upper palaeolithic.

Cueva de la Tazona,Totana (Murcia) maps 13,14 no. 95

The same comments apply. The Siret illustration is numbered 43 in the same figure. A rhomboidal point is quoted by Leisner & Leisner,1943.

Cueva del Cejo del Pantano, Totana, (Murcia) maps 13,14 no. 96

This site is mentioned by Martínez Santa-Olalla et al. (1948)/

6:51

(1948) in connection with supposedly Solutrean bifacial flints found by Cuadrado Ruiz, but which Martínez Santa-Olalla held were much later (neolithic, or perhaps even copper age ?).

Cueva de Montajú, Ramonete, Lorca, (Murcia) maps 13,14 no. 97

This is a cave near the coast referred to by Siret & Siret (1887) who report that a flat copper axe was found there.

Cueva de la Bermeja, near Hinojar (Murcia) maps 13, 14 nos. 98

This is a find spot marked on a map at the Museo Arqueológico, Murcia. Nothing further is known.

Cueva del Base Naval, Cartagena, (Murcia) mapss 13,14 no. 99

This cave could not be visited as it is on naval property, but private information of a collection of bifacial flint points from this cave was given to the writer.

Cueva de Pelcheles, Ifre, Mazarrón,(Murcia) maps 13,14 no. 100

The cave is mentioned by Siret & Siret (1887) who seem to have misspelt the name 'Percheles' . The present writer searched intensively, but failed to find the cave referred to. A rhomboidal arrow-point, some sherds, and a grain muller were found, and nearby two polished stone axes.

Cueva Ahumada, Ifre, Mazarrón, (Murcia) maps 13,14 no.101

A rock shelter containing flakes and sherds is mentioned by Siret & Siret (1887).

Cueva de Parazuelos, Ifre, Mazarrón, (Murcia) maps 13,14 no. 102

Sherds and a polished stone axe are mentioned by Siret & Siret (1887). The present writer could not locate the cave, though an intensive search was made.

Cueva del Agua, Ramonete, Lorca, (Murcia) maps 13,14 no. 103

The Sirets were given a bronze flat axe from this cave and state that there were deposits which were destroyed (Siret & Siret, 1887). With the collaboration of the owner, a survey was made of the cave (fig. 58) in the hope of finding chambers with occupation material, since it is an extensive cave. However, nothing was found at all.

Cueva de los Toyos, Ifre, Mazarrón, (Murcia) maps 13,14 no 104

This has been described earlier.

Cueva de Lucas, Águilas, (Murcia) maps 13,14 no. 105

This receives passing mention in Siret & Siret (1887) and Pericot (1928) refers to a Pectunculus bangle from the cave.

Cueva Ambrosio, Vélez Blanco, (Almería) maps 13,14 no. 106

This cave has been mentioned previously.

Cueva de Fuente de los Molinos, Vélez Blanco, (Almería) maps 13,14 no. 107

This cave has been referred to earlier.

Cueva de los Letreros, Vélez Blanco, (Almería) maps 13,14 no.108

This cave has been dealt with in connection with the schematic art paintings. It apparently contained a burial (Barras de Aragón, Actas y Memorias Soc.Esp.Ant.Etn.Preh. XI (1932) pp. 8-13). There is no trace of soil in the cave now.

The foregoing exhausts the known cave sites in the Segura and Vinalopó river basins . Burial constructions will now be listed. As regards the river basins of the research area, these are few indeed.

Cerrico Redondo, Montealegre del Castillo, (Albacete) maps 11,12 no. 4

This is a tumulus with various burial areas underneath which were apparently marked by extensive areas of ashy soil. It is not clear how the burials were demarcated, whether they were in cists, jars or natural fissures below the mound, as was the case at some other sites. The material is in the Albacete Provincial Museum. Preparation for publication is in progress, and the material is therefore not given here. A preliminary reference to the site is given in Sánchez.(1948) . There are typical Argaric ceramic forms among the vessels. The forthcoming publication will be by sr. de los Santos Gallego.

Cegarrón, La Cueva, Montealegre del Castillo, (Albacete), maps 11,12 no.4

This tumulus is nearby the aforementioned, and is also referred to by Sánchez, and the material is in the Albacete museum. There was apparently a nearby settlement, and it is not clear which finds are from which. Some sherds from 'Cegarrón' are shown in fig.

103. The collection includes two possibly 'Argaric' vessels with everted rims made of dark ware and small in size, 2 open profile bowls of red ware, a small globular vessel with an inturned rim, and a large carinated bowl 250 mm wide at the mouth and 220 mm tall. No metal is displayed, merely a bone awl, a saddle quern and rubbing stone for it, 2 flint nuclei, 2 sickle flint flakes, and 5 other flakes. There are also two sherds, one with a lug and one with colander perforations. Possibly the material is from the open site, not the tumulus.

Fontanar, Hoya Gonzalo, (Albacete) maps 11,12 no. 4a

A tumulus is referred to here by Sánchez (1948).

Dehesa de Caracolares, Tiriez, (Albacete) maps 11,12 no 5

The material in the Albacete Provincial Museum from this tumulus includes 3 small carinated vessels with everted rims, 2 large carinated 'urns' and a smaller one, a globular vessel with an inturned rim, 4 copper arrow-points, 1 two-rivetted knife of copper, 3 copper rods of square section, a serrated metal blade with two rivet holes, a bone pendant, a slate pendant with three holes at one end which is somewhat wider than the rest of the piece, a fibrolite polished stone axe and 2 granodiorite axes, two bone awls and a bone pendant. There were also 20 stone beads of discoidal shape except for one barrel-shaped bead, 5 copper arrow-heads, and 17 bone awls.

Las Almagreras, (Albacete)

The location is unknown. A tumulus is mentioned by Sánchez (1948) who shows 24 hollow based flint points and 1 axe-shaped Egyptian-type flint point, unique in the south-east:



Peñuela I and II, Pozo Cañada, (Albacete) maps 11,12 no.6

These two tumuli were somewhat strange. Peñuela II is illustrated by Sánchez (1948) and it had a large central chamber with dry stone walling. Vessels illustrated from the tumuli include 3 Argaric carinated pots, 3 carinated handled vessels, an open bowl, and a large carinated urn with lines of lugs rising radially upwards from the deep base as far as the carination.

Cervine bones were found. The material is in the Albacete Provincial Museum.

Vilches, Minateda, Hellín,(Albacete) maps 11,12 no.7

There are no details of this tumulus which is mentioned in Sánchez (1948).

Laderas del Castillo, Callosa de Segura,(Alicante) maps 11,12 no 8

Colominas (1936) described various kinds of burial on this hillside near to the mouth of the Río Segura: jar burials, cists, slab lined graves, and burials under mounds of stones which had been covered with earth. Both inhumation and cremation were practised. He illustrated a sample of pottery which appears to include carinated Argaric vessels and globular and baggy vessels, some with strangulated necks and somewith lugs (including one lugged Argaric carinated urn). Metal Argaric halberds with four rivet holes, knives/daggers with three and two holes, and metal rods or pins are shown. Sickle flints are illustrated and two perforated polisher/whetstone/bracer objects, and a fragment of one other. Seven bone awls, an imitation bone saw, an imitation bone barbed and tanged arrowpoint, and seven tubular bone beads are shown. There may be material from Furgús' excavations which comes from similar burials. The Furgús collection will be dealt with later on. Presumably Colominas' material is at Barcelona in the Museo Arqueológico.

Laderas de San Antón,Orihuela,(Alicante) maps 11,12 no.8a.

Cairns were described by Furgús (1902, rep.1937), and the material will be discussed along with the rest of the Furgús collection later on.

Loma de los Paletones,Totana,(Murcia) maps 11,12 no. 9

Leisner and Leisner (1943) report that the Sirets dug a a passage grave with trapezoidal chamber,but no finds were made.

Sierra del Cano,Lorca,(Murcia) maps 11,12 no.10

Vilanova and de la Rada (1894) found polished stone axes, flint arrow-points, saw-like pieces (sickle flints probably),human and lagomorph bones, bird bones, and red coloured sherds. It is

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Piedras de Verzara, Lorca, (Murcia) maps 11, 12 no.11

This was a small circular chambered passage grave excavated by Siret which contained 2 skeletons, a polished stone axe, a flint chip (trapeze?), and sherds, (Leisner & Leisner,1943).

Mazarrón, (Murcia) maps 11,12 no. 13

Five graves o unknown shape are said to have been dug by Siret (Leisner & Leisner, 1943), apparently providing baggy pottery forms. The site is described as the Rambla de los Ruices, Ifre. However, the present landowner, sr. Eleuterio Ruiz, could throw no light on the whereabouts of the graves. One might wonder if there was not some confusion with the Parazuelos cists and graves which are not megalithic (Siret & Siret, 1887,pp. 48-49), one of which yielded the strange urn with impressed cordons and vertical rows of perforated lugs. It had a decorative pattern on the base. However, this appears unlikely, and the Parazuelos site is listed separately.

Parazuelos, Mazarrón, (Murcia) maps 11,12 no. 14

The Sirets (op. cit.) describe 3 cists, one rectangular, one irregular. The first contained a flat based lightly carinated vessel with a vertical neck and slightly everted rim, and a carinated flared-rim bowl. There was a flat based sherd of another vessel. The second grave contained a flat based vessel which was incomplete, but perhaps like the first which was described above. The third grave produced two vessels containing cremated bones. Another urn was found near the site of the second cist. The vessel with cordons and perforated rising bands of lugs was found some distance away at a separate, undescribed location.

Canada del Alba, Puerto Lumbreras, (Murcia) maps 11,12 no. 12

Thirty cairns were described by de la Vega del Sella (1929) of which one was excavated and two slab-lined graves 0.5 metres wide were found below the mound. The remainder were then excavated and the same arrangement was encountered. Many snail shells of Helix punctatus and H. nemoralis were found. There were traces of burning, but no other remains whatever were discovered. The writer has visited the area and located the nearby settlement which was also referred to, where there is a great deal of prehistoric pottery on the ground.

However/
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However, the mounds were no doubt completely destroyed by the excavators, as there is nothing visible now.

Vélez Blanco, (Almería) maps 11,12 no. 15

De Motos excavated twelve round graves near Vélez Blanco which apparently could be divided into a group with flint blades, Pectunculus bangles, . perforated Columbella beads, flint trapeze points, a barbed and tanged point, a flint dagger and a lugged vessel, on the one hand, and a group with flint arrow-points, callaïs beads, limestone beads, and copper rings and punches/awls, on the other. All the graves were under mounds. One of the graves with copper objects had a dry stone cupola roof. (de Motos: La Edad Neolítica En Vélez Blanco, Mem. del C.I.P.P. no. 19.)

Cerro de la Alquería, Vélez Rubio, (Almería) maps 11,12 no. 16

A round grave with skeletal remains is referred to by the Leisners, and three oval graves with skeletons, one containing a Pectunculus bangle, and one a bowl, (Leisner & Leisner, 1943).

The surface sites (see maps 15,16) will now be briefly dealt with. Although there are a great many entries on the map, many refer to passing references to a 'poblado' about which nothing more is known. It is pointless to list all of these here, as they are listed, with bibliography, in the key to the maps in the appendix. Only sites from which material is available or published will be listed therefore.

Casa de Lara, Villena, (Alicante) maps 15,16 no. 63

This has been mentioned earlier, so no further reference is needed.

Cabezo Redondo, Villena, (Alicante) maps 15,16 no. 64

This important settlement site is being currently prepared for preparation by Soler, and therefore only a few brief comments will be offered. It has been dated by radiocarbon to about 1,600 B.C. in radiocarbon years (see list of dates). Some of the material is illustrated in fig. 102, although there is a vast amount which has been obtained from the excavations and will soon be published. Attention

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may be directed to the stone and bone 'idols' (nos. 7, 15) and the imitation bone arrow-points (nos. 17, 19). The pottery shows Argaric carinated vessels and baggy shapes. Copper tools includes simple flat axes (no.1), tanged daggers (no.2) and arrow-points (nos.5,21). There is a pottery spoon (no.20). A sherd of excised pottery is illustrated in fig. 97 also*. The collection is at the Palacio Municipal,Villena.

Cerrico de la Escoba, Villena,(Alicante) maps 15,16 no. 65.

Material from this open site is at the Palacio Municipal, Villena, and is unpublished. Fig. 102 shows a colander vessel, two flint barbed and tanged arrow-points, 2 copper rods and a sickle flint

Acequia del Rey, Villena, (Alicante) maps 15,16 no. 66

There are various decorated sherds, 4 barbed and tanged flint points, long unretouched flint blades, and a fragment of a marble bangle from this drainage channel, as well as 3 polished stone axes. The pottery is decorated by dot ornament and O-stamp ornament. This last mentioned only occurs at one other site in the region, the Elche Castillo site (see below) further down the Vinalopó valley. It may not be prehistoric pottery at all, however. The site is unpublished.

Puntal de los Carniceros,Villena,(Alicante) maps 15,16 no. 67

A collection of beaker sherds and one complete beaker bowl (fig. 97) comes from this site. The material is at the Museo Soler, Palacio Municipal, Villena. The material is unpublished.

Peñón de la Zorra, Villena, (Alicante) maps 15,16 no. 68

A carinated Argaric urn, whetstones/bracers, 2 copper or bronze lance points and a tanged copper or bronze dagger (fig. 102) was found at this site, with various beads of stone. The material is at the Palacio Municipal, Villena, and is unpublished.

La Languilla, Villena, (Alicante) maps 15,16 no. 69

Five unretouched flint blades, sickle flints, a tanged copp. arrow-point, a large pottery bowl and a collection of sherds was made at this site. The material is at the Palacio Municipal, Villena, and is unpublished. (See fig. 102). 6:58

*It is worth mentioning that there is also a double cup vessel from Cabezo Redondo and there are also spindle whorls.

Cabezos de Valera, Villena, (Alicante) maps 15,16 no. 70

A rough-out polished stone axe, some dark coarse sherds and sickle flints from this place are at the Palacio Municipal, Villena. The material is unpublished.

Peñón del Rey, Villena, (Alicante) maps 15,16 no.71

Coarse sherds and sickle flints were found at this find spot; material in Palacio Municipal , Villena, unpublished.

Las Penicas, Villena, (Alicante) maps 15,16 no. 72

Two fragments of copper, 13 sickle flints, a whetstone/bracer object, 17 bone awls, 3 V-perforated bone toggles, many cordon decorated and lugged sherds, and three intact vessels (see fig. 98) are displayed from this site at the Palacio Municipal,Villena. The material is unpublished.

Arenal de la Virgen,Casa de Lara, Villena, (Alicante) maps 15,16 no.73

Two post-cardial vessels (fig,97) from this site have already received mention (and see Soler, 1965). They are at the Palacio Municipal, Villena.

Fregenal de la Fuente Mayor,Torremanzanas,Jijona,(Alicante) maps 15,16 no.74

A plain marble bracelet, a polished stone axe of quartzite, a sickle flint, a retouched flint blade, about 45 unretouched flint blades and flakes and 35 very small flint rods, crescents and two thumbnail scrapers are displayed at the Alicante Provincial Museum from this site.

Catí Foradá,Petrel,(Alicante) maps 15,16 no. 75

This site was noted by Jiménez de Cisneros (1909a,1911) who found a polished nephrite chisel of rock very similar to an axe he found at Tabayá near Elche. The present writer visited the site which is high in the hills behind Petrel and above the Vinalopó valley. A large collection of coarse, micaceous, lugged sherds of nondescript profile (bowls,baggy forms) was made from the surface. A sickle flint was also found. One sherd (fig.77) is part of the

body/
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body and neck of a globular vessel with perforated lugs below the rim. Some sherds in the collection of the Centro Excursionista de Petrel (where the aforementioned sherd is) bear finger tip impressions in a horizontal line around the body just below a strangulated neck, and others have slashed impressions on applied cordons. A rough-out polished stone axe is in that collection.

Cati Foradá is the name of a peak rising to 933 metres above sea-level above the Rambla Cachuli. On the opposite side of this rocky spur from the valley, the south side, there is a flattish piece of land 50 metres below the peak which rises above it in a series of cliffs. On the Madrid meridian, this is at about E 2^{o} 59' 45" and N 38^{o} 30' 30". It is a strip of land about half a kilometre long by 150 metres deep, backing up against the rocky spur which runs SW - NE . At the extreme NE end of the spur, there is a natural rock arc, hence the name 'Foradá', i.e. 'holed' in Valencian.

The flattish strip is covered with pieces of pottery, flint chips, saddle querns and rubbing stones, but there are no traces of walls or structures. A trial cutting was laid out running out from the cliff near its SW end (fig. 104:plan and section; the cliff is at the left-hand end of the cutting on the plan). Two quite featureless sherds were found at locations indicated on the plan, and various saddle querns in a loose line of stones which hardly merits the designation of a 'structural feature' . There was no stratigraphical differentiation of the powdery, grey soil at any place (i.e. no foundation trench for the stones, no identifiable layers). Close by a stone (see plan) a very small number of grains of Hordeum vulgare (var. nudum) L., which were charred and blackened, was found. These were studied (see below) and submitted subsequently for radiocarbon estimation to the University of

Birmingham laboratory. The date obtained based on the 5,570 ½-life is: Birm-199 3502 ± 150 B.P. from which subtraction of 1950 gives: 1,552 B.C.

This is to be regarded as: 1,550 B.C.

since rounding to the nearest multiple of 5 years is conventional, (see Shotton & Williams, 1971).

The site is roughly contemporary with Pic dels Corbs, (Valencia), and Cabezo Redondo, Villena, (Alicante), which latter is only about 20 kilometres further north (see list of C-14 dates). Only slightly earlier is the date from Ereta del Pedregal, Navarrés, (Valencia), and that from the Cueva de los Tiestos, Jumilla,(Murcia) In 'absolute' terms, the dates range from about 2,400 - 1,900 B.C. by analogy with the Bristlecone Pine corrections provided for the Tiestos sample and based on Damon et al. (1972) .

Mirabuenos, Petrel, (Alicante) maps 15,16 no. 76

This is another open site in the hills behind Petrel which the writer visited and where a collection of coarse sherds was made.

Monastil, Elda, (Alicante) maps 15,16 no. 77

On a rocky spur which blocks the Vinalopó valley through which the river has cut a small gorge there is ab Iberian iron age settlement which has been dug by the Centro Excursionista. A few items, said to be from the lower levels are perhaps of greater antiquity. They are in the collection of the C.E.E. and mention may be made of a polished stone pestle or hammer, coarse lugged sherds of bowls and baggy vessels, and one sherd with incised decoration (ladder pattern and hachured triangle), a polished stone adze, 3 quartzite polished stone axes, a barbed and tanged flint arrow-point, 4 sickle flints, 2 bone punches, 35 other pieces of flint and quartzite, a polished stone pendant, and various animal remains (horse, boar, deer, snails, and various sea shells). There is little point in

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giving a detailed description or illustrations, since the site has been dug in so frightful a manner that the provenance of the artefacts cannot be ascertained.

Sites near Novelda,(Alicante) maps 15,16 nos. 78-81

Little is known of these sites other than the references given (Jiménez de Cisneros, 1909a; Explicación... 1950). The present writer attempted to locate the Loma del Cementerio site, but found nothing.

Laderas del Vinalopó, Elche, (Alicante) maps 15,16 no. 82

The material found on the banks of the river is illustrated in fig. 67 and consists of polished stone axes and some flint points in the Museo Municipal, Elche (unpublished).

Figuera Redonda, Elche,(Alicante) maps 15,16 no.83

Lugged sherds, polished stone axes, backed flint blades, sickle flints and bifacial arrow-points are displayed at the Museo Municipal, Elche. The material is shown in fig. 66, and has not previously been published.

Castellar de Morera, Elche, (Alicante) maps 15,16 no. 84

Prehistoric material is known from the hillside on which a Moorish castle overlooks the Vinalopó to the north of Elche. The present writer has visited the site. Finds in the Museo Municipal, Elche, are shown in fig. 66 nos. 1 - 17. Discoveries of prehistoric material were recorded by Jiménez de Cisneros (1909, 1909a,1910). Polished stone axes, sickle flints, a curious barrel-profile bifacial flint arrow-point, a stone mould metal bangles, and an S-headed pin are displayed at the museum. Some of the material may be of later than prehistoric age.

Tabayá, Elche,(Alicante) maps 15,16 no. 85

This prehistoric hill-top settlement is immediately opposite the previous site, and the writer has made a collection of featureless and lugged sherds from the surface. Probably the material illustrated in fig. 69 nos. 1-56 owned by sr. Mira of Novelda comes

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from clandestine digging at the site, which is scarred by pits of recent work. The collection contains incised and dot ornamented sherds, and some which are of beaker decorative type (e.g. no.41). Polished stone axes are in the assemblage, and the present writer knows of another axe definitely from the site, in addition to a nephrite axe described by Jiménez de Cisneros from Tabayá (1909a), compared by him to a nephrite chisel he found at Catí, Petrel.

Sites 86-90 near Elche and near San Vicente de Raspeig (Alicante) maps 15,16

Little is known of these sites apart from mentions in the references quoted.

Sierra Grossa, Alicante, (Alicante) maps 15,16 no.91

This settlement has been published by Llobregat (1971) on the basis of material from Belda's earlier excavations. There is no need to reproduce the material here, therefore. The vessels are baggy, some with handles and lugs, and also carinated vessels. Round based and flat based vessels are illustrated by Llobregat. Some have decorated cordons. Polished stone axes, clay weights, sickle flints, bone awls, a copper punch and a copper blade are illustrated.

Carpello island, (Alicante) maps 15,16 no. 92

This site was excavated and published by Figueras (1934). The pottery, like that from the Sierra Grossa, is at the Alicante Provincial Museum and is similar. There are deep and shallow bowls, some with lugs, a lightly carinated vessel with a handle, a tronco-conic flat based flower-pot like-vessel, and a globular bowl with a closed profile with dot ornamentation in the form of dependant triangles (point downwards) around the mouth. This is unusual.

Cabezo de El Negret, Agost, (Alicante) maps 15,16 no. 93

The present writer has made a collection of coarse feature-less sherds from this site which is on a hill-top and where remains of walls can be discerned. It is referred to by Jiménez de Cisneros (1912) and in Explicación ... 1950 .

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Santa Pola,(Alicante) maps 15,16 no. 94

All that is known of this find spot is a reference to flints, including 'knives' (i.e. large blades), polished stone tools, bone awls, and perforated shells (Ibarra y Ruiz, 1895, p. 8).

Peñón de Caro-Chita, La Torre de Massanes,(Alicante) maps 15,16 no.95

A settlement here is referred to by Llobregat (1971).

Laderas de San Antón, Orihuela and Laderas del Castillo, Callosa de Segura, (Alicante) maps 15,16 nos. 96,97

Mention has earlier been made of the Callosa del Segura burials, and it was stated that whilst some were under mounds, others were in cists, slab lined graves, and jars, ('J.C.' i.e. Colominas, 1931; Colominas,1936). The material need not be referred to again here. The Jesuit P. Furgús excavated many sites near Orihuela and Callosa between 1900 and 1910 and some of his early articles were reprinted by the S.I.P. of Valencia in 1937 . A collection, perhaps donated by Furgús, was kept in the house of a sr. T.Brotóns also. This latter was published by Albert (1945) and apparently came from the Laderas de San Antón, Orihuela (i.e. hillside above the San Antón suburb of Orihuela). This collection contained about 40 intact pots, including open and closed profile bowls, some with lugs, carinated 'Argaric' bowls and deeper pots, one with a handle at least, and at least two vessels with a more baggy profile and strangulated neck which have foot-rings. Three single rivet-hole, two double rivet-hole, and two un perforated copper blades without tangs are shown, as is a tanged copper arrow-point and three copper rings. Four rings and bangles of gold and silver are illustrated. Two whetstone/bracer objects and a fragment of a third, a sickle flint and a saw on a flint blade are depicted. Fragments of bone awls and of a bone imitation dagger blade are illustrated.

These objects may or may not have been found by Padre Furgús. His collection was dispersed when the seminary was overrun during the Republican period early in the Civil War. Some was removed

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by the Jesuits and has been examined by the writer at their high school, the Colegio de la Inmaculada Concepción, Alicante. A part of the collection, mainly pottery, is held at the Biblioteca Pública, Orihuela, and has also been examined by the writer. There is possibly other material, too, since a cousin of the present writer's wife recalls seeing prehistoric skulls at the high school run by the Dominican order at Orihuela, and local informants agree that Furgús gave much of the material away, perhaps for safe-keeping owing to the imminence of war. The early articles of Furgús are almost unobtainable, except for one in the Bol.Real Acad. de la Historia LIV for 1909, and reference must be made to the 1937 reprints for the most part. There are also a few finds displayed at the Museo Arqueológico, Murcia, from San Antón, and these have also been drawn by the present writer.

The principal drawback to the 1937 publication is that the photographs of the archaeological artefacts clearly do not relate to the descriptions of the excavations in the articles, but are a poor photographic record of Furgús' collection as it was before the Civil War. They are fuzzy and difficult to interpret. Hence the need for a set of scale drawings.

Figures 82 - 88 depict 239 items at the Biblioteca Pública and Colegio de la Inmaculada Concepción. Figure 89 nos. 1 - 24 depict material at the Murcia museum. Scales are given, and the text need not be overburdened with measurements. A full publication is envisaged in due course. Some of the material is labelled, though the ink has run on many of the labels. The labels take two forms: e.g. 1-34, 3-11, and also single sets of numbers, e.g 40, 125. Where these have been present, they are given on the figures, followed by the letter 'A' referring to the Alicante collection or O referring to the Orihuela collection. Other items without

labels are drawn as follows: my numbering 79 -131 inclusive represents pottery at Orihuela; nos. 132 - 180 represents metal objects at Alicante and 181 a metal object at Orihuela; nos. 182 - 218 inclusive are stone and bone objects at Alicante, and nos. 219 - 239 are stone objects at Orihuela. The following material from Alicante is not illustrated: 3 spirally wound rings of 3 turns each and 32 mm in diameter of round gold wire, and 4 small finger rings wound spirally in 2 turns each of round gold wire, a ring of a flat gold strip wound twice, a bangle of 46 gold 'bells' about 5 mm in size separated by a white stone spacer bead at every fifth bead, 48 small fragments of copper or bronze pins and nails, 3 or 4 slender tubes of rolled sheet bronze of which one is labelled 'Lucentum', 2 fibulae, various iron nails and fragments of iron rings or buckles, 4 perforated shells, one bearing the number '703', 4 other shells, 5 spirally wound rings of 3 turns each of iron (?), a perforated Conus shell, and 2 slivers of bone. The following material from Orihuela is not illustrated: a copper or bronze pin, 3 bone spatula objects, 3 rectangular slivers of bone, 2 bone awls, and a fragment of what might be a bone bangle. The gold ornaments were photographed in colour but a successful black and white plate could not be made.

It is clear that not all the material in the collection is from San Antón, Callosa and the Algorfa burial. One pot is labelled 'Castillo,Monteagudo' and a blade is similarly labelled. These come from Monteagudo, Murcia, (Murcia), quite obviously. The metal tube labelled 'Lucentum' must come from a Roman site. Also, the 1937 photographs of the collection show much Iberian painted pottery from San Antón which is now missing, at least from the collections examined here. There is also recorded in the 1937 photographs a collection of flints (including sickle flints) from the Cueva de Roca, which has not been located.

It/
6:65

It is fitting to turn to Furgús' accounts of the locations of the San Antón and Callosa sites. The former was described as an area 500 x 50-100 metres at the foot of the hill called Muela. Dark soil, 3-4 metres deep, containing inhumations and cremations yielded the Iberian pottery of iron age date. shoulders of the mountain range between the craggy peaks above there were 4 stone-lined chambers with bones, grain rubbers and querns, flints, black sherds and a Pecten shell. Lower down (presumably) there were ruined cairns and barrows. Under these were cists about a metre long containing single, crouched inhumations with a large pot by the head, a sword or dagger by the waist, a lance or arrow-point, or else bone awls, polished stone axes or chisels. The stones and earth over the cists contained a variety of artefacts also including copper/bronze or bone awls, needles, spatulae and blades, saws, as well as flint cores, piercers, daggers, saws, arrow-points, a lance point, scrapers, a polished flint piece and dentate pieces, polished stone axes, saddle querns and rubbers, 4 or 5 stone figurines, stone hammers and 'picks', red colouring matter, sea shells of many species and usually perforated, clay weights, whetstones and sherds, and remains of animals - teeth, tusks, antlers. Other burials, sometimes of females allegedly, were in holes in the ground covered with ashy soil and containing animal remains. These had richer funerary remains, viz. silver tubes (perhaps beads), bronze rings, silver bangles, gold spiral bangles, silver and bronze ear-rings, bone and ivory buttons, beads, bangles, boar tusk pendants, stone beads, many types of pottery vessels, pot spoons and buttons.

Most of the jar burials contained only human remains, usually burnt appart from isolated instances of ear-rings and beads. Around the urns were placed other pots, bone awls and flint tools.

Simple cists are also described. These apparently were full of sand, had few bones, and even fewer artefacts (a bronze dagger and 2 sherds in toto). One cist had a skull beneath the bottom floor stone of the box.

The Callosa material seems to have been very similar. The Algorfa cave burial appears to have had many more bifacial flint arrow-points (barbed and tanged, rhomboidal, foliate) than are now left (nos. 232 - 239 only), as well as polished stone axes, bone awls and a 'spatula', and five baggy vessels and bowls. There may have been two copper pins or rods. It is impossible to interpret the photographs unambiguously.

One cist had a cup-marked slab, according to the photographs.

The 1909 article refers to a second site at San Antón, near to the first. The material depicted is much the same halberds, flat axes, knives, and arrow-points of copper or bronze, carinated and Argaric pottery, an imitation bone saw, part of a flint palette with cortex remaining, and a hollow based bifacial arrow-point, among other items.

The material in the Museo Arqueológico, Murcia, is much the same (see fig. 89) but includes three bone pommels (nos. 11,12,13).

Many of the metal objects at the Alicante collection have pieces of cloth attached, as well as wood, preserved by impregnation with the metal salts. Various copper awls are mounted in bone handles.

Even where the acquisition numbers are present (my numbers 1 - 78 inclusive) it is impossible to make much sense of them. It seems unlikely that the first number of the two-number labels refers just to one burial, since the second number goes as high as 95 in one case. Perhaps they refer to campaign seasons. Furgús excavated between 1902 - 1908 apparently. The necklace of gold bells apparently came from San Antón . The illustrations of 1937 only show 3

flat
6:67

flat metal axes, two halberds, 2 copper knife blades, two copper arrow-points, . 2 rods or awls of metal, and ten vessels which are definitely illustrated under the caption of Callosa. The vessels numbered 80,81, and the metal objects numbered 132,133,134, 139,140,141 are likely to be from among those in the photograph.

Perhaps the majority of the other pieces are from San Antón. There now is no real way of telling, and further speculation is pointless.

The present writer has visited the Laderas de San Antón area and collected much coarse pottery from the surface of the ground and also sickle flints. The area is on the left-hand side of the dry valley which runs down behind the 'Al Marcha' factory on the Orihuela - Abanilla road immediately after it crosses the main Murcia - Alicante road. There is no soil to speak of. Rather, there is an exposed angular scree with orange,powdery earth between the stones among which is the prehistoric material. Cultivation terraces were once attempted, but lie abandonned. The stream valley (usually dry) shows that beneath this scree layer, which is 1 - 2 metres thick, there is a 2 metre thick layer of massive rounded limestone boulders and large pebbles. The present stream bed is formed on the top of an underlying layer of cemented boulders and pebbles of similar size which is at least 2 metres thick (exposed at a waterfall). This latter doubtless represents a very early phase of thermoclastic fluvial action. The boulders above it probably represent the Holocene thermoclastic phase of our stage B_3 , and the recent scree the later thermoclastic stage which followed the aeolian sands at cave sites such as Abrigo Grande, Cueva Santa and Cueva Emparetá. The presence of copper age material in such a layer is consistent with the observations of Cuenca at those caves (1973), but since the phase was lengthy, it does not help in ascertaining a precise date.

Acequión, Albacete, (Albacete) maps 15,16 no. 98

This site is illustrated in Plates xv, xxa. It seems to be a mound with retaining or defensive walls (?) rising out of an ephemeral swamp. The writer visited the site and collected some coarse sherds. The site is mentioned by Martínez Santa-Olalla (1951 and Sánchez (1948). It is unexcavated.

Other Albacete sites : maps 15,16 nos. 99 - 113

Most of these are given passing mention in Sánchez (1948) It is vaguely stated that these open sites have nearby tumuli of the kind already described. El Cegarrón seems to have been a hill-top open site. A potter's workshop is mentioned, and sherds of red and yellow body with crystalline filler. The firing is said to have been irregular with regard to a reducing atmosphere. The pottery is described as plain and smoothed for the most part, but some (e.g. fig. 103 no. 1) have finger-tip indentations of the rim, others (e.g. no.2) have lugs - a group of three together in the illustrat- example - and one (no. 3) has impressed cordons. There are about 80 sherds in the Albacete Provincial Museum collection. The forms appear to have been globular, straight-sided, or to have slightly closed profiles. The globular vessels, however, have everted rims. There is an intact hemispherical bowl and a small bowl with a carinated profile and everted rim. A large ovoid vessel had a light carination above which rose a straight, or perhaps slightly everted rim. Some of the lugged sherds have perforated lugs.5 bone awls and 26 sickle flints were found. Mammalian remains included those of red deer, goat, sheep, horse, hare, cattle, pig/boar, and snail shells were also found. The material is not fully published.

Another site, Cerro de los Moros, near Montealegre del Castillo again, produced sherds, bone awls and sickle flints.

From Cerro de los Castellares, Montealegre del Castillo, there are 7 sickle flints in the Albacete Provincial Museum.

Near Tobarra, at Hoya de Santa Ana there is an open site called Cerrico de los Moros. From this site the Albacete Provincial/

6:69

cial Museum collection contains two 'Argaric' type vessels of dark ware with everted rims, 2 open bowls of red fabric, a small globular vessel with closed profile, and a large carinated bowl measuring 220 mm tall by 250 mm wide at the mouth, a colander sherd, a bone punch, a saddle quern and rubbing stone, and other material. This has been mentioned earlier in connection with a tumulus near the site. It is not known if the material comes from the open site or the tumulus.

Los Calderones, Azaraque, Agramón, (Albacete) maps 15,16 no. 114

The six bowls from this cemetery are shown in fig. 103 nos. 1-6. One has a slightly strangulated profile and a wavy rim made by finger-tip impressions. The site is mentioned by Sánchez (1948) but the vessels have not been published. The site is close to the Río Segura.

Peñón del Tesoro, Riopar,(Albacete) maps 15,16 no . 115

Near the source of the Río Mundo tributary of the Segura is a hill-top settlement site discovered by sr. Santomaría during the 'Operación Río Mundo 1970' . A few coarse sherds were collected for analysis.

Esquina de la Peña, Parolís, Yeste,(Albacete) maps 15,16 no. 116

This site is on the Albacete-Jaén border just inside the latter province perhaps, but approached from Parolís in the former, where a resident showed the writer 3 polished stone axes and 2 saddle querns from the site. The site is in the upper reaches of the Segura valley.

Murcia : many sites in Murcia are no more than spots and names on a distribution map in the Museo Arqueológico, Murcia. Where no further information is available, they are ignored here (see key to maps 15,16).

Cerro de la Campana, Yecla, (Murcia) maps 15,16 no. 118

The material is in the Museo Arqueológico, Murcia, and is illustrated in fig. 78 nos. 1 - 19. The intact vessels are of baggy profile, and one is a necked amphora of asymmetrical shape with inclined mouth. One sherd has a strap handle, others have lugs. A

small 'dumb-bell' polished stone 'idol' is illustrated. Not shown are a mould for a copper rod, 23 sickle flints, 9 flint flakes, and a polished hammer stone. The site is unpublished.

Los Torrejones, Yecla,(Murcia) maps 15,16 no. 119

An ovoid lugged vessel from this find-spot is displayed at the Museo Arqueológico, Murcia (fig. 79). It is unpublished.

Cerrico de los Moros, Monte Arabí,Yecla,(Murcia) maps 15,16 no.117

This site may be a settlement referred to by Breuil (1935). The present writer visited the site (Plate xx) which is on a hill-top and is surrounded by a wall. Hut foundations can be seen. Coarse sherds and sickle flints were picked up on the surface.

Cerrico de los Conejos,Jumilla,(Murcia) maps 15,16 no. 122

In the Museo Municipal,Jumilla, 6 sickle flints, 14 coarse sherds, a large flint blade without retouch, and a saddle quern are displayed from this find-spot. The site is not published.

Los Gorgociles del Escabezado, Mentesinos , Jumilla,(Murcia) maps 15,16 no.124

A sickle flint and eight sherds of plain ware were found. Material in Museo Municipal,Jumilla; unpublished.

Cerrico de Santa Ana la Vieja, Jumilla, (Murcia) maps 15,16 no.130

A carinated, finely made Argaric dish, 2 larger urns, a clay weight, a sherd with three horizontal incised lines below which runs a double line of zig-zags, and 10 other sherds were found by the nuns of the Santa Ana convent in 1956. The material is in the Museo Municipal,Jumilla and is unpublished.

La Zella, Jumilla,(Murcia) maps 15,16 no. 134

A socketed bronze barbed arrow-head and part of the tip of another were found here. Material in Museo Municipal,Jumilla.

Fuente Pino, Jumilla,(Murcia) maps 15,16 no. 135

A barbed and tanged bronze arrow-head with a long tang was found here. Material in Museo Arqueológico,Jumilla.

El Portichuelo,Jumilla,(Murcia) maps 15,16 no. 136

5 sickle flints from this 'poblado' are displayed at the

Museo Municipal, Jumilla; unpublished.

El Prado, Jumilla, (Murcia) maps 15,16 nos. 137

This is an extensive open site in the enclosed valley in which the town of Jumilla lies. It is beside the road which leads to the Santuario. A very extensive surface collection of prehistoric, Iberian iron age and Classical period material has been made from this flat area which measures about 0.5 km x 0.5km on either side of the road. The present writer observed a stratigraphy of sorts when drainage operations were in progress in 1970, and layers of ashy soil could be seen. However, most of the material has come either from irrigation channels of the ploughed ground surface itself. The material in figs. 62 nos. 1-54, 63 nos 1-92, and 64 nos. 1-45 represents only a small part of the material stored at the Museo Municipal, Jumilla; retouched large flint blades, bifacial flint arrow-points, flint plaques with cortex unremoved, sickle flints, polished stone tools ,lugged and incised pottery, dot-ornamented sherds, handled sherds, 'dumb-bell' polished stone 'idols' sherds with very long lugs, bone awls, and clay horns. On display are some 53 large flint flakes and cores, 3 sickle flints on flakes, 25 unretouched large flint blades and fragments of 6 others, 20 such blades with retouch and fragments of 2 others, 78 bifacial flint arrow-points, 45 polished stone tools or fragments of the same, 4 'dumb-bell' 'idols', 1 piece of a marble bangle with a groove and circular in cross-section, two sherds with dot ornament within incised triangles, two sherds with incised line patterns, 22 other coarse sherds without decoration, a perforated Pecten shell, pieces of oyster or mother-of-pearl shell, bone phalanges of various animals, especially horse, and a bone button.

Samples of bone were submitted to A.E.R.E., Harwell, for radiocarbon determination, and the date obtained is given by

S-146 (371 g bone giving 61.4 cm CO_2)
4080 ± 130 B.P. or, subtracting 1950,
2,130 B.C.

Correction using the Bristlecone Pine data suggests an absolute date of 2,710 ± 170 B.C.

(Courtesy of Dr.R.L.Otlet, A.E.R.E.,Harwell, who carried out the estimation and made the corrections,after Damon et al., 1972)

Morrón de Bolbax, Cieza,(Murcia) maps 15,16 no. 142

The material from this site is shown in fig. 55, and include a segmented bone pendant. The material is at the Museo Arqueológico, Murcia, and is unpublished.

Canaverosa, Calasparra, (Murcia) maps 15,16 no. 143

This hill-top settlement by the Segura was apparently defended by a wall with right-angled corners reinforced by (?) towers. It was excavated by Cuadrado Díaz (1943), and yielded plain sherds with lugs, cordons, and baggy profiles, 4 long flint knives, one of which had a serrated retouched margin, and other items of flint and quartzite. The whereabouts of the material is not known.

Peñón del Cerro del Castellar, El Sabinar, Moratalla,(Murcia) maps 15,16 no. 146

This mountain-top eyrie above the Río Taibilla on the boundary of Murcia and Albacete provinces almost has much coarse pottery with baggy profiles and without decoration, except for lugs and a strap handle in one case. The present writer made an extensive collection from the surface. A trial cutting at one more or less level place t yielded nothing, either from the point of view of material or stratigraphy. Another cutting six feet long by four wide yielded a certain quantity of coarse sherds and some animal bones of sheep, rabbit and pig. The mountain rises above the hamlet of Arroyo Tercero and the settlement is at the peak, at about 1,300 metres above sea-level. On the Madrid meridian, it is at E 1º 30' 06", N 38º 10' 18". The bone samples have been submitted to A.E.R.E., Harwell, for radiocarbon determination.

El Castillico, El Sabinar, Moratalla, (Murcia)

Some coarse pottery and a polished stone axe fragment were believed by the present writer to have been associated with the first building phase of this defended promontory settlement which yielded early Iberian iron age material. It is below and close to the last mentioned site on the other side of a tributary stream which feeds the Taibilla. See off-print bound into this thesis for further details It cannot be definitely stated that there was a copper age occupation. Material at the Museo Arqueológico Nacional,Madrid.

Cerro de las Víboras, Bagil, El Sabinar,Moratalla,(Murcia) Maps 15, 16,no. 151

This site is also on a small hill-top, where a ploughed field yielded a surface collection of coarse pottery and fragments of polished stone axes;personal visit. A bowl is in a private collection (fig.99). Cist burials were examined here (Plates LXXXIII a-c).

Barranco de las Cañas, Caravaca, (Murcia) maps 15,16 no. 154

Polished stone axes were found here by Jiménez de Cisneros (1929) in the side of an exposed tributary canyon which feeds the Río Argos (a tributary of the Segura) close to where the Cehegín - Caravaca road crosses the tributary (Barranco de las Cañas) probably

Loma de Horadada, Archivel, Caravaca,(Murcia) maps 15,16 no. 155

Jiménez de Cisneros (1904) refers to burials here which are compared to those discovered by de Motos near Vélez Blanco, and to one which seems to be a cist grave. This is obscure.

Barranco de la Gotera,Abanilla,(Murcia) maps 15,16 no. 161

The same author refers to the discovery of prehistoric neolithic flints and scrapers here. No further details. Possibly sickle flints are intended, or perhaps bifacial arrow-points.

Sierra de la Espada,Abanilla,(Murcia) maps 15,16 no. 162

Prehistoric pottery and polished stone axes are mentioned from this group of hills (Explicación...Fortuna, 1953).

Cabezo de la Mesa,Capres,Fortuna(Murcia) maps 15,16 no. 164

Copper arrow-points and a polished stone axe are displayed at the Museo Arqueológico,Murcia (fig. 80).

La Presa,Alguazas,(Murcia) maps 15,16 no. 170

Coarse sherds displayed at the Mus.Arq.,Murcia (fig.55).

La Marrada,Cehegín (Murcia) maps 15,16 no. 157

Bowls and an incised sherd (fig. 55) in Mus.Arq.,Murcia.

Cabezo de Lubina, Alguazas, (Murcia) maps 15,16 no. 171

Sherds and a flint barbed and tanged point are in the Museo Arqueológico,Murcia,(fig. 55).

Monteagudo, Murcia,(Murcia) maps 15,16 no.172

In the Museo Arqueológico, Murcia, there are displayed six bronze/copper blades, comprising 2 halberds, a small knife and three daggers, all of 'Argaric' rivetted type, and both carinated and baggy profile vessels, (fig. 90). Not illustrated are 4 long flint blades, 4 bone awls, fragments of bone 'spatulae', and a saddle quern. The present writer has collected many coarse sherds from the hill of Monteagudo. 2 metal bangles are also shown in fig.90. In his catalogue of the museum, Sobejano (1924) refers to no fewer than 7 vessels from Monteagudo.A halberd and 2 daggers were in the collection at that time. Some of the urns seem to have represented individual burials.

Puntarrón del Chico, Beniaján,Murcia,(Murcia) maps 15,16 no.173

This is a hill-top defended settlement excavated about 10 years ago and unpublished. Much of the material comes from some 14 cists and is illustrated here (fig. 71 nos.1-31). Rivetted copper knives or daggers, a tanged copper blade, copper rings, incised and excised pottery , and a wide range of lugged sherds are present in the Murcia Museo Arqueológico collection. A curious canister of pottery with a handle and spout along the side, like an old-fashioned stoneware hot water bottle, has a parallel from San Antón (Furgús, 1937 - photograph). One incised ware sherd with parallel lines and chevrons may be of a beaker. Two sherds have foot-rings. 14 bone awls, a bone imitation saw, 3 flat bone squares about 1 cm x 1cm, a stone mould for a copper rod, 4 polished stone axes, a copper arrow-point, a polished mace or hammer, a copper rod, a whetstone, a serrated flint blade and a fragment of another flint blade were also found. There were various sea shells in addition.

Santa Catalina del Monte, Murcia,(Murcia) maps 15,16 no. 174

A globular vessel, copper axe and dagger are displayed at the Museo Arqueológico, Murcia (fig. 80)(Jorge, 1950)

Cerro del Santuario de la Luz,Murcia (Murcia) maps 15,16 no.178
Argaric pottery (fig.96) at Museo Arqueológico,Murcia.

Castillo del Puerto de la Cadena, Murcia,(Murcia) maps 15,16 no.176
A bowl and very small carinated 'Argaric' vessel are displayed at the Museo Arqueológico, Murcia, (fig. 80).

La Almolaya,Pliego,(Murcia) maps 15,16 no.180
Globular and carinated 'Argaric' urns and other vessels are displayed at the Museo Arqueológico, Murcia (fig. 96). The settlement was excavated by Cuadrado Díaz,(1945).

Alcantarilla,(Murcia) maps 15,16 no.182
A small cup (fig.72) was mentioned by Fernández de Avilés and Ossorio (1930) .

Cabezo Negro,Zeneta,(Murcia) maps 15,16 no.183
The writer visited this hill-top settlement and found sherds and sickle flints.

Lo Bellando, Canadas de S.Pedro,Zeneta,(Murcia) maps 15,16 no.184
Vessels from graves are listed by Sobejano (1924) and Fernández de Avilés & Ossorio (1930).

Alhama de Murcia,(Murcia):maps 15,16:unmarked. 2 copper arrow-ponts (fig.72) in Mus. Arqueológico,Murcia.

La Bastida, Totana,(Murcia) maps 15,16 no. 186
This settlement site is on a hillside above the Rambla de Lébor, (Plates xvii,xviii) and was excavated by Martínez Santa-Olalla et al.(1948), and at an earlier date by Cuadrado Ruiz. The excavation material has not been fully published, however, and there are many packing cases in the basement of the Museo Arqueológico, Murcia, which remain unopened as they were deposited after the campaign. Some of the accessible material is re-drawn and presented here in figs. 92 - 95 for comparison with the Furgús San Antón collection, being mainly from the burials published by Martínez.

Las Anchuras,Totana,(Murcia) maps 15,16 no. 188
Incised sherds, stone moulds, flints ... (Siret & Siret,1887).

Cerro de la Cabeza Gorda,Totana,(Murcia) maps 15,16 no.189
Argaric material from a cist (fig.91) is in the Museo Arqueológico/

eológico, Murcia; unpublished.

Cabezo de Juan Clímaco, Totana,(Murcia)maps 15,16 no. 192

The present writer visited La Bastida and Cabezo de Juan Climaco and made a collection of sherds from the surface. From the side of an eroded gully (Plate xix) fragments of animal bone were taken and submitted to A.E.R.E., Harwell, from which the radiocarbon date of 990 B.C. referred to earlier (see list of C-14 dates) was obtained. Rectangular houses (those at La Bastida are apsoidal), plain and incised sherds, barbed and tanged flint arrow-points, and other material suggestive of a copper age date were found during Martínez Santa-Olalla's campaign at La Bastida, although no excavations could be effected.

Campico de Lébor, Totana,(Murcia) maps 15,16 no. 192

This open site was published by del Val (1948) and seems to have consisted of a series of silos or pit-dwellings . Bifacial flint arrow-points, flint blades, sickle flints, polished stone axes, lugged sherds of plain and incised pottery, bone awls and shell beads were encountered.

Los Picaricos, Totana,(Murcia) maps 15,16 no. 194

This site is mentioned as an Argaric age site in Martínez Santa-Olalla et al.,(1948).

Cabezo Redondo, Archena,(Murcia) maps 15,16 no. 203

This Argaric settlement site was published by del Val(1945).

Escalera de los Moros, Casas Nuevas,Librilla,(Murcia) maps 15,16 no. 205

Polished stone axes and sherds (fig. 101) are displayed at the Museo Arqueológico,(Murcia).

Solana de Penarrubia, Béjar, Lorca (Murcia) maps 15,16 no. 208

Bronze weapons from this find-spot (fig. 72) are at the Museo Arqueológico, Murcia.

Casa del Niño school, Lorca, (Murcia) maps 15,16 no. 211

The sherds shown in fig. 70 include 'Argaric' type profiles and baggy profiles with lugs. Polished stone axes, a white kidney shaped or tear-drop stone bead, a square-section metal

chisel, socketed copper or bronze arrow-head, and a rivetted knife or dagger with two rivets. Two urn burials are said to have provided the finds.

Monte del Castillo and Los Pilones, Lorca,(Murcia) maps 15,16 no.212

The present writer has collected many coarse sherds from this area which is near to the last-mentioned. Sobejano (1924) refers to beads or pendants found in this region, some apparently made of pottery. This material is not in the present Murcia Museo Arqueológico collection, however. The same author refers to many intact vessels in the museum at that time from 'Lorca' . He also mentions worked flint flakes from Cabezo del Moro, Lorca (maps 15,16 no.206),and Cabezo de la Erbestida, S.Cristóbal suburb,Lorca (maps 15,16 no.209), as well as a polished stone disc from Cabezo del Madrono,Lorca (maps 15,16 no. 213) and an oval polished stone object from the Cordillera de Tarabes,Lorca (maps 15,16 no. 210). The flints from the first two locations are also mentioned by Jorge (1956).

La Alcanara, La Escucha,Purias,Lorca,(Murcia) maps 15,16 no.216

Carinated 'Argaric' and ovoid,lugged,closed profile vessels, and a number of baggy profile sherds, one with a wavy, finger-tip impressed rim, a two-rivet copper blade, whetstone/pendant with 1 perforation, saddle querns, clay weight, and other material are displayed at the Museo Arqueológico,Murcia, from this site (fig.81).

Cantera de Murviedro, Lorca,(Murcia) maps 15,16 no.218

Carinated 'Argaric' vessels and bowls, some with lugs, sherds of plaster vessels with criss-cross incisions and parallel lines, incised potsherds, cordon decorated sherds with finger-tip impressions, stab-and-drag decorated sherds, and beaker sherds were found at this site. Polished stone axes of granodiorite, fibrolite, and quartzite were found; also bifacial flint arrow-points, stone beads and pendants, a Pectunculus bangle, perforated Conus,Cypraea, Pecten and other sea-shells, 3 spirally wound wire pieces of copper or bronze, and a tanged bronze knife/dagger. Pieces of wood, red

ochre/

ochre, fragments of bone awls and 'spatulae' and a polished stone object are in the Murcie Museo Arqueológico collection (fig. 54 nos. 1-71). The material is mentioned by Jorge (1956) but is unpublished.

Vilaverde,Lorca,(Murcia) maps 15,16 no.220

Vessels from Vilaverde, Lorca, are illustrated by Fernández de Avilés & Ossorio (1930) as being in the Museo Arqueológico at that time: viz. a closed profile globular bowl with lugs, and a small pedestal bowl. These are not now on display.

Vessels from Vilerda,Lorca are mentioned by the same authors and by Sobejano (1924), comprising a small cup or open bowl and a vessel with 3 lugs (fig.72) in Museo Arqueológico,Murcia.

La Morra de Cano,(Lorca) maps 15,16: not marked: a copper arrow-point is in Mus. Arq.,Murcia (fig. 72)

Rambla Bermeja, Lorca,(Murcia) maps 15,16 no. 221

Jiménez de Cisneros (1903) found a prehistoric burial here in a cist, q.v..

Los Almendros, Torre Pacheco,(Murcia) maps 15,16 no. 222

A small plain ovoid vessel (fig. 72) at the Museo Arqueológico, Murcia is from this location (Fernández de Avilés & Ossorio, 1930; Sobejano,1924).

Cabezo de la Encantá, Coy, Lorca, (Murcia) maps 15,16 no. 214

A large number of coarse sherds from this small hill were collected by the present writer.

Cerro de las Viñas, Coy,Lorca,(Murcia) maps 15,16 no. 215

A large number of coarse sherds and a sickle flint were found here by the present writer.

Cabezo Agudo, La Unión,(Murcia) maps 15,16 no. 223

This hill has many ancient mines and caves, some of which probably show traces of Roman workings or even Phoenician mining. Prehistoric material is also known of earlier age. Sr.Aguirre of La Unión has a collection which includes a perforated whetstone/ bracer, 3 large flint blades and 6 flake-blades, a core, a sickle flint, 7 bone pins, a flat copper axe, 15 polished stone axes, one

other/

other of fibrolite, and a polished stone chisel of a semiprecious stone of purple colour. There is also a purple coloured miniature polished stone axe of kidney shape (fig. 65) and a polished stone imitation barbed and tanged arrow-head of a brown coloured rock. The collection is unpublished.

Dunas de las Amoladeras, Cabo de Palo, Cartagena, (Murcia) maps 15, 16, no. 224

Pottery and flints from this site (fig.65) have been mentioned earlier.

Pozo Estrecho, Cartagena, (Murcia) maps 15,16 no. 225

A number of stone beads were found here apparently (Museo Arqueológico, Murcia— Sobejano, 1924).

Parazuelos, Ifre, Mazarrón, (Murcia) maps 15,16 no. 226

A small settlement was excavated here by Siret & Siret (1887) which produced baggy vessels, copper implements, 17 . bifacial flint arrow-points, and 3 polished axes. A schist ring or bangle of hexagonal cross-section was found, among other material published by the Sirets. The burials have been mentioned above.

Zapata, Ifre, Mazarrón, (Murcia) maps 15,16 no. 227

This small settlement is in the same region as the last mentioned. However, the excavations produced fine wares including pedestal or 'tulip' goblets, one of which had a decorative motif inside the bowl. Pottery spoons are referred to. Long flint blades, polished axes, bone awls, spindle whorls and clay weights, and remains of wheat, flax and esparto grass cords are mentioned (Siret & Siret, 1887).

La Roca, Ifre, Mazarrón, (Murcia) maps 15,16 no. 228

Only brief mention of pottery, flints and querns is made with reference to this location (Siret & Siret, 1887).

Cabezo de Ifre, Ifre, Mazarrón, (Murcia) maps 15,16 no. 229

A prehistoric dwelling with an oven is illustrated by the Sirets from this settlement, 'Argaric' carinated and 'tulip' vessels, a bowl decorated on the inside, flat copper axes, copper arrow-

points/
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points, ear-ri gs, a copper saw, sickle flints, and polished stone axes are described (Siret & Siret,1887).

Las Cinuelas or La Cinuela, Mazarrón,(Murcia) maps 15,16 no. 231

Sherds and other material are vaguely mentioned (Siret & Siret,1887).

Cerro del Moro and Cabezo de las Piedras, Águilas,(Murcia) maps 15,16 no. 233

These sites are described as settlements by the Siret's, but no details are given (Siret & Siret,1887)

Cocedores,Águilas (Murcia) maps 15,16 no.234

A polished stone axe and flint blade were found (Siret & Siret,1887).

Owing to an unfortunate accident, some sites on the distribution maps 15,16 were given the same number. The sites near Puerto Lumbreras,(Murcia) have therefore been renumbered 234a - 234e .

Villerda, Puerto Lumbreras,(Murcia) maps 15,16 234a

This is marked on a map at the Museo Arqueológico,Murcia, and may be the same as 'Vilerda' mentioned above as being in the término of Lorca. (Redrawing of municipal boundaries took place in the Lorca-Puerto Lumbreras-Águilas region at one time.)

Arsenal de las Piedras del Rayo, Puerto Lumbreras,(Murcia) maps 15, 16 no.234b

A very large number of polished stone axes was found by Cuadrado Ruiz here, and many are at the Museo Arqueológico,Murcia and the Museo Provincial,Almería. Perhaps this was an 'axe factory' .

Cañadas del Alba,Puerto Lumbreras,(Murcia)maps 15,16 no. 234c

A hill-top settlement was mentioned by de la Vega del Sella (1929). The present writer has visited the site and collected many coarse sherds there.

Loma del Tío Ginés, Puerto Lumbreras, (Murcia) maps 15,16 no.234d

'Argaric'pottery and a copper blade are at the Museo Arque -ológico,Murcia (fig. 72).

Barranco del Asno,Puerto Lumbreras,(Murcia) maps 15,16 no.234e

'Argaric' and baggy pottery are at the Museo Arqueológico, Murcia (fig.72)

Calar de Leira, Vélez Blanco,(Almería) maps 15,16 no. 268

The hillside above and behind the Cueva Ambrosio is littered with coarse sherds and sherds with lugs. The writer made a collection of these for analysis.

Cerro de las Ánimas, Vélez Rubio,(Almería) maps 15,16 no. 269

Cardial impressed pottery from this location is mentioned by Colominas & Esbona (1925).

Loma de la Fuente de los Molinos, Vélez Blanco,(Almería) maps 15, 16 no. 270

The present writer collected various coarse sherds, some with lugs above the spring at this location (Breuil, 1935).

Loma de la Cueva de los Letreros,Vélez Blanco,(Almería) maps 15,16 no.271

The present writer collected coarse sherds, some with lugs, from the hillside below the cave (see Breuil,1935).

Vélez Rubio,(Almería) maps 15,16 no. 272

A prehistoric settlement about 0.5 km SW of the garage on the Granada road and on the opposite side of a small canyon yielded a quantity of coarse sherds (personal visit).

Cerro de los Judíos, Vélez Blanco,(Almería) maps 15,16 no. 273

A small hill near to the Fuente de los Molinos yielded a quantity of coarse sherds from the surface (personal visit).

Cerros de las Canteras, Vélez Blanco,(Almería) maps 15,16 no. 274

A defended settlement and burials were described by Gil Farrés (1950) who states that de Motos excavated and encountered a lower layer without metal, baggy pottery, including sherds decorated with an 'oculus' motif and a rim (?) decorated with chevrons and bitriangular motifs. A burnt layer was followed by upper deposits with copper knives and awls and pottery which included carinated 'Argaric' forms.

Discussion of the Sites.

The sites given above are those which fall within the river basins of the Vinalopó and Segura. Other sites are shown on the distribution maps in adjoining regions, and comparisons will be made with those. The writer has visited several of the sites in Valencia, Alicante, Albacete, Granada and Almería and collected pottery and other material for eventual analysis. This must be a long term project, although some data are given in the following section.

The brief comments on the sites of the Segura and Vinalopó basins which have been given in the previous section serve to demonstrate that sites of different kinds and different ages may have many elements of the material assemblages in common. This is the cause of the main difficulty to the typological/'cultural' method in Spanish prehistory. Although caves burial constructions and open sites are mutually exclusive categories, functionally they overlap as regards burial which may be practised at all three, and habitation at the first and third. Nor is there any particular 'cultural' or chronological separation detectable. Caves, however, are only found in limestone areas as a rule (exceptions being 'artificial caves' and undercut sandstone or other cliffs). By and large, the distribution of the cave sites corresponds with that of limestone rock, although the relativ densities in particular limestone regions requires additional explanation. In this respect, the geographically interlocking distributions of cave burials and of burial constructions is interesting. Neither is entirely confined to just one part of the map, however, and, of course, there are other areas of the Peninsula where similar sites are also found as is well known.

However, it is the more 'generalised' aspects of all the sites which is the obstacle to typological cross-dating and cultural interpretation. For instance, a case can be made out for interpreting the Sicilian copper age in terms of Greek and Aegean developments (Bernabò Brea,1957) despite the paucity of copper (and see Evans, 1967). In south-east Spain, the situation is almost the opposite; copper is certainly present at many sites, but the hunt for 'parallels' can turn into a frantic and unprofitable chase of a will-o'the-wisp . This should lead one to suspect that intrinsically indigenous is involved (Renfrew, 1967), a view which has its origins in the scheme of Bosch Gimpera (1932). For instance, incised pottery with anthropomorphic and schematic motifs is known from both Sicily and Troy I, but it is not really like the 'oculus' pottery of Almería.

It has already been proposed that a hypothetical invasion of the south-east by neolithic colonists bringing bifacial points, flat idols, callais beads, and amphora pots, as proposed by Blance, is untenable. It now seems that invaders bringing the full-blown Almerian copper age are equally untenable. If the Tabernas radiocarbon date is correct, where on earth could they have come from ? There is no particular reason to suppose that a radiocarbon age of 3,400 B.C. is wrong. After all, the Frágoas passage grave gives dates only slightly later. Nor can one any longer hold the view that the circular passage graves necessarily must have their origin somewhere east of Spain, given the even earlier radiocarbon dates for Breton passage graves which have been available for a long time now. It will be suggested that there is even less to be said for the view that in the third millennium B.C. Cycladic colonists played a major role in developing the Iberian copper age (Blance, 1960 publ. 1971; 1961; Daniel & Evans, 1965).

It has been stated by Renfrew (1967) that there are probable chronological difficulties in equating the earlier phase of the Los Millares settlement with Aegean early bronze age II settlements such as Chaliandrhriani which have been said to have similar defensive walls with bastions, that many features of the Almerian copper age (ivory combs etc.) are not Cycladic at all, and that it is curious that obsidian failed to reach Spain. (In fact, obsidian is known from the Cueva de los Murciélagos, Lubrín, Almería - Siret, 1931; but this seems to be a late upper palaeolithic assemblage.) Renfrew points out that in Portugal, the Vila Nova de São Pedro 'import' ware was made locally and its grooved decoration is not paralleled in the Aegean. The two bird-headed pins which Blance (1960) illustrates from the Portuguese site could have been traded casually.

The chronological difficulty is paramount. Poliochni I or early Troy I cannot be dated to much before 2,500 B.C. in radiocarbon years; say 3,300 B.C. in absolute terms. Tabernas is dated now to 3,400 B.C. in radiocarbon years and 4,300 B.C. in absolute terms. Even with the earlier available dates from Los Millares of 2,300 and 2,400 B.C. in radiocarbon years, the cross-dating was tenuous. One may cite the date for copper age deposits at the Cueva Encantades in Catalonia of 2,500 B.C. (see table of dates for precise figures) and the Frágoas passage grave dates aforementioned. One may confidently anticipate that further samples from Tabernas will confirm the chronology.

That is not the end of the matter. If the dating were based on radiocarbon dates alone, perhaps some eyebrows might be raised in protest against so forthright a declaration. Arribas (1953) , Savory (1968), and Tosi (1959) have suggested

parallels for the fourth millennium B.C. to which more detailed attention may be paid now.

Some of the material from Tabernas in the Almería Provincial Museum from Cuadrado Ruiz's excavations is shown in fig. 60 nos. 1-52. The curious three-dimensional figurine with stumpy arms (no.5) has been likened by Topp (1959) to one from Zengővárkary which she termed Danubian II. If this parallel is accepted, then the radiocarbon date from Tabernas is about what would be expected since the Hungarian LBK-derived cultures are placed between 3,800 - 3,000 B.C. in terms of the 5570 ½-life of radiocarbon (Tringham, 1971). Topp draws LBK parallels also for pedestal bowls from Tabernas, and for strainer/colander vessels. She suggests that the twin vessel from Cueva de la Sarsa has LBK parallels. This vessel, like one from the burial cave at Blanquizares de Lébor, Murcia, has a communication between the two ovoid pots. Another twin vessel is known from Tabernas which is rather different (fig. 60 no. 13); from Cabezo Redondo ; Mola Alta de Serelles (Botella, 1926); Coveta de l'Or (Plá,1961); three examples from Almizaraque (Arribas, 1953); and Los Millares house 1 (4 small jars joined together - Arribas,1953). It is not suggested that all these are contemporary or LBK. Indeed, the former is impossible, the latter improbable. Topp also sees an LBK parallel in a bone pin from the Cueva de la Pastora which has a separate, vertically pierced pin-head, although the crutch-headed pin from that cave she assigns to Unetice parallels. She also suggests that notched spatulae of bone from Coveta de l'Or and Cueva de la Sarsa have Starčevo affinities, and certainly this fits well with the C-14 dates from l'Or.

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There are other features which have nothing to do with LBK material at Tabernas of course, and the present writer is of the opinion that probably only the stumpy armed idol is so derived at that site. The assemblage includes painted pottery (fig. 60 no.1), clay arc and 'horns' (nos. 42,51) bone 'boomerang' (no. 52), and the whole range of Almerian plain pottery such as the flower pots (nos. 2,23) two flat based vessels with inward sloping walls (nos. 16,24), and everted rim bowls. Mention may be made of an unusual polished stone adze (no. 47). The copper flat axe and arrow-points (nos. 6,7,8), shards with long butterfly lugs (no. 29), and carinated vessel (no.22) are typical also, the latter heralding 'Argaric' ceramic forms surely. Plaster vessels and beaker ware are present at the site, though the latter, at least, not from the earliest level, whereas painted wares do occur in that level (Gusi, personal communication). It is uncertain whether copper objects occur at the lowest level. However, the radiocarbon determination probably corresponds to the middle of the three layers. Lastly, a vessel which has a partition against the rim at one side (fig. 60,no.43) is like two from Castillarejo de los Moros, near Andilla,(Valencia) (Alcácer,1956; Fletcher & Alcácer, 1958: Plate VIII no.7 and no. 4).

In order to find parallels for the shapes of the vessels one certainly cannot turn to Troy or the Cyclades. There is nothing remotely like Almerian pottery in profile in the Aegean Sea or its littoral. Nor is Bernabò Brea's Sicilian copper age a more fruitful source for parallels; nor yet are Maltese ceramic forms. There is, indeed, only one area to which can confidently turn, and that is Egypt.

It has already been remarked that the Fayūm A culture dated to between 4,400 - 3,800 B.C. has hollow based bifacial flint arrow-points (see Wendorf et al., 1970) although it should

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be remembered that the preceding phase [redacted], with barbed and tanged, rhomboidal and foliate bifacial points dating between 6,000 - 5,000 B.C. lacks pottery (ibidem). In Upper Egypt, the Badarian dates to about 4,000 B.C. or slightly later, and Clark (1970) gives the range of Naqada I and II as 3,800 - 3,600 and 3,600 - 3,200 B.C., respectively. Emery (1961) put the date of union at ca. 3,400 B.C. - 3,200 B.C. for the two parts of Egypt.

Certainly, the Badarian, dating in absolute terms to around 4,000 B.C., has pottery which can be exactly parallelled in south-east Spain: flat based pots with inward sloping walls, flower pots, baggy vessels with strangulated necks, round based bowls with a light carination and straight and curving walls, open and closed profile bowls, twin cups not unlike that from Tabernas, and pot spoons (c.p. Tabernas, fig. 60 no. 4C). Twin cups with communications are found in the Naqada phase, as also spouted vessels, tetrapod bowls etc. (Brunton & Caton-Thompson, 1928; Flinders Petrie, 1920, 1921; Childe, 1934). Before discussing the differences which exist between southeastern Spain and Egypt, it is worth remarking that whilst some parallels may be offered on the basis of the Spanish painted and 'oculus' incised pottery and that of Hassuna (Iraq) and Mersin (Turkey) (Savory, 1968, p. 90), those sites do not have hollow-based flint arrow-points, although they have other forms (Savory, loc. cit.), whereas the Badarian does have hollow-based forms. In Egypt these forms eventually cease, and the typical point becomes the tranchet 'axe' shaped flint point. One example is known from south-east Spain, significantly occurring in a collection of hollow-based and flat-based triangular flint bifacial arrow-points at the inland tumulus of Las Almagreras, (Albacete) (Sánchez, 1948, Plate V), about which little is published unfortunately. There are 25 points altogether and a stone bead illustrated by Sánchez.

The rarity of the 'axe' type of flint point should provide a clue as to the closing date of Peninsular interest in Egypt - perhaps during or towards the end of the Old Kingdom. It will be seen that other evidence supports this view. It is sometimes held that hollow based arrow-points are a south-western or Portuguese trait.* This is wrong. They occur, together with flat based triangles, at very many sites:- Blanquizares de Lébor; Las Almagreras; Laderas del Castillo at Callosa de Segura; Orihuela San Antón sites; Cueva de la Pastora; Covacha de Ribera at Cullera in Valencia; Covacha del Barranc del Nano at Gandía in Valencia; Terra Venturas; Cueva de Nerja; Ereta del Pedregal; Llano de la Media Legua; Loma del Cucador at Arboleas; Huéchar-Alhama; Millares at 22 separate tombs; Loma de la Rambla de Huéchar 2; Loma del Alcanzón at Huercal-Overa; Loma del Campo de Mojácar 1,2 and 3; Loma del Belmonte; Peñicas 4 at Níjar; Loma de la Atalaya 3 at Purchena; Jautón 5; Llano de la Rueda 13 at Tabernas and Cañada de los Meones; Loma de la Casa Alta at Turre; Puerto Blanco at Vera; Almizaraque graves L5, L16 and XXI, and over 75 separate burial tombs in the Granada series. It will be seen that many of the passage graves and round graves are those with other exotic and specifically 'Egyptian'-type objects (see below). By contrast, the barrel-profile bifacial flint arrow-points said to be characteristic at Vila Nova de São Pedro by Blance (1960) are rare. There is one from Castellar de Morera at Elche,(Alicante) and perhaps another from El Prado, Jumilla,(Murcia). What these forms may mean is that hollow based flint points were found useful and continued to be made alongside barbed and tanged and rhomboidal forms until long after they ceased to be used in Egypt. It should be noted that trapeze flints are often found in similar contexts of burial constructions and burial caves of the copper age, and were presumably also found useful Perhaps the bone awls which are so plentiful were used for pressure flaking of bifacially worked arrow-points. Flint is plentiful, especially in the limestone of Murcia and Alicante of Cretaceous age.

6:88a

*e.g. Savory (1968), but see Plá (1956).

Although Munoz (1965) has even tried to link the square mouthed pottery from some of the Catalan fosa graves to early and middle pre-dynastic Egyptian pottery, pit burial is not the usual type in south-east Spain, with the possible exception of de Motos' Vélez Blanco graves. Nevertheless, the date for the Sabassona pit grave (see list of C-14 dates) in real terms might be around 3,000 B.C., and Munoz considers that this is one of the later ones, since it is one of only two fosa graves with copper artefacts. An alternative view sees the fosa grave culture of Catalonia more closely related to Lagozza-Cortaillod , with the square mouthed pottery ultimately deriving from Italy. From our point of view, it does not matter very much which is the correct interpretation. One might say that the Catalan culture is betwixt-and-between the Levantine-Almerian on the one hand, and the southern French and Lagozza traditions on the other. This way of looking at it underlines the absence of the latter traditions in southeastern Spain. Moreover, the southeastern culture is clearly copper age, whereas the Catalan one is not, nor are the later Chassey traditions; and Lagozza material does not give way to the copper-using phase at the Gruta dei Piccioni until 2,350 B.C. (in radiocarbon years), i.e. exactly contemporary with Sabassona.

The Tabernas and other south-eastern Spanish painted pottery may be in part influenced by Ripoli painted wares and in some instances Serraferlichio wares, but unlike the Italian painted pottery, it is in a wholly copper age context, although contemporary. Yet it is uncommon. Why this should be is uncertain. Moreover, it continues for quite a long time. If it commences with Tabernas at 3,400 B.C. in radiocarbon years, it can be detected at the Cueva de los Tiestos at 1,840 B.C. in radiocarbon years. The Tiestos sherds show broad bands of red and solid triangles, chevrons, concentric arcs, and 'oculi' (fig. 61), and perhaps give

the context of the schematic rock paintings in cultural and chronological terms. Very similar sherds come from the Cueva de Mongó, Denia,(Alicante)*, the material from which has never been fully published, and some of which is illustrated here in fig. 59 nos. 1-29 (from the Alicante Provincial Museum). The similarity is so striking that it is likely the two sites are contemporary. Mongó has more incised pottery than Tiestos, however, and beaker sherds have been compared by Millán (1950) to sherds from the Cueva Ambrosio. The sherds shown here from Mongó are remarkably similar to the so-called pre-beaker sherds (Savory, 1968) illustrated by Jiménez (1962:p. 35 fig. 16 nos. 2,4,5,6,8). Jiménez (1947) stated that many of the forms were hemispherical bowls (c.p. the later beaker decorated bowls of southeastern Spain, e.g. fig. 97) and that the top C.60 metres of the cave floor fill provided the decorated pottery which comprised one-quarter of all pottery found. The decorated pottery at Ambrosio was given an almagra slip. The layer produced no metal objects, however. This by itself means nothing. At a perhaps similar date , layers at the Ereta del Pedregal,Navarrés, (Valencia) were without copper objects (C-14 age of 1,980 B.C.). All this could mean is that no copper objects were mislaid in the area of the excavation at that depth.

Both the Badarian and Amratian of Egypt have combs, the former sometimes of ivory (Brunton & Caton-Thompson, 1928) and the latter of wood. There are two wooden combs from the cave of Blanquizares de Lébor in Murcia, and an ivory comb from that of Monte de la Barsella in Alicante. Bone combs are also known from:- Tabernas; Montefrío at the Cueva Alta; Los Millares graves 12 and 40; Jautón grave 5,Purchena; Fuente Álamo; El Oficio and El Argar. That from Los Millares grave 12 is a winged ivory comb of quite clearly Egyptian type.

Also/
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* Figueras (1950).

Also of pre-dynastic affinity is the bone pendant hook from the Blanquizares de Lébor cave and a bilobed pendant from the Cueva de la Pastora has been compared with pre-dynastic bilobed artefacts by Pericot (1952) although the parallel he quoted is described by de Morgan as a pommel and is from Saghel-el-Baglieh (de Morgan, 1896, p. 148 fig. 348). It is presumably a larger and hollow piece, unlike that from Alcoy. Both Blanquizares and Monte de la Barsella have anchor pendants of bone. Savory (1968) compares these to Palestinian Ghassul culture stone amulets. Arribas (1953) compares them to schematic rock paintings, and there are some similarities to painted rock art from the mountains of north-central and north-west Andalusia (see Breuil, 1933,1935). The same is true of the painted oculi on bones from Pastora (Ballester, 1946) and Ereta del Pedregal* (engraved) , though these also relate to the Millaran pottery and the painted motifs of the Tiestos sherd.

Also present at the Cueva de los Tiestos was an imitation bone barbed arrow-point (see above). Two of these were found at Cabezo Redondo, one by Colominas at the Laderas del Castillo at Callosa de Segura and another by Furgús at the same site, one from layer 3 at Ereta del Pedregal**, and further north these are found at the Cueva Fonda, Salamó (Closas, 1934; del Castillo, 1947). A polished stone imitation arrow-point was found at Cabezo Agudo, La Unión,(Murcia) as has been stated earlier, Imitation weapons are found in 'Badarian , and other pre-dynastic assemblages, and continue into early dynastic times, perhaps to some time after 3,000 B.C. in absolute terms. In Spain they may be slightly later than that in absolute dates, however. Nevertheless, the parallel is hard to draw with other cultures, and the bone arrow-point found by Colominas at Callosa can be parallelled in middle and late pre-dynastic Egypt without any doubt, having small wings or protruberances on the tang below the barbs.

*Fletcher (1961) **Fletcher et al.,(1964)

Probably the miniature polished stone axe of kidney shape from Cabezo Agudo, La Unión (Murcia) and a larger one from Carmona (Sevilla) represent Egyptian contacts, as also the miniature ivory axes from Los Millares graves 5 and 7, and a done tanged dagger with incisions from Los Llanillos Tgb. 21/5 in Granada province (see Leisners' corpus). Other imitation weapons, perhaps home-made items, include daggers from Orihuela, Mola Alta de Serelles, Millares graves 7 and 57, Llano de la Sabina 126, Llano de la Cuesta de Guadix 50, and Los Castellones L6 and L9. Bone saws are known from Puntarrón del Chico and Laderas del Castillo at Callosa. Slate knives were reported at the Cueva de los Murciélagos at Albuñol.

Other types of grave goods common to both cave sites and burial constructions are beads of steatite, talc and callais (Cueva las Lechuzas, Cueva de los Siete Pisos, Cerro del Cuchillo, Cueva Roca, Cueva de la Pastora, Monte de la Barsella, Blanquizares, Grieta de les Llometes, among the caves; Palacés, La Pernera, Atalaya de Garrucha, Almizaraque, the corbelled round graves from Vélez Blanco, Chruletas 3, Millares (various, esp. 9,18,25,57,63), Fonelas 10, and Cerro de la Encina at Monachil). Pectunculus shell bracelets (see Pericot,1928) may also be mentioned, as also segmented pin-heads, tubes and pendants (Nieto, 1959a), decorated bone cylinders and round bone bracelets. Marble bracelets are less common outside the cave sites, though they do occur at Cabezo de la Raja de Ortego near Garrucha, Llano Manzano 4 near Mojácar, and Llano de la Lámpara 1 at Purchena. Stone plaques, plain, perforated, and incised sometimes occur in the tombs, rarely (Blanquizares;Monte de la Barsella) in caves, only rarely (Llano de Alicún,16 in Granada) of 'Portuguese' chevron ornamented type, indicating the scant contact between the south-eastern and western copper ages once again.

6:91a

The red chevrons on the alabaster vessel from the Cueva de los Blanquizares (Plate LXXI) are similar to the paintings on the Tiestos and Mongó pottery, and a beaker with horizontal bands of 'x's comes from Blanquizares, and beaker pottery has already been referred to in connection with Mongó and Ambrosio. Alabaster vessels are an Egyptian characteristic and alabaster seems to have been commonly used in the south-east during the copper age also.

But perhaps the most characteristically Egyptian artefacts encountered in the Peninsula are the 'face' and 'fly' type of pre- and early dynastic beads (see Brunton & Caton-Thompson, 1928; Brunton, 1928). A necklace of these was found by Cabré (1922) at Monachil b near Granada. Their provenance is slightly in doubt, but they seem to have come from a grave which contained 3 tulip shaped pedestal goblets, an incised bowl, 4 baggy necked pots, 6 shallow bowls, 3 copper daggers with 3 rivets each, and 1 with 4, fragments of a silver bangle, and a copper bangle. There were 3 skeletons. This was one of a series of 'Argaric' type graves. An incised amulet from the Peñón del Trinitario burial no. 2 , Elda, (Alicante) referred to earlier is of this Egyptian type, as are two amulets from Cabeço da Arruda, Torres Vedras, Portugal illustrated by Savory (fig. 24 nos. g,i). Also from the Peñón del Trinitario, but from the burial described as no. 1, there were described two black and white glass beads. These are quite similar to beads depicted in Brunton (1928: CII 80 and 84), and the tear-drop type of stone bead or pendant is also well parallelled in that publication. The Trinitario and tear-drop objects by analogy with the Egyptian material would be placed chronologically in the IV-V dynastic period, i.e. roughly 2,700 - 2,500 B.C. in absolute terms. This agrees well with the Tiestos radiocarbon date for the charred grain from a carinated 'Argaric' type vessel when allowance is made for the Bristlecone Pine correction (1,840 B.C., corrected to 2,330 B.C.).

The chronology proposed seems fairly secure. Zoomorphic amulets occur in the Tagus group of tombs in Portugal (Savory, 1968), ivory sandal at Alapraia 2 (compared by do Paço,1941, to one from Almizaraque), imitation pine cone at Carenque (compare the pot/baked clay one from El Gárcel: Gossé,1941), imitation hoe at: Sao Martinho 'tholos' passage grave which is surely of predynastic Egyptian inspiration, bone and ivory combs at various tombs, and a schist crozier with geometric decorative motifs at Anta da Herdade das Antas (see Savory, 1968).* Savory points out that the marginal retouch on flint halberds, such as one he illustrates from the burial cave of Casa de Moura, is a predynastic phenomenon. Perhaps the marginally retouched plaques of flint from southeastern sites represent a similar tradition (Cueva del Monte de la Barsella; El Prado at Jumilla; Casa de Lara at Villena; Torre del Mal Paso in Castellón province; Orihuela; and the rock cut tomb of Loma de los Peregrinos at Alguazas,Murcia).

It seems as if the copper age began throughout the southern half of the Peninsula, therefore, in the fourth millennium B.C., and developed fairly uniformly with wide-ranging contacts (e.g. Egypt). By the middle of the third millennium B.C. the second stage of the copper age with 'Argaric' and beaker pottery appears in some areas, and rivetted daggers, swords and halberds are made. This agrees with the stratigraphical evidence presented by Savory (1970) to the effect that beaker pottery is a later development at Vila Nova de São Pedro, and the Leisners' view that beakers were later additions to the grave goods at Los Millares. Blance (1960, publ. 1971) divides the 'Argaric' phase into an early phase with broad butted daggers with three rivets in cists (of Sangmeister's beaker 'Refluxstrom' associations) and a later phase of jar burial with longer daggers with 4 rivets in square formation.

*c.p. a cruder object from Los Millares grave 17.

The comparative statistical analysis of grave goods at 'Argaric' sites by Blance suggested to her that the La Bastida occupation, with fewer cists and mor jar burials than El Argar, no halberds (an early phase type according to her), and no V-perforated buttons ('Refluxing' objects according to Blance), was later in date than Argar. Perhaps the radiocarbon date from the adjacent Cabezo de Juan Clímaco obtained by the present writer confirms her hypothesis. Conversely, gold (a 'Reflux' object according to Blance) did occur at Cabezo Redondo, and a tanged copper dagger would presumably be considered by her to be 'early phase' rather than late, and the radiocarbon date here is 700 years earlier than at the former site.

Three questions are raised :

(a) what is the role of the beaker phenomenon ?

(b) what is the role of the 'Levantine eneolithic' tradition ?

(c) is there a south-east Spanish bronze age ?

These are all highly inter-related matters. An example of this inter-relationship (at least of the possibility of it) may be indicated. Excised pottery is known from 4 sites in the south-east: Cabezo Redondo (1,600 B.C. in radiocarbon years), Puntarrón del Chico (described earlier - possibly contemporary with Orihuela-Callosa on the basis of the canister pot, contemporary with the 'Levantine eneolithic' on the basis of its decorated wares), the Cueva Ambrosio (incised wares, pre-beaker ware etc.), and Cerro de la Virgen where Schüle & Pellicer (1966) state that carinated vessels (which look like fore-runners of 'Argaric' forms) and Vila Nova de São Pedro - like pottery are followed stratigraphically by beakers and carinated wares, giving way finally to a full-blown 'Argaric' phase with excised wares at the beaker/fully 'Argaric' interface.

The Pottery Problem and the SE Spanish Copper Age

Blance attempted to resolve the origins of the Spanish bronze age in terms of metalwork. Her conclusions, taken together with the spectrographic analyses

may be accepted provisionally. However, this does not really get to the bottom of the matter. The scheme proposed above is as follows:-

Absolute age				C-14 age
4,300	Early Copper Age (Bronze I)		Tabernas ?Gárcel	3,400
3,700			Portuguese Pavian tombs	3,000
3,000			Millares I ? Vila Nova S.P. I Almizaraque El Prado Sabassona Ca. Encantades	2,300
2,500	Middle Copper Age (Bronze II)	(Beakers)	Tiestos Monachil El Argar cist phase	1,900
2,000		End of Beakers	Zambujal Cabezo Redondo	1,650
1,500	Late Copper Age (Bronze II)		Fuente Álamo faience beads. Jar burial phase La Bastida	
1,000			Juan Cimaco	1,000
	Bronze Age (Bronze III)			

Unfortunately, there is no clear-cut pottery sequence which fits precisely and repeatedly with the sequence established -- not even in one region such as the south-east of Spain.

The reasons for this may be of two somewhat different kinds. First, the early copper age is precocious when compared with Italy or France, hence there is no advanced neolithic and no major influences from other European neolithic cultures of the fourth millennium B.C.. Quite different types of ceramic development from other areas of Europe ought therefore to be expected. Secondly, because there was a thriving copper age society in the southern part of the Peninsula, subsequent chalcolithic and bronze age developments in Europe were effectively excluded. They were not needed. The area was effectively isolated, both by its self-sufficiency and by geographical distance from developments in Europe during the second millennium B.C.. Possibly Phoenician influence stimulated the development of the Iberian iron age in the first millennium, but by that time the Halstatt and post-Halstatt movements had also reached the Peninsula. Climatic deterioration and old-fashioned technology were only overcome with a struggle -- and with the aid of the happy circumstance that just as copper was abundant in the hills of the region, so, too was iron around Cartagena and La Unión.

If this seems to ignore the beakers, that is only because they must be seen from the viewpoint of the first kind of reason and not the second. Traditionally, it has been interms of the second, that is to say of cultural movements, that beakers have been considered. It will be suggested that such a perspective is inappropriate, because it is to attempt to answer the wrong kind of question.

It should not be thought that beakers are rare in the Segura and Vinalopó basins however. They occur at the Blanquizares cave and Ambrosio ('pre-beakers'), as well as at Puntarrón del Chico and Morrón de Bolbax, in the Segura basin. In the Vinalopó region they occur at the Cueva de las Lechuzas, at Casa de Lara possibly, at Puntal de los Carniceros, Tabayá, and further north near Alcoy they get into the Valencian caves at Coveta del Barranc del Castellet at Carrícola, Cueva del Retoret and Cueva de la Recambra lower down the Serpis valley near Gandía, and they also occur at two sites near Albaida, Atarcó and Alfogas, and one near Bélgida at Beniprí (see Ballester,1928a; Jornet, 1928). The notion that beaker pottery is absent from the area is due to the obscure publications and to wrongly labelled sherds in collections (or unidentified sherds). At the Albaida sites, it seems to occur with baggy and 'sub-Argaric' pottery. They may have been occupation sites. It should be recalled that beaker pottery is known from occupation sites as well as from chambered tombs in the south-east, and seems to represent a middle copper age phase at the settlements (late at Vila Nova de São Pedro in Portugal, and perhaps at Los Millares and Almizaraque, and certainly at Terra Venturas - Gusi, personal information, and it also occurs at El Argar). The present writer does not wish to express too many opinions on theories of beaker origins and 'refluxing', since the data from the Segura and Vinalopó regions is too sparse for conclusions to be drawn. It may be worth remarking that cardial impressed pottery and pseudo-cardial pottery occurs with beakers at Atarcó and the Carrícola cave. It also occurs perhaps at Hoya del Conquil 48 in Granada, where there was copper and plaster ~~pott~~ sherds, and at Cueva de los Tiestos in Murcia where there are plaster sherds. An early date for some beakers would not be impossible, and would be in

line with comments offered here about parallels between Ambrosio and the Cueva de Mongó in Alicante (which also has beaker sherds), and the Cueva de los Tiestos and Mongo, with respect to their painted wares, and perhaps Blanquizares might be brought into this comparison with its beakers, plaster sherds and painted alabaster vessel. Deep ridged and grooved sherds may also be early, occurring at sites with some of the aforementioned types: Alfogás , Torre del Mal Paso in Castellón, Castillarejo de los Moros in Valencia, El Prado at Jumilla, and Cuartillas near Mojácar (Siret & Siret, 1887). So, also, may cups with long lug 'handles', from El Prado, Cueva de la Carigüela and Tabernas.

The Incised Tradition

This tradition is ancient in the southeastern neolithic. Incised wares occur with plain and cardial impressed sherds at Cocina (Fortea,1971) at which site, and perhaps also at Hoya de la Mina, there are also combed sherds. Combed wares occur in pre-dynastic Egypt, but their presence there may be later than in Spain. The Carigüela cave sequence with incised slipped and encrusted wares, similar pottery with spouts at the Nerja cave occurring with handled costrel pottery indicating El Gárcel relations, and the plain ware layers at Coveta de l'Or (perhaps of Starčevo contemporaneity - Topp,1959) may correspond roughly to one another. There is a possibility that El Gárcel may represent the earliest copper age settlement. Perhaps the notion of incised and encrusted geometric decoration owes partly to an indigenous fashion, and partly to long-range copper age contacts with the Badarian and Amratian. Perhaps it was an attempt to recreate the effect of the black and white geometric decoration of Badarian pottery. Geometric designs occur on the inside of a platter rim from Cerros de las Canteras near Vélez Blanco (Gil Farrés,1950). This is a very 'Egyptian' style. The absence of metal at the site may be fortuitous;a cylindrical vessel resembles one from Campos,and a copper age date is likely.

Similar rim decoration occurs at Llano de la Atalaya tombs 3 and 6 at Purchena (Leisner & Leisner,1943) with an omphalos based plain bowl and an omphalos based baggy vessel with 3 incised lines as well as 3 bell beakers at the second tomb, one with omphalos base . There were also fragments of a beaker bowl and other plain vessels. Omphalos beakers occur at Alapraia and Vila Nova de São Pedro in Portugal and Los Millares grave 13. Occasionally, beaker-type wares get zoomorphic motifs (Palmela in Portugal;Las Carolinas,Madrid). The beasts are cervines. Cervines are also incised on a bowl from Millares grave 7 and the tetrapod bowl from Millares grave 15*. Tetrapod bowls are common in pre-dynastic Egypt. The Millares

(* and Almizaraque grave XXI ?)

bowl has a strange projection in the middle inside. Unlike the beakers, both have 'oculus' markings. 'Oculus' motifs are incised on the inside of shallow bowls at Almizaraque 4 17, and Millares 57, 37, 15 ('fern' motifs also at latter). 'Oculus' motifs are painted on the vessel from Millares grave 21 (fig. 119), and with a 'fern' motif on the sherd from Cueva de los Tiestos (fig. 61). The combination of 'oculus' and cervine schematic motifs has been seen painted on rock faces, such as at Cañaíca del Calar in Murcia province.

What all this surely means is that there was a very wide range of table wares and other 'superior' pottery available in the early and middle copper age. The cervine motifs suggest a continued interest in hunting or other (domesticated ?) man-cervine activities. Perhaps the cervine engraved clay plaque from Vila Nova de São Pedro (Savory, 1968, p.154 fig. 50a) and the cervine motifs on the pottery reflect ceramic zoomorphic motifs on pre-dynastic Egyptian pottery and plaques. However, there is a tradition of zoomorphic painting in Spain and convergence in similar environments is more reasonable an explanation.

It is not being suggested that the Spanish copper age arose out of the Egyptian neolithic ! It is the view of this writer that that a precocious Spanish copper age had far-ranging contacts of a commercial nature and the word 'parallel' used frequently in this chapter is not to be misinterpreted as 'precursor outside Spain' in every case. However, the baggy copper age Almerian-type wares are mainly plain. Nevertheless, incised wares which are not particularly of beaker affinity but which are more like those of Andalusian cave sites are found in the Almerian tombs. Plain beakers are also found in the tombs (Millares 41; Loma de Belmonte 1; Llano de la Atalaya 6) and they are also found in the Alentejo tom-

bs (Savory,1968). It should be remembered that at two of the three Almerian graves there were also decorated beakers. The point is that there is a gradation of decorative styles from plain to very elaborate notch-incised, 'oculus' motif, encrusted and incised, painted and plain lugged pots. There is a similar gradation of shapes: open bowls, platters, baggy vessels with strangulation, pre-beaker shapes, beakers, troncoconic forms, round based vessels with inward sloping, straight sided, and concave profile above a carination. This latter type becomes pronounced in the 'Argaric' phase of the copper age. Away from the cemeteries, domestic wares may have been somewhat less varied, with more bowls and globular vessels, baggy strangulated pots, and plain straight sided flat based bowls or 'flower-pots'.

One type of rather special vessel is that made of plaster ('Gipsekeramik'). This kind especially is decorated with incised lines and occasionally paint (see fig. 119). They are commonly met with in the burial caves of Murcia (Cueva de los Tiestos; Cueva Amador; Cueva de los Blanquizares de Lébor). Elsewhere they are known from:-Huéchar Alhama; Jautón 5; Ruriallos 1,5 at Tabernas; Los Millares 3,9,5,15,23,52,58, (all in Almería), Cuesta de la Sabina 35; Hoya del Conquil 48; Hoya de los Castellones 15; Fonelas 3,9,10,11; Loma de la Manga A1; Loma de la Torre; Llano de la Teja B1,B6,B11,B16,B20;Loma de los Álamos Negros 1 (all in Granada). The Granada tombs included intact vessels: simple bowls, baggy bowls with strangulated neck, and ovoid bowls with closed profile. In other words, they resemble the forms decorated by incised ornament and beaker-type notched ornament in Spain. Many of the sites with plaster vessels have painted pottery and objects to which exotic parallels can be referred, and they are mainly burial sites. This raises the question of the assemblages of the 'Splendid Burial Sites' and their relation to contemporary copper age settlement sites.

'Splendid Burial' Sites

The large ossuaries of Almería deserve this label. Llano del Jautón 5 contained remains of 300 skeletons, and grave 6 contained 200 skeletons and 250 pots. The cave, grave 66 at Los Millares contained 100 vessels, and grave 40 contained 100 skulls and 126 vessels. Other graves in Almería which could be singled out are Los Millares 1,2,5,7,8,9,11,12,15,16,18,21,36,37,39,40,45,57,67, Huéchar-Alhama, Llano de la Media Legua, Loma de la Rambla de Huéchar 2, Loma del Campo de Mojácar 1,2,3, Loma del Belmonte 1, Canecito del Aguilar, Las Peñicas 4, Llano de la Atalaya 6, Llano de la Lámpara 1, Llano del Jautón 5,6, Llano de las Curuletas 1,3, Loma del Llano de las Eras 2, Rambla de los Pozicos 8, and in Granada province Llano de la Sabina 99, Loma de las Viñas 116, Llano de los Castellones 8, Hoya de los Castellones 19, Río de Gor 5, Fonelas 10, Laborcillas Tgb 17/5, 17/14, 5/2, 19/9 (see Leisner & Leisner, 1943 for details).

The foregoing list includes graves of different types from round graves to circular passage graves. It includes corbelled chamber tombs and angular chamber passage graves. The problem in the past has been that burials are capable of receiving new material at later date. A typological 'evolution' of graves loosely supported by grave goods and distance from settlement site has been proposed by the Leisners (and see Llobregat, 1963/1966). The 'splendid' ossuaries look very like those of cave sites such as Cueva de la Pastora, Cueva de Beni Sid, Cueva del Talanqués, Cueva del Monte de la Barsella. Plá (1954) suggests that a distinction should be made between ordered burials where a number of corpses appear to have been buried together and seated around the walls of the chamber (Cueva de la Monte de la Barsella upper series; Cueva de los Murciélagos) and other ossuaries. He has offered some presence/absence tables on Valencian caves which attempt to distinguish between what we may take

as neolithic sites (e.g. Cueva de la Sarsa) with occasional burials in what may have been mainly occupation caves on the one hand, and on the other burial caves with many skeletons and rather different 'funerary' assemblages. The Ereta del Pedregal occupation, however, (Fletcher et al., 1964) at an open site suggests that metal was not left lying around at a date when we know metal-using was well-established in south-eastern Spain, and therefore the absence of particular categories does not allow the possibility of a cave being primarily used for burial purposes to be excluded. It may have been the case that interments were accompanied by personal possessions automatically, hence the metal objects. Special 'ritual' objects were likewise placed by the deceased, and the large amount of plain pottery in the 'splendid burials' perhaps suggests that there was a special production line of pottery en masse for burial purposes and that the time which could elapse between death and putrefaction did not permit decoration before firing to be carried out, so that only those decorated vessels actually owned and prized by the dead man were interred with him, the rest being plain ware made after death for the funeral. This is not to deny that plain wares were used for domestic purposes extensively, of course, as El Gárcel demonstrates.

Now the cave burials offer a chance for excavation in circumstances which in some instances preclude later additions. At Monte de la Barsella there were two distinguishable stratigraphical groups, and at the Cueva de los Tiestos the stratigraphy and absolute dating suggest a single interment episode. What can be deduced of relevance to the passage grave question from the Murcia-Alicante-Valencia cave burials ?

If the 'splendid' nature of some burial constructions and some cave burials be equated, and if the two sets of distribution maps be compared, a lightly overlapping interlocking distribution is

Suppose that the equation be drawn between the plaster pottery caves and passage graves, painted pottery caves and passage graves, and beaker pottery caves and passage graves ('passage graves' here is taken to include all megalithic graves, including round and oval graves without passages), then one can ask whether this makes sense in cultural and chronological terms ? The second matter is capable of factual determination at least.

The upper burial series at Monte de la Barsella has Blance's 'Reflux' things: V-perforated buttons and a dagger with a broad heel plate and three rivets. A radiocarbon age of 1,700 - 1,600 B.C. or an absolute date of about 2,250 - 2,000 B.C. seems very likely. The upper burials also have a silver ring, and precious metals are said to be another 'Rückverkehr' feature by Blance. The disposition of the bodies recalls the Granada cave (Góngora, 1868) with its famous gold diadem (Cueva de los Murciélagos). Here the pottery included the local domestic incised wares, whereas at Monte de la Barsella plain baggy forms were found. At this stage the pottery is not 'Argaric' in these cave burials. Perhaps they were peripheral to the area where it was developing; or perhaps 'Argaric' pottery was an 'inappropriate' type for funerals.

The lower burial series has a polished stone axe pendant, and the famous bone double-anchor ornament. This must give the context of the Cueva de los Blanquizares de Lébor which has a similar one. Various parallels outside the Peninsula have been adduced; Savory suggests stone anchors from the Palestinian Ghassul culture. They do not have Egyptian or Cycladic parallels which are convincing.

Both layers at Monte de la Barsella have segmented pin-heads and the upper layer a bone comb. Combs are known from Argaric sites including the type site (vide supra). Combs are hardly very diagnostic, and presumably have always been items of personal necessity.

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6:102

There is a wooden comb at Blanquizares. The upper layer and lower layer at Monte de la Barsella have bone bitriangular and other 'spatulae' and 'idols'. These, too, are not chronologically specific.

The painted ware at the Cueva de los Tiestos, Cueva de Mongó, and the alabaster painted vessel at Blanquizares have much in common. Mongó and Blanquizares have beaker wares. Tiestos has incised sherds, and so do Mongó and Blanquizares. Tiestos has an Argaric vessel, and so perhaps does Blanquizares. There were perhaps 80 pots at Blanquizares. But Blanquizares and Tiestos do not have 'Reflux' objects. Perhaps therefore Blanquizares, Mongó, the Cehegín caves, the lower layer at Monte de la Barsella, and Cueva de los Tiestos form a contemporaneous group in radiocarbon years between 1,900 - 1,800 B.C., and in absolute terms 2,500 - 2,250 B.C.. Amber beads were found at Blanquizares, but these could come from local sources of amber which Jiménez de Cisneros refers to near Almorquí, Agost, (Alicante), and in the Caravaca - Moratalla region of Murcia from fossil amber deposits, (see below).

The bone hook pendant at Blanquizares and an 'imitation bone tusk pendant have Old Kingdom parallels. This recalls the bilobed pendant from Cueva de la Pastora. Here, too, there were amber and faience beads, but not all faience beads have to be second millennium as opposed to third, and the earlier age of Pastora fits better with the other caves. The Peñón del Trinitario amulets and glass beads suggest a date around 2,500 B.C. as has been argued, and the flat based carinated pot with everted rim looks rather Egyptian. The kidney shaped or tear-drop stone beads also support this date. Such beads are present at many Murcian and adjacent cave sites, and there was a necklace of such beads from Cehegín, perhaps from one of the caves. The radiocarbon date for El Prado, Jumilla is only slightly earlier. Tne ~~bilo~~ dumb-bell polished stone 'idols' from this open site are found again at Yecla not far away and at

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6:103

Los Millares grave 62 and Llano de Alicún grave 14 (Granada).

A violin idol with stumpy arms and cruciform idols, all of stone, come from Blanquizares. From Pastora there is the series of 'oculus' decorated bones, parallelled at the following: - Ereta del Pedregal (Fletcher,1961), Los Millares grave 7 (Leisner & Leisner, 1943), Cueva Bolumini (Pascual,1957), Hoya de los Castellones grave 19 (Leisner & Leisner, 1943). Violin idols with stumpy arms are known also from silo no. 1 at El Arteal near Cuevas de Almanzora (Arribas, 1953), Loma de la Torre 4 at Arboleas (Leisner & Leisner, 1943), and two of alabaster from Huéchar-Alhama (Leisner & Leisner, 1943). Violin idols without arm stumps occur at Hoyo de la Mina (Such,1919), three from Monachil (Cabré, 1922), and perhaps one of pottery from the Zapata . settlement (Siret & Siret, 1887). Cruciform idols are commoner, occurring as at Blanquizares with violin idols at Huéchar-Alhama, from the Cueva de la Carigüela (Pellicer,1964), La Pernera (Siret & Siret,1887), Loma de la Atalaya 12, Llano de la Lámpara, El Jautón 3, Las Churuletas 3, Llano de la Rueda 1, Loma de la Manga 1, Llano de la Media Legua, Loma de la Torre (Leisner & Leisner,1943), Hoya del Conquil 46 (ibid.,) , Tíjola (Cabré, 1922) and anthropomorphic figurines similar to those from Loma de la Torre and Tíjola were found in a deep shaft at Bancal de la Corona, Mas de Is, Els Dubots near Alcoy (Taracena, 1951).

The violin and cruciform idols include two 'axe'-ended idols from Loma de la Torre grave 4 at Arboleas and one from La Pernera. Perhaps these are to be likened to 'axe'-headed figurines from Amorgos as proposed by Siret & Siret (1888). As the Sirets pointed out, only one anthropomorphic figurine from the south-east has Egyptian affinities. This underlines the eclectic nature of the early copper age which collected influences from many areas and appropriated them, rather than representing a 'colony' from just one.

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6:104

The date of such idols can be roughly ascertained by reference to the tables in Renfrew (1972) for Cycladic figurines. However, some of the odder local features represent divergent developments, and the heirloom effect must also be taken account of. Perhaps it is wisest to say that an absolute date roughly corresponding to Troy I or early Troy II (early/mid-third millennium B.C. in absolute terms) agrees well both with Spanish radiocarbon dates and the other cross-dating proposed above. This agrees with Savory's interpretation of clay 'idol-spits' from Vila Nova de Sao Pedro I in terms of early third millennium Anatolian examples (Savory,1968, pp. 136-7).

Planoconvex segmented bone/ivory objects occur both at Monte de la Barsella and Blanquizares. A rather different planoconvex plaque comes from Llano de la Lámpara 1 in Almería.

Plaster sherds have been listed earlier. Painted sherds and pots are known from Tiestos, Mongó, Blanquizares (painted alabaster jar), Cueva de Tío Gil (Plá,1966),Almizaraque L7 (Almagro & Arribas,1963),from Los Millares graves 1,9,21,40, Loma de la Rambla de Huéchar 2, Loma de Belmonte 1, Loma del Llano de las Eras 2, Llano de la Teja B 16 and B6, Fonelas 3,9,10 (Leisner & Leisner, 1943), Balma de Soleia de Can Joval near Solsona in Catalonia (de Mergelina,1923),Lapa da Bugalheira near Almonda in Portugal, from Campo Real near Carmona (Sevilla: Bonsor, 1899 p.107 figs. 41,42), Mesas de Asta (Sevilla: Esteve,1945), Car Gahal in Morocco (Tarradell, 1958) and from copper age layers at the Cueva d'En Pardo near Vall de Gallinera,(Alicante: Llobregat-personal communication). Not all are necessarily of the same date. Clearly, at Terra Ventura the painted ware is fourth millennium, and other examples which may be referable to Italian neolithic painted wares have been mentioned earlier.

The Catalan painted sherds were also incised. The Sirets illustrated incised sherds from La Gerundia, Tres Cabezos, Campos, Lugarico Viejo, Ifre (inside a bowl), Las Anchuras, Zapata (inside a pedestal cup), Gatas, El Oficio, and Fuente Álamo. There was even one sherd (apart from a beaker sherd) from El Argar. Dependent arcs, chevrons, horizontal lines, often with dot ornament, are common. One wonders whether the typological separation of the geographically contiguous El Argar-La Gerundia-El Gárcel complex did not distinguish between Argar and Gerundia merely on the basis of undecorated as against decorated pottery. Much of the material was not in sealed layers and no stratigraphical sequence was recorded. Both Gerundia and Gárcel presented a lot of Argaric material and this was apparently rejected by the excavators as 'later contamination', despite their lack of referent collections for the remainder of the assemblages which they elevated to the Gerundia and Gárcel types.

All this really looks very like the ornemented pottery of Carigüela or Nerja - or, for that matter, many other Andalusian caves. It also looks like the incised and dot ornamented pottery of Murcia, Alicante and Valencia. Probably a Troy II equivalence for this pottery is acceptable on the grounds of dot and line ornament elsewhere in the Mediterranean (Evans, 1972). It also underlines the point that the 'Argaric' phenomenon is not so exclusively characterised by plain wares as consideration of the type-site collection or the slightly chronologically later Bastida pottery might lead one to believe.

But one may wonder whether the incised tradition is not basically an indigenous one. This seems a plausible and economical hypothesis given the weight of evidence. From the early incised ware layers at the Carigüela (well below the cruciform idol) there are incised geometric designs, including the hachured triangle.

This is perhaps one of the most typical symbols of copper age incised pottery in the south-east, and chevrons lines by dot ornament are another common motif. The pottery from Jumilla, from Puntarrón del Chico, from Tabayá and many other sites in Murcia and Alicante includes these or similar motifs., as does that from the Murcian and northern Almerian sites illustrated by the Siret's listed above. One rarely finds an example of painted pottery or of plaster ware at any of the Almerian burial sites without encountering at the same tomb an example of incised ware. This is not confined to the south-east as the Catalan sherd demonstrates. At Campo Real where there were found sherds of painted chevrons and vessels of typical copper age profile, there were incised hachured triangles on some sherds (e.g. Bonsor, 1899,p.109).The zonally decorated incised round based bowl with inward sloping sides from Cabecito del Aguilar, Mojácar, (Almería) represents the kind of incised ware more usually found on beakers or incised baggy bowls on a carinated copper age vessel , and another chevron and dot ornamented sherd from that site has been compared with similar sherds from layer 6 at the Castillejos de Montefrío (Granada) and El Minguillo at Villanueva de Córdoba. One might comment on the 'Argaric' look of pottery at Llano de la Lámpara 1, at Churuletas 3, or Loma del Llano de las Eras 2 near Tabernas from which there are painted and incised wares as well. The excavations at Cerro del Real (Pellicer & Schüle,1964) demonstrate that 'Argaric' carinated pottery can be followed stratigraphically by almagra slipped baggy wares.

The point to be emphasised is that there are many sites at which 'Argaric' type wares and decorated wares occur together, and there many sites at which carinated and baggy ('Millaran') wares and decorated wares occur together. The site of Canteras de Murviedro at Lorca,(Murcia) which is illustrated in fig. 54 is a typical instance of the former. The 'oculus'decorated sherd from Castillarejo de

los/

los Moros,(Valencia; Fletcher & Alcácer, 1958) occurs at a site with what has sometimes been held to be 'sub-Argaric' pottery. The incised pottery clearly continues in strength into the period following the appearance of V-perforated toggles and other 'Reflux' objects, as the material from Lugarico Viejo in northern Almería (Siret & Siret, 1887) or Gatas (ibid.) demonstrates. The main difference between the early and middle copper age is that in the latter the flat based carinated vessels (e.g. Parazuelos vases : Siret & Siret, 1887) are replaced by round bottom forms. Pedestal goblets or foot-ring bowls may occur in the early copper age perhaps (Fuente Vermeja - Siret & Siret,1887; Quesada - Carriazo,1925 ; Cova Fonda de Salamó - Closas, 1934; Cueva de los Murciélagos - Góngora,1868; Llano de la Cuesta de Almiel 24 - Leisner & Leisner,1943). Once again we see artefacts normally held to be 'Argaric' associated with 'splendid' burials. It might be said that the contribution of a re-appraisal of the burial caves of the Segura and Vinalopó to an understanding of the Almeri-an passage graves is that the stratigraphical data permit the 'splendid' burial assemblages to be seen as contemporary but heterogeneous, and that there is now no need to regard all of the heterogeneous pottery assemblages from the burial tombs as representing diachronic episodes of tomb utilisation, though some may.

Both Argaric and beaker pottery is firmly rooted in the indigenous early copper age. Beaker pottery is rather odd. Unlike other wares it has little mineral filler, or rather, little large or medium grain-size filler. This suggests that it was not mass-produced, but was a special production order. Perhaps the closeness of the ornament could not be obtained with large crystal filler. Cardial impressed ware which has similar close decoration is usually made of fine grained filler. Looser incised decoration and painted wares do not need and do not have such fine grained filler. A large grained filler brings a

greater/

greater risk of cracks appearing during the drying phase before firing. This is undesirable where a great deal of work has gone into ornamenting a vessel. Non-industrial potters, that is to say rustic part-time amateur potting, can also afford the time to use fine filler. This is perhaps not the explanation of the beaker technique, which is probably more concerned with the decorative techniques. Beakers at first were perhaps no more than just another special kind of funerary decoration on baggy vessels and bowls in the Peninsula (Andalusia, Portugal). Only at a later date where 'Reflux' artefacts appear do we see influences (?returning?) from farther north. These were perhaps no more than the consequence of the insatiable local demands for exotic objects, especially for funerary purposes.

At first, maritime contacts with Egypt fulfilled those needs during the early copper age. The ivory sandal from Los Millares 12, the ivory container lid and winged ivory comb, not to mention 800 ostrich egg shell beads, from the same tomb are typical. One of 5 amber beads here has a V-perforation, so not all such perforations are of northern origin. There were jet and amethyst beads in the tomb, and hollow based arrow-points. Graves 7 and 5 have imitation Egyptian axes, the former with an amber bead, 'oculus' phalange idol, and oculus-cervine incised vessel, the latter has 3 ornamented ivory vessels with criss-cross excised decoration. These were found at grave 40 which had the 'flame' painted pot, and Loma de la Rambla de Huéchar 2 which also has a pain ed pot,and incised vessels occur at both. Imitation weapons in bone or ivory are, as has been stated, pre-dynastic and early dynastic objects. However, in the south-east they clearly continue into the middle copper age (e.g. at Orihuela and Callosa). . Egyptian influences seem to get fewer, and many of the artefacts may have been made locally. A metal arrowhead from El Argar (Siret & Siret,1887, Pl.XXVI no. 49) looks very

like/

Old Kingdom forms, and like the bone imitation from Callosa. The tripod bowl (ibid., Pl.XVII no.7) is clearly of Egyptian inspiration. The three zoomorphic figurines in the same plate may be likened to that from Llano de la Sabina 126 (Leisner & Leisner,1943), (and c.p. the zoomorphic stone vessels from Portuguese dolmens such as Carvalhal - Blance,1960 rep. 1971). The inference is that the El Argar sequence begins early in the middle copper age, say shortly after 2,500 B.C., in absolute terms. The occurrence of tulip or pedestal goblets in the Granada passage graves does not necessarily therefore mean that they have to be late in date. Perhaps pedestal bowls or goblets were inspired by vessels of Troy I and early Troy II. Possibly even earlier examples are said to be in the Diana style in Sicili (see Bernabò Brea, 1957). These items, the violin figurines, and clay idol-spits at Vila Nova de São Pedro, indicate that between 2,500 - 2,000 B.C. alternative sources had to be contacted to satisfy the exotic tastes of the Peninsular copper age.

The Settlements

Little is known of the settlements in the south-east, other than what is published in the works of Siret. However, at Campos there seems to have been a kind of fortified dwelling about 12 metres across which was destroyed and rebuilt on a smaller scale. This site is a few hundred metres from the Tres Cabezos settlement of round or polygonal huts. The pottery and other artefacts suggest contemporaneity. Round houses were present at Terra Venturas in the lower layer. Irregular shaped dwellings seem to have been present at Parazuelos, Lugarico Viejo, Ifre and Zapata. Only Zapata has typically 'Argaric' pottery in profusion. At Gatas and El Oficio, with incised, dot ornamented and carinated 'Argaric' wares, the houses were rectangular. Oficio had a horned altar of supposedly Anatolian or Cretan affinities. Further north, there are the odd

pit 'dwellings' of Campico de Lébor (del Val,1948), apsidal structures at La Bastida (Martínez Santa-Olalla et al.,1948), and rectangular dwellings at many Alicante and Valencia hill-top settlements.

The Sirets' analyses of metal objects revealed that most of the Parazuelos objects were copper and some of the Campos ones. Bangles, however, from Campos, Qurénima and Caldero de Mojácar were of tin-bronze. On the other hand, Fuente Vermeja, Lugarico Viejo, Ifre, Zapata, Gatas, Argar, Oficio and Fuente Álamo yielded less with the possible exception of the last two sites. Fuente Álamo had faience beads of segmented type . A mid-second millennium date seems acceptable. Whether one should put the 'early bronze age' as commencing here, or following the end of the major 'Argaric' occupation sites at the end of the first millennium, is rather a matter of taste.

The incised and dot ornamented wares of the south-east extend into Valencia, and the Valencian 'eneolithic' is no more than the same phenomenon. Many sites have carinated plain pottery of 'Argaric' type, and dates for sites such as Cati Foradá or Pic dels Corbs fall in the first half of the second millennium. Many of the . sites have rectangular houses. Cist, jar, pit, and tumulus funerary arrangements seem to have been practised. Most of the 'Argaric' pottery, carinated urns, jars and bowls, comes from burials, whether at Argar or the northern Almerian sites, Bastida, or Orihuela and Callosa, on the one hand, or the Granada passage graves on the other. Wherever settlements have been excavated and the domestic pottery has been published (which it has not for either Argar or Bastida, from which only funerary pottery is published) we find incised wares - even at Oficio. This burial pot-

tery is plain, except for beakers. In other words this looks like the same kind of phenomenon which we have noted by and large for the early copper age burials.

It is unfortunate that we have no settlements which were occupied over a long period of several centuries. What is known is that as one settlement was destroyed or fell into disuse, another was established in roughly the same geographical area to continue the proto-urban tradition, suggesting that the socio-economic infrastructure was not unduly disorganised and that populational organisation demanded a pattern of settlement and classes of manufactured artefacts of a type analogous to the early copper age pattern. Invaders with an alien culture and way of life seem unlikely, and local clan warfare, or even accidental fires might be better explanations of the changes. Certainly there were no 'Refluxing' beaker folk disrupting the traditional patterns, and the basically inland pattern of settlement excludes maritime invaders almost as certainly. Possibly agricultural necessity, owing to exhaustion of the soil and the need to seek new fertile land, may have played a role. The major later sites - Argar, Fuente Álamo, Bastida, Orihuela, Cabezo Redondo - are inland, by contrast with Almizaraque, Gatas, Parazuelos, Ifre and Zapata. Perhaps this indicates a reduction in maritime trade during the second millennium as against the third.

6:112

The burial chambers are not entirely unrelated to those of the early copper age. Many are fissures near to the settlements (see Siret & Siret, 1887), at least in so far as regards the earlier middle copper age sites. The occurrence of 'Argaric' pottery in some Granada passage graves may be middle copper age rather than early copper age, especially perhaps Barranco de la Cuesta de Sabina 58 where there were copper objects, blue glass beads and an Argaric pedestal goblet, (García Sánchez, 1959). This may refer to faience which is known from Fuente Álamo. Perhaps jar burial was borrowed from Levkas, or perhaps as suggested by Evans from Milazzo or Thapsos. The published metal analyses (Blance, 1959; Junghans et al., 1960; García Sánchez, 1963)indicate that most of the early and middle copper age sites employed the local arsenical copper ores which resemble Aegean and Anatolian rather than Central European ores, except for occasional German-type ores at Ereta del Pedregal and 1 instance at Argar. The Argaric metallurgy is again seen to be rooted in the early copper age rather than in a foreign source, except for perhaps 'Reflux' beaker objects which were imported.The metal forms have been compared by Evans (Ph.D. thesis) with the northern Italian early bronze age and forms deriving from the Aegeo-Anatolian region at a further remove. Savory prefers to see local development of forms such as the halberd. There is no doubt that during the middle copper age the proto-urban communities turned more towards the north and less towards the eastern Mediterranean, but chronological primacy for particular weapon types is hard to establish for one region, and imports or their copies made locally only occasionally suggest really strong analogies (e g. the tanged 2-rivetted dagger from El Oficio or the indented heel plate one-rivet dagger from Lugarico Viejo : see Evans, Ph.D. thesis). Perhaps the 'Argaric' phenomenon is best regarded as a continuation of the localised south-

eastern early copper age using traditional technologies and expanding away from the denuded valleys of northern Almería northwards to Murcia, and from southern Almería north-west to Granada. The local economy received an additional stimulus and montane settlements in the uplands of Murcia, Alicante and Valencia participated in the prosperity. This may have involved contact with the northern part of the Levantine region and Catalonia, and hence the land-route to France and Italy became more utilised as a source of imports. Archery equipment and perhaps even late beakers were traded via this route at a time perhaps equivalent to the Italian Remedello and Rinaldone cultural complexes. Only some objects were received; thus battle axes do not reach the south-east, and the ornate double cups with elaborate bridging handle get no further than the Còva Fonda de Salamó (see del Castillo, 1947). It seems true to say that the south-east was insulated from most of the changes which affected areas further north in Europe during the bronze age, at least until the close of the second millennium B.C.. Occasional pieces of Argaric metalwork, which may be early perhaps, suggest French or even Wessex parallels (see Blance, 1960 ,thesis p. 437 on a wide heel-plate 4 rivetted dagger with a projection; and perhaps the La Bastida dagger shown here in fig. 92 no. 13). But contact with the west seems to have been as slight as with Catalonia. The present writer finds little to disagree with in the statements of Blance (1960) or Savory (1968) on the somewhat uninteresting developments in the south-east during the latter half of the second millennium.

VII

INVESTIGATIONS INTO ARTEFACTS, CEREALS, AND A DISCUSSION OF SOME SOCIO-ECONOMIC CONSIDERATIONS IN THE COPPER AGE OF THE SEGURA AND VINALOPÓ BASINS.

Introduction

Ceramic Technology

Methods of investigation are briefly listed, and the sites so investigated likewise are catalogued.

Petrology of Ceramic Filler

In which the conclusions of the microscopic examination are given.

X-Ray Emission

The details of the X-ray emission determinations are given and discussed.

Refiring Experments, Shrinkage, Relative Porosity

These experiments are discussed.

Comparative Ceramic Results

In which an attempt is made to compare the pottery from different sites, with special reference to the investigations above.

Projected Investigations

In which the direction of future work is indicated.

Scalograms

In which the results of multidimensional scaling programs performed on the computer on ceramic profiles are discussed.

Agriculture

In which the copper age agriculture is briefly described and a statistical analysis of wheat and barley grains is discussed.

Axe Localisation

Sources of rock for polished stone tools are speculated upon, but

Vitreous Minerals and Precious Minerals

These substances are referred to briefly.

Site Localisation

The situation with regard to resources of minerals and organic materials of the settlements and other sites is discussed.

Cup Markings

In which some curious rock carvings recently recorded are discussed.

Conclusion

The writer's opinions about the nature of copper age society are aired briefly.

INVESTIGATIONS INTO ARTEFACTS, CEREALS, AND A DISCUSSION OF SOME SOCIO-ECONOMIC CONSIDERATIONS IN THE COPPER AGE OF THE SEGURA AND VINALOPÓ BASINS.

Introduction

One of the greatest difficulties in disentangling the later neolithic and copper age phases is, as has been said above, the intractable nature of the pottery qua type-fossil. This might one to wonder whether or not there were special features regarding the culturo-socio-economic organisation peculiar to south-east Spain. After all, the notion that different stages in implement or weapon technology may be related to different stages of ceramic style is an observer-based viewpoint. It may be a working hypothesis which holds good for many prehistoric societies. There is no a priori reason why it should always do so. It has already been remarked that findings concerning copper ores suggest no particular change of utilisation as between the early and middle copper ages, apart from some beaker period arrivals. However, a smith might well use the nearest ores to hand regardless of his cultural 'origins', and he may melt down obsolete weapons of an earlier 'style'or 'culture' to fabricate new ones in a different style. These are hypothetical possibilities.

If one were to determine homogeneity with regard to several unrelated matters, however, then the continuity or discontinuity between different assemblages might eventually be disentangled. This is a long-term laboratory affair. The trouble is knowing where to begin. The present writer, baffled originally by the ceramic

hetero-/

heterogeneity, decided to attack the problem by different routes altogether to those of traditional stylistic inspection, cross-dating, and stratigraphical observation, in order to determine whether the traditional methods could be supported. Investigations both into ceramic technology and physical anthropology have been undertaken. It was decided to use many techniques on a small amount of material rather than an approach confined to just one on a lot of material. The reasoning was that one could not know which technique would be most worthwhile developing subsequently, and it was hoped that initial investigations might point to those areas which could be profitably taken further at a future date. Thus the results to be presented are a kind of sample series to determine areas for development, and do not represent a statistically significant set of observations for any one site or culture as yet. Material is collected from which a much larger project can subsequently be embarked upon in the laboratory. The emphasis was to be placed on ecbnomic and demographic aspects: viz. ceramic technology, prehistoric agriculture, and (next chapter) physical anthropology.

Ceramic Technology

Very many sherds have been collected from spoil heaps and the surface in Spain, samples have been provided by many museums in Spain and in the U.K., and some sherds have been examined from stratified excavation situations. For the most part they are coarse, hand-made sherds without decoration. They come from the area of the Segura and Vinalopó basins, adjacent open and cave stations in Valencia, Albacete, Granada, and Almería. Most of those

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7:2

be reported on are from the Segura and Vinalopó basins and Almería. Methods of investigation include:

(1) petrological examination of thin sections of pottery to identify the filler

(2) refiring experiments

(3) relative porosity experiments

(4) hardness estimation

(5) X-ray emission fluorescence spectrometry.

Samples have also been submitted to other laboratories for thermoluminescence dating and for atomic absorption spectrophotometry of trace elements. Sherds have been drawn and described, but except for special pieces (e.g. painted ware) no reference to those details can be given here for reasons of space. The following table indicates the site of origin and determinations carried out. The numbers refer to the number of pottery samples for each investigation. Unfortunately it has not always been possible to perform all of the investigations on the same sherds, though this practice has been followed wherever possible. (Some sherds were too fragile for certain tests. Sometimes the sample the writer was allowed to take was too small for more than one investigation.)

Details of the techniques will not be given, and the reader is referred to standard works: e.g. Kidder & Shepard,(1936), Shepard, (1956), Matson,(1965 1950), Hammond,(1971), Williams (Ph.D. thesis,1967). Relative porosity was determined using the method described in Shepard,(1956). Hardness was determined using a scratch test and Moh's scale. Thickness and shrinkage were determined using a micrometer reading to 0.1 millimetres and calipers. Refiring was carried out

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in an electric furnace with a pyrometer in an oxidising atmosphere. The temperature was raised from 500° to 1,000° C in steps of 100° . Sherds were given 30 minutes at each step, and 20 minutes elapsed between insertions to permit stabilisation of the furnace at the next higher temperature. Colour changes were notes by reference to 'Revised Standard Soil Colour Charts' published by FHK Fujihara Industry Co.Ltd. of Tokyo (1967), which are revised Munsell charts.

The X-ray fluorescence counter was a 60 kilovolt machine working on 24 $m\lambda^2$ at the Geology Dept. of Edinburgh University.

Site	Microscopy	X-Ray Emission	R.P.	Hardness	Refiring	Shrinkage
Abrigo Grande	6	2	1	2	2	2
Coveta de l'Or	2	9	1	1	1	1
Casa de Lara	10		8	8	8	8
Còva Volta	1	3				
Còva Bernarda	1	4				
Còva Blanquisau	1	2				
Covacha del Barranc del Llop		2				
Gárcel	6	13	13	13	13	13
Cueva Santa	4					
Còva de Mongó	13					
El Prado	3	15	14	14	14	14
Cueva de los Tiestos	17	3	8	8	8	8

Sima de los Tiestos		7				
Millares	7	5	5	5	5	5
Barranquete	6	9	9	9	9	9
Almizaraque	13	23	12	12	12	12
Tres Cabezos	12	13	13	13	13	13
Gerundia	7	11	10	10	10	10
Argar	3	14	14	14	14	14
Campico de Lébor	3					
Bastida	8	14	4	4	4	4
Juan Clímaco	7	9				
Cerro de las Víboras	1	9				
Peñón del Cerro del Castellar	14	1	14	14	14	14
Castillico	30	3	13	13	13	13
Puntarrón del Chico	4					
Cerro del Cuchillo	6	1				
Peñón del Trinitario	9					
Tabayá	8		4	4	4	4
Catí Foradá	7	2	7	7	7	7
San Antón Orihuela	15	1	6	3	6	6
Peñón del Tesoro		4				
Cabezo Redondo	1					

Cueva/
7:5

Acequión	1					
Puntal de los Carniceros	1					
Acequia del Rey	1					
Cueva del Lagrimal	1					
Forat del Aire Calent		3				
Cegarrón	3					
Cueva de la Decorada	1					
Terra Venturas		10				

Where a few specimens are referred to in the first column, these were small samples from intact vessels or sherds in museums, and were used for thin sectioning only. Where several specimens are given in the second column, there remain specimens for thin sectioning and the other investigations. It was purposely decided to use different groups of sherds in some instances for thin sectioning and for X-ray emission (i.e. different sites), because the former technique is so laborious that it can be conveniently be postponed, whereas the latter is automated and rapid, although there is a queue of users for the apparatus. Hence if the latter technique can provide results which indicate a separation between sites, thin sectioning can subsequently be done on other portions of the same sherds. Of course, they may not be petrologically different, for the X-ray diagnosis of trace elements may refer to the clay of the sherd only, whereas microscopy cannot distinguish between sherds, but can only permit crystals of filler to be identified. However, it seems useful to employ both techniques as economically as possible for a preliminary sampling such as is presented here.

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In addition to the investigations referred to earlier, a Renfrew-Sterud multivariate computer program was performed on the profiles of the pottery in the Furgús collection by J.D. Wilcock of the North Staffordshire Polytechnic (see fig , 111-118 for scalograms).

Petrology of Ceramic Filler

Microscopic inspection and mineralogical identification of rock fragments and crystals demonstrates that there are at least two rather different types of filler used mainly, but not always, at different sites. In the first place one may discern fragments of metamorphic rocks such as mica schists. Usually these vary from a grain size of as much as 8 millimetres down to fine particles of quartz and biotite less than 0.1 mm in size. The finer particles (down to 0.025 mm) are often rounded and are probably not filler but small quartz granules in the clay selected by the potter. Usually the particles above 0.25 mm across are angular and clearly represent crushed rock intentionally taken for ceramic filler. The second type of filler consists of angular pieces of calcite or dolomite which also vary from 5 mm in size down to less than 0.1 mm., and these are often accompanied by a few smaller quartz fragments which were probably present in the original clay and which were probably not filler. Both types of filler may be accompanied by terracotta 'grog' filler. This never occurs exclusively on its own. The two types of filler vary as between their comparative occurrences at different sites.

Before discussing those sites, a word should be said about the density of filler in the clay body. This is an extremely difficult matter to estimate, especially since the microscopic section is a two-dimensional and not a three-dimensional perspective. The larger the pieces of filler, the lower the density of fragments per

square millimetre of field by and large. But this is not entirely true. Sometimes there are many very large fragments, say greater than 0.5 mm across, and many very small angular pieces, less than 0.1 mm across. These suggest that the rock was crushed, and the resulting filler thrown into the clay, fragments, powder and all. If these very small pieces are counted, some sherds, which have very large rock fragments, nevertheless have very high densities of particles per square millimetre, say greater than 40 particles, whereas other sherds with large rock fragments may have been more carefully made (i.e. the powder was removed, perhaps by blowing it away) and the density may be as low as 10/mm^2. Probably the personal preference of the pottery was involved, though one might be tempted to see in the former the mark of a rapid production-line pottery appropriate to a proto-urban settlement.

Occasionally other types of filler are met with, notably rounded quartz granules between 0.5 - 0.1 mm across. These may derive from aeolian ~~ex-frac-sivenine~~ sands. Two sherds, one from Peñón del Trinitario and one from Almizaraque suggest vegetable tempering, having what look like impressions of a grain of wheat and a grain of barley respectively on their inner surface. These sherds also have ordinary mineral filler, however, and so perhaps these impressions are due to something else, or represent material placed in the pot while it was drying before firing, perhaps to prevent it sagging.

A rather special form of micaceous volcanic rock occurs near Jumilla. This is characterised by the member of the mica group called phlogopite. It seems to have been preferred by copper age potters in the region, and may be a means of distinguishing between copper age and earlier sites in that part of the Segura-Vinalopó basins.

Briefly,/
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Briefly, micaceous schists and rocks characterised by very large spicules of biotite and by large aggregations of quartz crystals are common in Almería: Millares, Barranquete, Tres Cabezos, Almizaraque, El Argar, La Gerundia and El Gárcel. When the last 5 sites (which are all fairly near together) are compared, Gárcel and Tres Cabezos seem to have a somewhat denser use of filler than the rest (i.e. more smaller particles were used alongside large ones) This is a somewhat subjective judgement. Gerundia and Gárcel seem to have fewer spicules of biotite than the others, however. The metamorphic rocks occur locally.

Moving slightly further north to the Totana group of sites, the picture at La Bastida, Campico de Lébor and Juan Clímaco is much the same. Local rocks were probably again utilised, since the crystalline content occasionally includes apatite and perhaps sillimanite. The pottery from Puntarrón del Chico near Murcia is very similar. At San Antón, Orihuela, some sherds are much the same, but some vessels contain plagioclase feldspar crystals in addition, others contain Jumellitic rock, and yet others contain altered pieces of calcite or dolomite in addition to the large aggregates of siliceous rock.

The use of limestone seems to be a feature of the Vinalopó region, and northern Alicante and Valencia. It is used at the Gandía caves, at the Cueva de Mongó, at the Acequia del Rey station near Villena, the Peñón del Trinitario caves, and at the Cueva Santa. It reaches Yecla where it occurs in pottery at the Cerro del Cuchillo burial cave. It occurs in the Cati Foradá pottery in 50% of the sherds examined and at Tabayá in profusion. To some extent this reflects the local geology, but not entirely. There are plenty of Pleistocene 'ramas' or caps of scistose gravels available for exploitation of metamorphic gravels and grit, just as, conversely, the

the more southerly area is not devoid of limestone. Probably the simplest explanation is that the potters used whatever was most convenient .

Interestingly, the Casa de Lara pottery uses limestone fragments of large size rather than the sand of the dunes. Perhaps the pottery was made elsewhere and the dunes were not a settlement site at all, as has been suggested earlier.

All of the pottery from the Vinalopó contains quartz, but only at Tabayá, Catí, Cerro del Cuchillo, and Orihuela is it possible to say that rock fragments were crushed and mixed with the limestone (or sometimes used by themselves). Elsewhere the fragments are small and may have been present in the clay.

The Jumellitic rock is found at Catí, Orihuela, Tabayá in isolated cases, suggesting that it was traded (or the pots were, alternatively) over a long area. It is not found at the Totana sites, on the other hand. It is a notable feature of the pottery from Jumilla, of course, but it is also interesting that limestone filler was also used there. This reinforces the geographical relation of Jumilla and Yecla with the Vinalopó sites and Orihuela. Limestone never occurs at the Totana sites in the pottery.

At the Coveta de l'Or and the early layer with pottery at the Abrigo Grande, the filler is sparese quartz crystals, perhaps from local sands. One sherd which may be of copper age date from the surface at the Abrigo Grande contained limestone crystals.

Pottery from the Peñón del Cerro del Castellar and El Castillico in the upper Segura basin occasionally contains limestone, but usually contains grains of quartz of about 0.25 mm in diameter, perhaps from local river sands. The sites are on lime-

stone and there is ample limestone scree available. It seems not to have been used, however. Limestone filler occurs in a vessel from the Cueva de la Decorada near Letur,(Albacete), not far away, and a sherd from the Cerro de las Víboras, Bagil, El Sabinar,Moratalla,(Murcia) only about 10 kms distant.

Perhaps one might speculate that the Jumellitic mineral was used during the copper age, perhaps from about 3,000 B.C. onwards. The Orihuela sites, which have some 'early Argaric'-type material (Blance's 'Reflux' objects) use it, but by the time La Bastida (which does not have those), it was no longer exploited.

Plates LXXVIII - LXXXIII are photomicrographs of sherds from Peñón del Trinitario (note limestone fragment in centre of plate LXXVIII), from Almizaraque, Barranquete and Los Millares (note biotite fragments: Plates LXXIX - LXXXI), a slide which shows a particle of grog filler and a plagioclase crystal (Plate LXXXII: Orihuela), and finally (Plate LXXXIII) a microscope slide of a sherd from Tres Cabezos.

X-Ray Emission

The X-ray emission data is given in the following table. The values represent parts per million of the trace elements tested for, except for the Fe_2O_3 which is given in gm% .(The identification numbers refer to sherds catalogued by the writer and is for the purposes of correlating the table with ceramic petrological observations at a future date.)

Ceramic Analyses by X-ray Fluorescence

(LT = less than)

No.	Ba	Zr	Sr	Rb	Pb	Zn	Ni	Fe_2O_3
Millares								
15	800	200	400	150	LT 100	50	100	13
16	700	200	200	150	100	100	100	12
17	700	200	500	200	LT 100	150	250	12
18	700	350	300	150	LT 100	50	600	9
19	600	300	300	150	LT 100	50	1250	12
Almizaraque								
20	450	150	600	200	LT 100	150	350	10
21-2	350	150	300	100	LT 100	50	100	9
23-8	450	200	350	150	350	100	400	12
29	2100	300	950	100	600	150	500	6
30-1	1250	250	650	100	650	100	100	5
32	600	250	550	150	1500	100	550	9
33	1300	200	1450	150	800	150	150	10
34	800	250	450	150	200	150	150	10
35	500	250	200	200	500	750	550	11
36	450	250	350	150	LT 100	100	150	10
37	450	300	200	200	500	800	200	11
El Prado, Jumilla								
---	1450	800	950	650	LT 100	100	2400	7
200	1600	450	700	350	LT 100	100	850	9
201	1350	450	700	300	LT 100	50	800	9
202	550	200	1600	100	LT 100	150	150	6
203	200	50	850	50	LT 100	50	50	LT 2

No.	Ba	Zr	Sr	Rb	Pb	Zn	Ni	Fe_2O_3
204	850	600	1050	500	LT 100	100	1400	7
205	450	150	850	100	LT 100	50	250	9
206	950	500	800	350	LT 100	100	700	8
207	500	250	900	250	LT 100	50	350	4
208	1050	600	1200	600	LT 100	100	1350	5
209	1050	500	2450	450	LT 100	100	1150	5
210	700	650	900	550	LT 100	50	1350	5
211	750	300	1300	250	LT 100	100	600	7
212	850	400	2700	350	LT 100	100	950	5
213	1100	550	950	550	LT 100	150	1500	6
Orihuela (San Antón)								
250	100	100	500	50	v. low	100	100	9
Cerro del Cuchillo, Yecla.								
278	200	150	250	50	v. low	150	100	7
Almizaraque								
300	800	150	750	150	350	250	200	9
301	650	200	800	150	100	150	350	11
302	450	150	1000	150	LT 100	150	150	9
303	450	150	1100	100	LT 100	150	400	7
304	600	150	800	150	LT 100	300	500	5
304	300	150	850	150	LT 100	150	250	9
305	2000	300	350	100	550	50	200	9
306	300	500	800	50	200	50	300	10

No.	Ba	Zr	Sr	Rb	Pb	Zn	Ni	Fe_2O_3
307	450	250	450	100	250	100	300	6
308	1650	250	850	200	LT 100	200	400	10
309	400	200	500	200	LT 100	200	400	10
310	300	150	300	100	LT 100	50	200	8

Tres Cabezos

351	300	250	450	100	LT 100	50	200	9
352	500	200	1050	100	LT 100	50	50	5
353	450	250	500	150	LT 100	100	250	11
354	450	250	400	150	LT 100	100	350	11
355	350	150	1250	150	LT 100	50	100	6
356	250	200	550	150	LT 100	100	550	8
357	400	200	750	150	LT 100	100	400	8
358	700	300	950	150	LT 100	50	400	11
359	450	250	500	250	LT 100	100	850	10
360	350	250	1150	100	LT 100	100	300	5
361	300	300	400	150	150	100	450	9
362	350	250	850	100	LT 100	50	600	10
363	550	200	550	150	LT 100	100	400	9

Barranquete, Níjar

400	350	100	150	200	LT 100	200	LT 50	11
401	650	300	200	200	100	200	150	9
402	450	200	250	200	LT 100	150	150	12
403	500	100	250	250	100	450	600	9
404	600	200	250	200	650	300	400	12

7:14

No.	Ba	Zr	Sr	Rb	Pb	Zn	Ni	Fe_2O_3
407	700	150	150	100	v. low	100	150	12
408	600	150	100	100	50	150	100	11
409	550	150	100	100	100	500	50	12
410	650	100	200	100	100	300	150	13
La Gerundia								
431	600	200	250	200	100	100	450	10
432	450	200	450	200	LT 100	100	750	10
433	400	200	450	100	350	100	1250	9
434	600	200	200	150	LT 100	100	350	9
435	300	150	450	50	v. low	50	200	9
436	550	150	350	100	50	100	250	10
437	300	300	200	100	v. low	100	100	10
438	550	200	200	100	v. low	100	100	9
439	750	150	450	100	v. low	100	100	9
440	600	100	700	50	v. low	100	50	4
441	400	100	600	50	v. low	100	100	4
La Bastida								
452	450	150	150	100	100	200	250	13
453	900	150	200	100	v. low	150	150	11
454	550	150	300	150	v. low	100	150	10
455	850	150	300	100	50	100	200	10
456	1000	150	300	50	v. low	50	150	7

7:15

No.	Ba	Zr	Sr	Rb	Pb	Zn	Ni	Fe_2O_3
457	600	150	250	100	50	100	100	9
458	450	150	150	100	150	150	100	10
459	300	150	200	100	v. low	50	150	9
460	600	150	250	100	50	100	150	9
461	750	150	250	100	v. low	100	100	8
462	1100	150	350	100	v. low	100	150	9
463	1500	150	200	100	100	100	100	10
464	550	150	150	100	50	100	100	9
465	850	150	250	100	v. low	100	150	7

El Argar

501	400	300	250	100	300	100	1250	10
502	300	150	400	150	100	100	600	11
503	350	150	350	150	100	100	450	11
504	450	350	400	100	LT 100	350	650	8
505	450	200	400	100	LT 100	100	500	10
506	550	150	150	100	50	150	200	10
507	400	50	550	100	v. low	150	150	2
508	250	100	200	100	50	100	200	11
509	400	100	250	100	50	100	150	12
510	750	100	400	v. low	v. low	100	250	19
511	900	150	200	150	50	50	200	9
512	900	100	400	LT 50	50	50	350	14
513	1350	50	700	LT 50	50	50	200	12
514	1150	100	400	100	v. low	100	200	9

No.	Ba	Zr	Sr	Rb	Pb	Zn	Ni	Fe_2O_3
El Gárcel								
560	1250	150	300	100	v. low	100	100	10
561	900	150	650	100	v. low	50	100	9
562	700	150	350	100	v. low	100	100	10
563	1050	150	400	50	v. low	50	300	8
564	500	100	450	LT 50	50	50	350	12
565	500	150	200	100	v. low	100	150	9
566	700	100	350	50	50	100	150	8
567	300	150	300	50	v. low	50	400	10
568	350	100	300	50	v. low	50	500	8
569	400	100	250	100	50	100	150	9
570	1200	100	450	50	50	100	300	9
571	800	100	350	100	v. low	100	250	10
572	650	100	350	100	100	150	300	10
Cabezo de Juan Clímaco								
580	450	100	550	100	v. low	100	200	6
581	1350	100	350	100	v. low	100	150	10
582	1350	50	300	50	v. low	100	100	11
583	850	150	350	50	50	100	100	10
584	1200	100	1100	50	v. low	50	150	6
585	750	100	1100	50	v. low	100	100	6
586	950	100	1150	100	v. low	100	100	6
587	400	150	500	100	v. low	150	150	9
588	550	150	250	100	50	100	100	10
El Castillico								
610	600	250	450	100	LT 100	50	150	4
611	400	200	250	100	LT 100	50	LT 50	3

7:17

No.	Ba	Zr	Sr	Rb	Pb	Zn	Ni	Fe_2O_3
612	350	200	350	200	LT 100	100	450	10
Penón del Cerro del Castellar								
664	1950	300	550	100	LT 100	50	LT 50	3
Cueva de los Tiestos								
701	450	200	150	200	LT 100	50	450	9
702	850	600	550	450	LT 100	50	1000	7
705	350	350	400	200	LT 100	50	250	4
708	300	150	200	150	50	100	150	5
Cati Foradá								
762	700	300	200	50	LT 100	50	150	7
763	950	300	200	50	LT 100	50	100	8
Abrigo Grande								
1001	250	50	200	100	LT 100	50	LT 50	4

No.	Ba	Zr	Sr	Rb	Pb	Zn	Ni	Fe_2O_3
1005	300	100	400	100	50	100	150	4

Coveta de l'Or

1102	200	100	200	100	50	50	200	9
1103	100	150	100	100	50	100	200	7
1104	200	100	500	50	v. low	100	150	4
1105	500	100	250	100	v. low	650	150	6
1106	200	250	100	50	v. low	100	100	11
1107	450	100	250	50	v. low	800	150	6
1108	200	100	50	50	50	100	150	4
1109	150	150	100	100	v. low	50	200	8
1110	150	150	50	50	v. low	100	150	8

Covacha del Barranc del Llop

1121	100	50	150	50	v. low	100	300	3
1122	200	100	200	100	v. low	50	100	6

Còva Volta

1131	200	100	600	100	v. low	50	100	7
1132	300	100	50	100	v. low	100	150	6
1133	150	100	150	50	v. low	100	100	4

Còva Blanquisau

1141	150	100	200	50	50	100	50	6
1142	v. low	100	50	100	v. low	50	100	4

No.	Ba	Zr	Sr	Rb	Pb	Zn	Ni	Fe_2O_3
Cerro de las Víboras								
1152	300	150	100	50	50	50	100	5
1153	450	100	150	LT 50	v. low	100	LT 50	5
1154	450	50	150	LT 50	v. low	100	LT 50	5
1155	150	100	100	100	v. low	50	LT 50	5
1156	400	100	150	50	v. low	50	100	6
1157	500	100	100	200	v. low	100	50	6
1158	300	100	100	100	v. low	50	100	5
1159	350	150	100	50	v. low	50	50	4
1160	450	100	100	200	v. low	150	100	6
Forat del Aire Calent								
1181	150	150	100	50	v. low	50	150	9
1182	400	100	150	50	50	150	200	9
1183	250	150	200	100	v. low	50	100	9
Còva Bernarda								
1190	100	50	50	50	v. low	100	100	5
1191	350	100	100	100	v. low	100	50	4
1192	150	100	150	50	v. low	100	100	3
1193	350	200	100	50	v. low	100	100	7
Terra Venturas								
1201	300	150	100	100	v. low	150	100	13
1202	350	150	100	150	50	150	100	11
1203	400	100	200	100	v. low	100	100	8
1204	350	150	100	150	50	200	100	9
1205	200	200	100	100	100	100	150	11

7:20

No.	Ba	Zr	Sr	Rb	Pb	Zn	Ni	Fe_2O_3
1206	400	100	350	100	100	150	100	10
1207	400	150	100	100	50	200	200	11
1208	300	200	150	150	100	600	150	9
1209	300	150	200	100	100	200	200	9
1210	450	150	200	150	50	100	300	12
Peñón del Tesoro, Riopar								
1250	250	150	50	LT 50	50	100	300	10
1251	250	200	50	50	v. low	50	100	9
1252	300	150	100	LT 50	v. low	50	200	5
1253	250	200	100	LT 50	v. low	50	150	5
Sima de los Tiestos, Riopar								
1260	550	100	100	150	50	100	50	7
1261	300	100	50	100	v. low	100	100	8
1262	150	200	50	LT50	v. low	50	100	2
1263	250	50	100	LT50	v. low	50	50	4
1264	400	100	150	100	v. low	100	50	6
1265	250	100	50	50	v. low	100	50	4
1266	100	50	100	LT50	v. low	50	50	4
Jumilla								
Large pebble	200	350	50	50	v. low	50	50	5
Small pebble	100	v.low	50	v.low	450	100	150	(v.high (730

The data are accurate to the nearest 50 ppm. Although less precise than atomic absorption spectrometry, X-ray emission studies allow important distinctions to be made. For instance, all the Almizaraque pottery has a low lead content, except for 1 sherd. On inspection of the catalogue, it appeared that this sherd had been inadvertently included, but was in fact hors-de-série, being a sherd of later, Iberian iron age wheel-thrown ware picked up on the Almizaraque tell surface. The figures may be interpreted helpfully as graphs for each sherd (figs. 107 - 110). Fig. 108, for instance, allows different sherds from northern Almería to be compared, and fig. 109 does the same for southern Almería. Fig. 107 refers to the Jumilla pottery and other sherds from the vicinity. Fig. 110 allows the Peñón del Cerro del Castellar and El Castillico sites, which are very close geographically, to be compared (note copper in the clay of the latter). One interesting result of these studies is that even where mineral filler is large-grained and of identical species, there may be trace element differences. In these cases it is likely that they are due to differences in the clays, and it may be proposed that differences between other sites,with different petrology as regards filler, may be due to differences in the clays. In other words, one might tentatively suggest that where two sherds from different sites have the same microscopic characteristics and the same X-ray emission spectrographs, that the intact pots were made at one pottery and diffused, whereas where only one of the investigations shows similarity this did not occur. In such a case the appropriate constituent, that is to say filler or clay, may have been diffused from a quarry to different potteries. The former is perhaps more likely than a movement of clays. The ignorance of the localised petrology in the research region prevents further speculation.

Refiring Experiments, Shrinkage, Relative Porosity

A sherd may be of dark colour because:

(a) a brown or grey clay was used (e.g. one containing ferroferric oxide or ferrous sulphide)

(b) a lighter, ferric oxide clay clay was used but was fired in an absence of oxygen and carbonaceous impurities remained

(c) smudging may have been practised for effect, i.e. impregnation of the surface during firing with carbonaceous material such as dung

(d) firing in an atmosphere lacking oxygen may have been intentional for effect, such that the lower oxidation states of iron in clays containing those compounds were not oxidised further.

Many combinations can be envisaged. It can easily be worked out that a bright red, orange or yellow cross-section of a sherd means a ferrix oxide clay was completely oxidised. A uniform grey cross-section suggests a ferrous clay. A mid-line black band suggests incomplete oxidation in these instances, however. patchy blackness suggests carbonaceous matter or smudging, but usually this is not seen, because in such cases the temperature and oxidising conditions may have prevented complete oxidation of ferrous salts. Many of the larger sites (Almizaraque; Argar etc.) show a wide range of red, grey and yellow sherds, completely oxidised, indicating a variety of different clays. Clays can vary over a few score metres, and the changes in physiography due to recent erosion stages would render a search for possible clay sources somewhat futile.

Many sherds were refired in oxidising conditions to determine whether clays which normally would become completely oxidised had been fired at lower temperatures or were fired in processes

pre-/

7:23

precluding full oxidisation. Length of firing, and the various factors affecting blackness are unknown aspects of the prehistoric technology, and the pitfalls against too facile an interpretation have been spelled out by Kidder & Shepard (1936) and Shepard (1956). Other factors can affect the fusion temperature, too. Some fillers can reduce the fusion temperature of some clays. A high porosity may assist smudging techniques where these were intentional, and it also not only reduces thermal shock but furthermore can assist in complete firing. Certain minerals (quartz, calcite) undergo changes at known temperatures (sometimes, unfortunately, changes which are later slowly reversed) and inspection of these minerals can give a clue as to firing conditions.

To be brief, the results of the experiments performed are inconclusive. Apart from some Iberian iron age pottery which was probably fired in an oxidising atmosphere of more than 900 - 1,000° C., most of the pottery studied (see earlier table of sherds submitted to the experiments) seems to have been fired at 600°-700° C., since from most sites there were sherds which had been incompletely fired (assuming that firing in oxidising conditions had been intended) but which became fully oxidised at roughly that temperature renge. Sometimes, particularly at Argar and Bastida, there seems to have been repeated production of a reducing atmosphere for the inner surface of the vessel; perhaps they were stacked in such a way that this occurred accidentally, however. Shrinkage following the refiring experiment was only marked (reaching 15% of sherd thickness) at Almizaraque. The relative porosity of all of the sites was of the order 10 - 20%, a 'moderate' degree according to most workers, and one not uncommon for prehistoric coarse wares.

One or two sherds deserve special comment. The handled sherd of a baggy vessel from layer 2 at the Abrigo Grande may have

been sun-baked or fired at a very low temperature. It was a pink colour initially, but at 500°C turned black, regaining its pink-buff colour at 700°C.. Presumably carbonaceous material and ferrous salts had been incompletely oxidised during manufacture. There was grey impressed sherd from that layer, and dark cardial impressed sherd from the surface at that cave site. A similar dark cardial ware sherd from the Coveta de l'Or ware refired and again complete oxidation was reached at a low temperature. There were other rather similar sherds from Casa de Lara as regards colour and firing characteristics. Clays with ferrous salts may have been favoured by the earlier period potters.

Comparative Ceramic Results

In addition to the foregoing, the following may be suggested. First, the X-ray studies suggest that various local clays were used with basically the same type of filler in the southern part of the research area and in Almería. At Almizaraque there were at least 3 clay types, one with high barium, strontium and lead content, one with high lead, zinc and nickel content, and one with low amounts of all the trace elements looked for. The latter type occurs at Millares, except for 1 sherd with a high nickel content. The Tres Cabezos site used a different clay from the nearby Almizaraque, characterised by high contents of strontium and nickel only, all other elements being in low amounts. The Barranquete passage grave cemetery suggests a variety of clays (see table). At Terra Venturas 1 sherd had a high zinc content, but all the rest had only low amounts of all trace elements.

Argar, Gerundia and Gárcel are all within a few hundred metres of each other. Argar pottery can be divided into sherds with a high barium and a low barium content respectively. 1 sherd had a high nickel content, a feature which distinguished 4 of the

Gerundia sherds, the rest having low amounts of all elements, and 6 of the Gárcel sherds. This suggests some parallelism between the latter two sites. The Argar pottery may have been sherds from grave sites of different manufacture, or from a culturO-chronologically different group. Comparing La Bastida and Juan Clímaco, it is seen that each site has a group of sherds with high barium and a group with low amounts of that and all other elements. The Castillico and Peñón del Cerro del Castellar sherds are distinguished by their barium content. One sherd from the Cueva de los Tiestos has a high zirconium and nickel content, the rest have low amounts of the elements tested for. The Prado collection suggests one group with high barium, strontium, rubidium and nickel, and another with high barium and strontium only. At Catí Foradá sherds with Jumellitic rock have high barium, but low rubidium and zinc, suggesting that the Jumellitic filler was carried to another place where pots were made locally. Jumilla is 50 - 60 kms as the crow flies from Catí Foradá.

It has been written, "If pottery from two regions with different resources is being compared, the question is not if firing methods were identical. There is no reason why they should be as long as the clays differed. The important point is whether, with the clays they had, potters obtained full or partial oxidation or fired for a special effect such as reduction or smudging" (Shepard, 1956,p.105). The preliminary study of prehistoric southeastern pottery suggests that the potters were adept at a variety of techniques, and selected clays and fillers appropriate to the varied firing procedures they required. Impressed ware pottery and beaker sherds seem to have been carefully made using particular clay types and little filler, presumably so as not to interfere with the decoration. Painted sherds from Tiestos and Mongó are surprisingly coarse, especially on their inner surface, with large fragments of filler. The limestone seems to have been favoured as a filler on account of its

flux/

flux property when used with a low firing temperature as well as because of its suitability in reducing shrinkage and cracking during the drying stage before firing. It was too large, however, for fine impressed pottery which was made with quartz sand. Since clays do not bind well on to this, lower firing temperatures were used. The use of limestone was continued in the copper age, almost certainly as a flux, because in the Jumilla-Vinalopó region the later sherds show that it is no longer fresh and angular, but altered owing to the somewhat higher firing temperatures in some instance. Decorated and painted wares, however, show angular fragments, suggesting a lower temperature, perhaps with longer exposure of the vessel in the kiln. The Jumellitic mineral was favoured no doubt because clays bind well on it, and unlike mica-schists with biotite spicules do not develop fissures in the body parallel to the spicules (because the phlogopite of the Jumellitic rock is not arranged in any particular longitudinal direction).

The southern group of pottery with biotite mica-schists and other quartz-containing rock fragments tends to develop such fissures. Commercialisation of the pottery industry may have enabled a high wastage to be tolerated in that area. The smoothing and polishing which was universally practised was frequently taken further in the south by either applying 'almagra' slip or by burnishing. These were doubtless carried out to prevent buckling and wrinkling after polishing due to the inadequacy of the available clays; the former being appropriate to impressed or incised decoration, the latter only appropriate for plain wares, fairly obviously. So the differences of manufacture observable can be explained in functional terms fairly simply, without a necessary recourse to 'cultural' variation as the main explanation. Burnishing is found from Terra Venturas to La Bastida, i.e. from the start of the early copper

age to the end of the middle copper age. Whether or not there was 'cultural' variation (whatever that means) is open to debate. The present writer does not favour such an opinion.

There may or may not have been a cultural variation in the early copper age based on a geographical distribution, or alternatively the differences in filler types may reflect availability more than anything else, with different manufacturing techniques designed to overcome this as a consequence, rather than a causal factor in determining the geographical patterning.

A word should be said about hardness. This was found a most unsuitable test, and anyway there was little difference between any sites. No wares seem to have been harder than Moh grade 5, but individual sites showed a range of several grades below that in most cases. Hardness depends on the firing characteristics and the techniques of manufacture and will vary according to the effect desired. Surface hardness is affected by such things as partial oxidisation and burnishing when contrasted against hardness of a cross-section of the sherd. The large filler size prevents the latter from being adequately assessed by a scratch test. It is felt that hardness has little place in investigations into southeastern neolithic and copper age wares.

There is a break between copper age and Iberian iron age pottery (even detectable at El Castillico) as regards manufacture. Apart from the advent of the potter's wheel, higher firing temperatures and smaller grain-size filler were used in the later period, including what for lower temperatures are unsuitable fillers such as [illegible] aeolian sands. Limestone was not used because at the higher temperatures it crumbles away to dust.

Projected Investigations

The most promising investigations are those based on microscopic thin sections and X-ray emission studies. The other investigations seem somewhat unhelpful. Attention will be directed to extending the two aforementioned techniques at the expense of the rest. The aim will be to collect a statistically significant set of comparable data from the major sites and carry out a computer analysis using multivariate techniques. Thermoluminescence and atomic absorption data are awaited, and possibly further fine differentiation based on neutron activation analysis could be profitably undertaken.

Scalograms

Figs. 111 - 118 show the results of multidimensional scaling plots and dendograms of profiles from the Orihuela collection of P. Furgús' excavations at San Antón, Callosa de Segura and Monteagudo. Numbers refer to my enumeration of the illustrations of the pottery. Figs. 111 - 114 refer to comparisons based on profile and dimensions and suggest a gradation based more on size than anything else. Figs. 115- 118 show the results with suppression of the dimensional data, requested by the present writer, but only reluctantly performed by Mr. Wilcock. The typology produced agrees better with an 'archaeological' assessment of the pottery, though the bagginess or carinated-ness of the profiles does not seem to be distinguishable relatively. If this represents a genuine feature and is not a characteristic of the method in which the computer program interprets the profiles in numerical terms, then it suggests that there is no particular feature such as angular carination in middle copper age pottery which is of classificatory significance. This agrees with opinions given earlier.

Agriculture

The vine and olive seem to have been clearly used from the early copper age, but whether this constitutes an intensive agricultural exploitation of those resources is uncertain. The balance of probabilities suggests that it did as in the Aegean (and see Renfrew on the latter, 1972). Reference to wild precursors of cultivars has been made in an earlier chapter (and see Hernández-Pacheco,1959, and Arribas,1968). Cotton,* flax, esparto, and probably wool and leather were utilised in the early copper age. Fruit and nuts of various kinds occur at different sites (see chapter 6). Presumably most of the common animal domesticates were known, and an enormous variety of wild species were hunted (see Boessneck, 1969), including some which are most inedible (e.g. hedgehog, eagle). Presumably the chase was enjoyed for its own sake as well as for food.

Particular mention may be made of acorns at Muntanyeta de Cabrera in Valencia (Tarradell, 1963) in connection with the role of pig farming in prehistoric economies (Jarman, 1972). Hazel nuts occurred at the Peñón del Trinitario.

The skin of pressed grapes at the Cueva del Monte de la Barsella suggests wine was made. Possibly the strainer/colander sherds and impermeable well-fired burnished pottery, not to mention the 'Argaric' pedestal goblets were used for drinking wine.

Curious 'canister' pots such as those from San Antón, Puntarrón del Chico, El Gárcel, and Loma de los Pozicos grave 8 at Tabernas (fig. 71 no. 9, for instance) may have been used for bee-keeping (D.L.Clarke : suggestion made to the present writer).

Although Triticum monococcum L. and T. dicoccum were known at the Coveta de l'Or (Hopf.,1966)as well as T. aestivum and Hordeum/

*García Sánchez(1959)quotes Giro on Còva del Vall de Cerves 7:30 in Catalonia.

Hordeum vulgare (var. nudum) L., the wheats are not found in the copper age except for a dubious identification of T. dicoccum at Almizaraque. Tellez & Ciferri (1954) carried out an excellent scientific study of charred wheat grains from copper age sites using modern charred wheat grains for comparison and for determination of the effects of shrinkage and deformation due to charring. It is sometimes objected that the prehistoric conditions of charring were possibly due to a variety of different causes, and different effects might be anticipated, but since for any given case it is usually impossible to determine the circumstances of charring, a reductionist approach is surely acceptable pro tempore instead of subjective 'interpretative' opinions.

The present writer has measured samples of T. aestivum L. and H. vulgare (var. nudum) L., the former from the Cueva de los Tiestos, and two sites in Granada province at Purullena and Montefrío, the latter from the Cueva de los Tiestos and Cati Foradá. The details are given in the second part of the second appendix (computer data) and has been prepared as an experiment written using the IBM 370/155 computer. Mr. G. Chadwick, an authority on barleys, prepared charred modern barley grains of two very different cultivars of H. vulgare (var. nudum) L. for comparison. These were also measured. In all, some 400 grains were measured for length, breadth and thickness by the present writer, using calipers reading to 0.1 mm. (see appendix for details of selection of grains from the collections). Tiestos and Purullena wheats compare with those of T. aestivum L. from Almizaraque (the data for these as published by Tellez & Ciferri are given in the computer appendix). The wheat measurements from Montefrío suggest a rather different type of bread wheat from that iron age site, on the other hand. When the wheats studied by the present writer are compared among themselves/

selves using "Student's" t-test statistic and probability estimations of homogeneity or heterogeneity, it is seen that whilst there is a strong probability that the Purullena and Tiestos grains are drawn from one statistical population, the iron age site grains are almost certainly not. Tellez and Ciferri's data are comparable as may be seen from the means, standard deviations and maxima and minima (see appendix). Thus there seems to have been some uniformity of wheat cultivars in the early copper age between 2,500 - 1,500 B.C..

The barley grains tell a very different story. The Catí and Tiestos grains are almost certainly not from the same statistical 'population'. This is interesting considered in the light of what has been said about the trade in Jumellitic mineral between Jumilla and Catí. Unfortunately, Hopf's data on the neolithic barley and wheat grains do not allow comparison, since they are published on the basis of an idiosyncratic intraspecific subdivision based on subjective classification, and standard deviations for the means are not given by her.

The most that can be said is that in the early copper age standard cultivars of bread wheat were grown, but barley shows more localised diversification of cultivars within the species. The Tiestos barley grains include germinating grains. Was this because they had been intended for beer-making and had been dried too intensively ? This is a possibility.

From Portuguese sites, do Paço reports Triticum sphaerococcum and Hordeum distichum as well as other species found in the south-east (do Paço, 1954, 1957) as well as Vicia faba and Lathyrus cicera. Spices were also used and from Quesada in Granada, Carriazo (1925) mentiones Capparis spinosa. The opium poppy (Papaver somniferum) was found at the Cueva de los Murciélagos, Albuñol, (Granada).

Most of the sites excavated have provided quantities of cervine, equine, bovine, suine and ovicaprine bones. It is sometimes assumed that some species are domesticates and others wild on a basis which relies upon archaeological hypothesis rather than on strict osteological impartiality. Few detailed studies have been performed, however, so the argument is circular (similar comments have recently been made by H.N. Jarman, 1972 with regard to cereals in the Near East).

Axe Localisation

Distribution maps of polished stone axe distributions cannot easily be drawn up owing to incomplete information. However, there seems to have been a production centre for axes near Puerto Lumbreras (Murcia). Rough-outs are known from other sites, however, and may represent local production (Tabayá; Catí Foradá; Cerro de la Campana near Yecla). Fine axes of nephrite (Tabayá and Catí) were described by Jiménez de Cisneros (1909a). In the Albacete Provincial Museum there are many axes of jadeite, quartzite and fibrolute from very many find-spots in the upper reaches of the Segura basin. Similar semi-precious stone axes are widespread in the south-east and may have been made locally from igneous and metamorphic rocks. Such axes are plentiful in 'splendid' burial caves and constructions.

Most of the polished stone tools are of local metamorphic rocks: granite, granodiorite, syenite, dolerite, rhyolite and trachyte. In the immediate post-war years a strong call was made for petrological investigation of axes by del Val (1947) supported by Martínez Santa-Olalla. Nothing was done, however, and changes in the bureaucracy led to the emphasis of archaeologic-

al research being changed to other areas. Absence of really detailed petrological research in the area hinders the identification of quarries, moreover.

Vitreous Minerals and Precious Minerals

Sources of flint abound in Murcia and Alicante. White flint of good quality is found near Hondón de las Nieves,(Alicante) in Tertiary limestones, and flint of other colours is found elsewhere in abundance. Obsidian is only known from one station, the upper palaeolithic site of the Cueva de los Murciélagos,Lubrín,(Almería), and its source is unknown. Flint arrow-points of chalcedony are sometimes found (e.g. Atalaya de Garrucha burial tomb, and Millares graves 17, 40,)and chalcedony is known from Gatas and Las Anchuras which are settlements. Agate is mentioned as occurring at the Cueva del Gato,Jet occurs at Millares graves (7,8,12,18,20), and a tomb near Almizaraque. Cornelian beads occurred at Millares grave 33 and at Campos. Serpentine beads also occur at various sites. An amethyst bead was found at Millares grave 12. Jasper is reported from the Cueva de los Murciélagos,Albuñol,(Granada). Jet is known reported from the Cueva de la Pastora also, and that site has amber objects. Amber from Millares grave 12 is said to be of Balkan origin because of its high succinate content. Amber has been found at Millares 17,74.,63 Almizaraque L8 and L63 and Llano de la Teja B17 in Granada. Jiménez de Cisneros (1936) reported local finds of amber in quarries near Agost in the Sierra de los Castellares,(Alicante), and Hondares near Moratalla,(Murcia). Possibly some amber objects are made of these fossil resins and analysis of the artefacts might be profitable.

Site Localisation

Most copper age settlements (except for Almizaraque and the tiny hamlets near Mazarrón) are inland, not on the coast. This maintains the earlier tradition, and argues for autochthonous development of a settled way of life, not a maritime invasion. In those situations around the Mar Menor and the Albufera of Valencia where there are Roman and Phoenician colonies, copper age sites are conspicuous by their absence, yet since the recent alluviation in the lower reaches of the Segura basin left the littoral of the Mar Menor clear of sediments, as the classical age remains witness, copper age sites would have been found had they been present. Elsewhere, the situation is more complicated owing (a) to the removal of lower terrace deposits which may have removed many one-time valley-bottom settlements such as El Argar, and (b) possible burial of such settlements further down the river valleys by subsequent redeposition of the removed material.

Most of the settlements even fairly near the mouths of the rivers are situated slightly above the present flood-plain level, as at Orihuela, Callosa, Monteagudo and other sites. Perhaps the pattern of settlements was not very different to that which is known to us. One reason for these locations may have been the accessibility of useful metamorphic rock pieces in the higher terraces and in the Pliocene 'raña' deposits. Also, near Monteagudo there are volcanic dykes of dolerite which would be useful for polished axe manufacture. Sandstone rocks are also common, and were preferred for saddle querns, and Jiménez (1909) refers to a site near Elche used in his day for making millstones. Dolerite is found in Pliocene gravels near Negret and Tabayá in Alicante, and axes may have been made locally here again. It is very plentiful in similar gravels near the Lorca castle site, near La Bastida, and the sites near Coy, as also Cañada del Alba and Puerto

Lumbreras. These gravels generally contain a wide range of igneous and metamorphic rock fragments.

The general pattern of settlement is around the middle and lower reaches of the river valleys, and one might surmise that advantage was being taken for agricultural purposes of the alluvia in those regions. Hill slopes and even hill-tops were favoured settlement places by those parts of the valleys, and defensive constructions suggest another reason for such locations. Defended block-houses ('forts') occur close to some settlements (Los Millares; El Oficio; the Campos building by Tres Cabezos). These may indicate dwellings of important personages, or they may have been communal redoubts.

Hunting and presumably herding still seems to have played a role, as witnessed by cervine and caprine bones (and perhaps the equine bones at Cabezo Redondo). The rock art sites were still utilised and some settlements are still in the upper reaches of the river valleys. In addition to the stylistic paintings at the rock shelters, cup markings perhaps appear during the advanced neolithic and early copper age.

Cup markings

In addition to the stylistic rock paintings to which mention has already been made and which bear comparison with the art of early copper age artefacts, there are various examples of cup marked rocks in the south-east. One large expanse of markings with cups, cup and ring markings and gutters is shown in Plates XC - CLII inclusive. These are on the western end of Monte Arabí near Yecla on the edge of the escarpment which faces into Murcia province. The present writer was visiting his medical friend Dr. Pedro López Ibanez of Yecla who has a house about half a kilometre from Monte Arabí in 1969 when he learned of the carvings from him and made the photo-

graphic record given here, which follows the carvings from west to east over about half a kilometre of exposed rock along the edge of the escarpment.

The present writer has made a particular study of these markings in Great Britain (Walker, 1970) and several other articles are in preparation. He has also carried out extensive field-work into such carvings in Galicia in north-west Spain, and publications are in preparation. It must suffice to state that in those localities there are grounds for believing that cup markings commenced no later than the mid-third millennium B.C. and continued to be carved perhaps for as long as a thousand years or more in one form or another. He has indicated that there are regional differences, and marked differences between the localisation of the art and that of passage grave and other funerary art.

It is unclear what relation the new Murcia discovery bears to these other areas of cup and ring markings. Perhaps a pointe are the oblong carvings with rounded corners, which are also met with in Galicia, where they occur sometimes carved in relation to mammalian quadruped markings, and which the present writer has supposed might be 'axe' motifs. However, there are no stylised animal representations at Monte Arabí.

Cup markings were described by Siret (1893 p. 542 figs. 269-271) from Lomo de Bas near Ramonete-Ifre in southern Murcia and from Cobdar in Almería, as well as some on a cover slab from Millares grave 63 (Siret 1913, p.259). There are cup marked stones from La Bastida in the Almería Provincial Museum and published by Martínez Santa-Olalla et al. (1948: Plate XLII). Ponsell (1926) refers to possible cup marks at Mas de Menente near Alcoy. Farther afield, the Catalan cup carvings of schematic type are well-known (Bosch & Colominas, 1931) as are those of Granada (García Sánchez & Spahni, 1958). (For other Spanish sites in the east, see key to Map 9.) Furgús (1902a) shows a cup marked cist slab from Orihuela.

The closest parallels are with Galicia, however, and the significance of the Monte Arabí carvings is therefore something of a puzzle. Perhaps further discoveries in the south-east will throw light on the matter.

Conclusion

The pattern of settlement during the copper age seems to have made use of the alluvia deposited in the middle reaches of the river systems following the earlier phase of sub-desert erosion. Agriculture was practised, but livestock was still a matter of importance. There is quite clearly much in common between the stylistic portrayals of animals on pottery and even on the slabs of chambered tombs (as at Montefrío L 15 or Orca das Juncaes further west). Does this signify wide-ranging patterns of transhumance or droving ? Certainly, the schematic paintings spread further west in the mountains of north-central and north-west Andalusia and even Portugal. Perhaps the zoomorphic figures of Galician rock art with cup and ring carvings indicate the extent of cross-Peninsular movements. If over-grazing had depleted the available fodder on the nearby hills, then long-distance movements might have been necessary. The inland distribution of sites may be significant from the viewpoint of the need to keep 'a foothold on the hills' so to speak. The mines of Granada and the Sierra Moreno may also have been an attraction, and gold from the rivers Darro and Genil in that province may have attracted settlers to move north-west from southern Almería. This could have occurred at a relatively early date in the third millennium at about the time of the 'Argaric' phenomenon if not before. Perhaps population pressures played a major part in addition. One may envisage perhaps a northward movement into Murcia impinging on the cave burial users of the early copper age, perhaps following exhaustion of soils in the Almanzora and Antas valleys, requiring

new settlements such as La Bastida during the second millennium B.C... Tribal warfare may have demanded block-houses and hill-top fortifications during the early and middle copper age. Some inland sites may still have relied as much on livestock breeding as on cereal agriculture or 'polyculture', obtaining their cereal requirements by trade. There are modern parallels for nomadic peoples based on towns which may even boast public buildings (e.g. the Ethipian Danakil people). The burial of bodies with a complete set of personal goods may perhaps be more typical of nomads or semi-nomads than of town-dwellers. A nomadic group within the society might well have doubled up with the task of exploiting mineral ores and/or exploitation of flint and metamorphic rock resources. One cannot doubt from the parallels of different artefacts in the tombs that there was widespread movement of people to-and-fro in the south-east, even if these people were in fact traders selling exclusive wares to the local petty chiefs. Burial customs and surgery such as trepanation were similar, regardless of tomb-type, at least during the early copper age. Trepanation (see next chapter) is a localised feature associated with 'splendid' burials, especially in caves, but also in Granada tombs (Cuesta de la Sabina no. 53), only rarely found furthern north (Còva d'Aigues Vives: de Mergelina,1923 - a Catalan site), and incisions of the crania of the deceased were practised too (Sabina 42;and Cueva del Agua at Iznalloz). The sitting-up arrangement of corpses extended from Monte de la Barsella to the Cueva de los Murciélagos in Granada. Perhaps we must think of clans with much splitting and subdivision, but perhaps with 'home-base' settlements, often at a distance from the location of any given splinter group (c.f. Scottish clans), with much movement and petty skirmishing. These were the forefathers of the Iberians who were so prized by Rome as soldiers. Perhaps the separation between Catalonia, the south-east, and the south-west, characteristic of the Iberian iron age, has its roots in the copper age.

VIII

PREHISTORIC PHYSICAL ANTHROPOLOGY

Introduction

Sex

Age at Death

Pathology

Non-metrical Observations

Metrical Observations

Results of Factor Analysis

Results of Bivariate Statistics on Metrical Data

Interpretation

The interpretation offered is one which explains the heterogeneity of the montane populations north of the Vinalopó in terms of genetic drift and other local phenomena, owing to the lesser mobility and greater isolation of these populations when contrasted against the more mobile proto-urban populations further south. Comments are made on agricultural activities as possibly evidenced by pathological features. The essential homogeneity of the southeastern copper age people is emphasised.

PREHISTORIC PHYSICAL ANTHROPOLOGY

Introduction

This section will be kept as short as possible and frequent reference will be made to the data presented in the appendix of computer print-outs.

Previous physical anthropological studies in south-eastern Spain have been carried out as separate inquiries from archaeological studies (Jacques, 1887; Fusté Ara, 1957). Osteological surveys can and usually are undertaken as isolated activities. When they are so carried out, the aim seems often either description pure and simple, or else the determination of the relationship between the population under examination and those populations of other geographical regions and/or chronological periods.

Unfortunately, most skeletal studies are confined either to metrical data or to metrical data and descriptions. There is very little attempt on the whole to examine and appropriately to score the presence/absence of particular characteristics or their anomalous variants. The effect of that is to confine comparative attentions to metrical data, especially metrical cranial data. Those measurements are treated as belonging to different series of continuous variables, and provided given populations roughly correspond to normal distributions (in the statistical sense) and provided that different kinds of measurements are chosen for comparisons between populations on the basis of little inter-correlation, then it is usually possible to make some rough and ready statement about the similarity of two or more populations, or dissimilarity. Major discontinuities are often treated as indicating a change in the kind of population — migration, conquest, displacement. Some time-wise changes are admitted, however, notably a tendency for increasing brachycephalisation in the third and second

millennia B.C. in the Near East and in circum-Mediterranean countries.

It is therefore not possible to compare different populations from the standpoint of presence/absence of particular characteristics or anomalous variants, since those are not usually available in the literature. If such polymorphisms were to be shown to have a genetic basis of a fairly simple nature, they would, however, be a far more powerful tool for investigating the relationships between different populations than the metrical measurements alone are. This is because tests of homogeneity and heterogeneity between populations would be supplemented by chi-square tests of the probability that a few individuals with particular combinations of attributes might occur randomly or non-randomly. Metrical data, on the other hand, are often inter-correlated, and very likely to be influenced each by several genes, not to mention external factors. So that whilst theoretically chi-square tests and probability functions could be derived from metrical data, their use would be open to question. Student-t tests on lumped data would seem to be about as far as it is legitimate to go in that direction, and refer to comparisons between populations. Multiple factorial and cluster analyses also allow such comparisons to be made, of course.

Given the limitations of the statistical interpretations of prehistoric skeletal populations, the physical anthropologist has the choice of collecting a few data from several populations, or a lot of data from fewer populations (or both, if he has infinite time, money and patience !) . Most physical anthropologists are not first and foremost interested in archaeological problems, mainly owing to lack of specific archaeological training. This is especially true of those who concern themselves with later prehistoric and historical periods of time. The present writer regards himself as an archaeologist primarily, and a physical anthropologist only secondarily. It seemed apposite from the viewpoint of a survey of the neolithic and copper ages in south-eastern Spain to examine the skeletal remains of the area in order to observe in the first place whether there were phase-change irregularities in

space/

Space and/or time in the osteological material, with a view to considering ering if any observed irregularities corresponded to space and/or time phase-changes in artefact assemblages, or whether there might prove to be no such clear correlation at all. Theories about foreign influences in connexion with copper age origins, 'Reflux' beaker movement, and the different stages of the Argaric cultural phenomenon seemed to make a re-assessment of the physical remains of the inhabitants involved a matter of some archaeological interest.

The time spent in visiting collections and measuring skulls and other bones was considerable, especially since a complete list of metrical and non-metrical attributes gave a total of 210 possible characters per skull (see appendix). Subsequent time spent in preparing the information for the electronic computer and in computer programming was also considerable. Metrical data from other Spanish skulls recorded by other workers was also entered into the computer file, for comparison both as regards observer-biases and errors, and as regards different human populations. Thus there has not been time to undertake statistical computer comparisons with populations outside the Peninsula. The importance that various polymorphisms might have with regard to genetic links at or between different sites, also involved time and energy, and the lack of such recorded data from other countries also was a reason against detailed comparisons with foreign material.

The osteological study is largely confined to cranial and mandibular data, because whilst some post-cranial material was studied, time often did not permit a complete assessment at some museums. Moreover, collective burials are common, and the association of cranial and post-cranial bones is frequently impossible. Details on techniques and on the skulls at the different sites may be found in the appendix of computer print-outs.

Sex/

Sex

Sex is useful both for it's own sake as a guide to the representation of men versus women in prehistoric burials, and also according to many authorities to prevent spurious discontinuities within a non-sexed population, and possibly due to sexual differences in the expression of morphological characteristics. However, this last point is open to the criticism that sometimes one sex may represent an indigenous population whereas the other (usually held to be men) represent an exogenous one.

A much deeper criticism, however, attacks the view that prehistoric skulls can be adequately grouped into sexes unless complex statistical discriminant functions based on several metrical characteristics are employed (Giles & Elliot, 1963). These workers took post-mortem Negro and White skulls of known sex and derived such functions for those modern populations. It was found that traditional subjective methods of sexual assessment by experienced physical anthropologists were less reliable in identifying the true sex of the skulls than a consideration of the twenty discriminant function formulae (each based on several metrical characteristics).

One may pertinently inquire whether such subjective sexing on the basis of generalised impressions of gracility/robusticity can be employed on prehistoric skulls of unknown sex, or whether such sexing (as in Jacques, 1887; Fisté Ara, 1957, on south-eastern Spanish skulls might not in fact be highly misleading.

One authority (Dr. R. Riquet, private communication) holds the view that the minimal vertical height of the zygomatic process of the maxilla can give a rough guide to the sex of a given population, being greater in males, and less in females.

The present writer has therefore employed three methods in

his/

his attempt to sex the cranial remains (other than mandibles) of the skulls from different south-east Spanish sites. One technique is the subjective assessment method. This was found difficult on some skulls, and the following tables indicate the skulls on which an assessment was actually made. The second technique involved the computation using the electronic computer of six of Giles and Elliot's discriminant function formulae. Regrettably, many of their formulae could not be used owing to the non-measurement of mastoid processes, since the present writer only became aware of their work after he had embarked upon his own measurements of the Spanish skulls. The third method was the maxillary zygomatic process measurement. For the second method, the cutting points for the computed functions (given in the appendix) were as described in Giles and Elliot's article (see appendix). For the third method, the mean value from all the skulls was taken, and values in excess of 1 standard deviation on each side of the mean were used, those in excess of two standard deviations being indicated with a + sign.

The discriminant functions were scored on the basis of strongly male = M, strongly female = F. Where some values were only weakly male or female, the symbol (?) follows the M or F. Where only one score could be computed out of the possible six (due to missing data) the entire score is placed in parentheses, e.g. (M) or (F?). Where too few scores of one or other sex resulted, they are entered as (M?=F?), (M > F) etc.. Lower case letters refer to juveniles. The subjective sexes are also given as M or F. Parentheses here indicate scores entered in the writer's notebook but accidentally omitted from the computer programs. The ? symbol for the maxillary zygomatic process height (or minimum malaire in French) indicates values falling within 1 standard deviation of the mean for all the skulls.

Sexing/

Sexing of Skulls

Site	Ref. no.	Subj.	Comp.	Min. mal.	Vault Incomp.	Face Incomp.	Total crania	Total intact crania	Age if not adult
001	2	M	M				3	2	
002							3		
003	10	M	M				15	8	
	11	M							
	15	F							
	16	M	F						
	17	F							
004	23	M					2	1	
005	24						1		
006	25	M			1		3		
	27	F			1	1			
007	28	f					1	1	juve-nile
008	29	M				1	4		
009	33		M(?)	?			14 (3 juve-niles)	10	
	34			M+					
	35			?					
	36*			M*					
	37			?		1			
	38		(F?)						
	39			?		1			
	40		F?	?					
	43			?					
	44*			?					juve-nile
	45			F					
Skulls asterisked show generalised pathological hyperostosis.									
010	47		F	?			4	2	
	48		(F?)	?					
011	51		(M?=F?)	M		5 (3 juve-niles)	1		
012	53	(F)		?			2	1	
	54	(F)				1			
013	55			F+	1		1		

014/

Sexing of Skulls (cont.)

Site	Ref. no.	Subj.	Comp.	Min. sal.	Vault Incomp.	Face Incomp.	Total crania	Total intact crania	Age if not adult
014							1		
015	57		(M?>F?)	?					
	58		(F?>M?)	?			2	2	
016	59		F	F			1	1	
017	76			?					
	77	M		?					
	78			?					
	79	F				1			
	80	F		?					
	82	M		?					
	83	F							
	84			?			27	11	
	85			F					
	86	M				1			
	91	M				1			
	92	M		?		1			
	93	M				1			
	94	M				1			
	97	F	F	?					
	98	M		M					
	99	F				1			
	100	F		?					
018	101	M	F(?)	?			1	1	
019							1	1	
	103	F		?					
	104	M		?					
	105			?			6	4	
020	106	M		?					
021	108	M		?			1	1	
	109	M		?					
022	110	M				1	3	1	
	111	F							
023	112	F				1	1		
024	113	M			1	1	2		
025	116	M				1	1		
026	117		F	F+			1	1	
	119	M		?					
027	144	M				1	8	2	
	145	M	(M?)	?					
	147	F				1			

028/

Sexing of Skulls (cont.)

Site	Ref. no.	Subj.	Comp.	Min. mal.	Vault Incomp.	Face Incomp.	Total crania	Total Intact Crania	Age if not adult
	121	M			1	1			
	122	M				1			
	123	M			1	1			
	124	M				1			
	126			?					
	127	M				1			
	129	F			1	1			
	130	M		M	1				
	131	M		?	1				
	133	M	F?(M)	?					
028	134	M	F	?			47	6	
	135		(F?)	?					
	136	F		?					
	138	M		?	1				
	139	M		?	1				
	140	F		?					
	142	M			1	1			
	196			M	1	1			
	201	M			1	1			
	206			?	1	1			
	148	M		M					
	149	M				1			
029	151	F		?			8	3	
	152	F	F	?					
030	154	M				1	1		
	155	F		?					
	156	M			1				
031	157	M		?	1				
	158	M		?	1				
	159	M					18	2	
	160	F		?					
	161	F			1				
	162	F			1				
	163	F			1				
	235			?	1	1			
032	164	M	F ?M	M			1	1	
	165	F		F					
	166	M		?					
	167	F		?					
	168	M		?					
033	169	F	F	?					
	170	F		F			22 (2 juve-niles)	10	
	171	F		?					
	172	F		?					
	173	F		F					
	221			F	1				
034	174	M		?			1	1	

035/

Sexing of Skulls (cont.)

Site	Ref. no.	Subj.	Comp.	Min. mal.	Vault Incomp.	Face Incomp.	Total crania	Total Intact Crania	Age if non adult
035	175	F					1	1	adolescent
036	176			M+	1		1		
038	60			?					
	61		M(F?)	?					
	62			?		1			
	63			?					
	64		M(F?)	?					
	65		M(F?)	M					
037	66			?			15	8	
	67			?	1				
	69			?					
	70			?	1				
	73			M	1				
	180			?	1				
038							1		
039							1		juvenile

Subjective sexing was attempted on 82 crania, giving 50 male and 32 female adults. Discriminant function sexing was possible on 26 crania, but only 13 of these proved to be skulls on which subjective sex assessment had been attempted. Discriminant function sexing only gave 6 unequivocal males and twelve females, with eight skulls being of indeterminate sex. Sexing using the minimal height of the maxillary process was possible on data from 84 of the skulls, though 2 are rejected because they are abnormal pathologically, leaving 82. Of these, 10 gave male, and 8 female values, leaving 62 indeterminate. In toto, 128 skulls were sexed in one way or another, but two were rejected for pathological abnormality and one for non-adult status. The salient feature is the large number of sexually indeterminate cases, given a population of some 237 individuals as represented by cranial (i.e. non-mandibular skull) bony remains.

Of 13 cases where sexing by subjective assessment and discriminant function methods was attempted, there were five instances of disagreement between the techniques, underlining the sexually "hermaphroidte" physiognomy./

physiognomy. Moreover, the disagreements were always on individuals represented by complete skulls, and not just on fragmentary skull vault or facial bony pieces. Considered by site of origin, at site 003 (Monte de la Barsella) subjective and discriminant analysis sexing agreed in 1 case and disagreed in 1 case from a group of 5 out of 8 intact skulls on which sexing was attempted (total crania, 15), at site 028 (Cueva de la Pastora) subjective and discriminant analysis sexing agreed in 1 case and disagreed in 2 cases from a group of 7 out of 7 intact skulls on which sexing was attempted (total crania, 29), and at site 033 (Beni Sid) there were two instances of agreement out of 9 out of 10 intact skulls on which sexing was attempted (total crania, 22). The numbers of skulls in the three sites suitable for the discriminant equations were 2, 3 and 2, respectively. Three of these seven skulls gave conflicting results, therefore. It seems safe to conclude for the southeastern Spanish skulls under consideration that they cannot be satisfactorily sexed by any method with any degree of confidence. Therefore no attempt will be made to divide skulls into male and female subsets for the ensuing statistical investigations. It is felt that should sexual dimorphism exist nevertheless among southeastern Spanish skulls, the effects of a few extremely masculine or feminine skulls might well cancel each other out in an overall statistical inquiry, unless the additional assumption be made that at some sites at least individuals of different sexes might represent separate genetic populations (as in the case of invaders of one sex mating with indigenes of the opposite sex). Even then, the effects would only be observable in the actual individuals concerned in the original hybridisation, and thus in burials of individuals known to be contemporary within a very narrow time-span, since animal-breeding demonstrates that where two markedly different strains of a species hybridise, the first generation off-spring show bizarre morphological traits and are not as similar to one or other parental strain as would be expected from a consideration of simple Mendelian genetics (c.p. Thoma, 1957, 1958). The concept

of/

of 'hybrid vigour' is well known to plant and animal breeders. Given

(a) sexing difficulties

(b) possible non-homogeneity of individuals of same age (biological age)

(c) variance of first generation hybrids

all of which are unknowable for the southeastern Spanish sites, it is safest not to attempt to interpret bi- or polymodal curves for particular variables or indices in any given population, since any combination of those effects might be involved. Nevertheless Fusté (1957) and Jacque (1887) have suggested various interpretations of racial 'types' on the basis of such discontinuities for Valencian and El Argar skull series respectively.

(Sexing is easier, of course, where hip bones and other post-cranial bones are available and related to the skulls. These are frequently missing, and from multiple cave burials where they may be present they are not clearly related to individual skulls owing to mixing and re-use.

Age at Death

The biological age at which cranial vault sutures are obliterated has been shown to vary widely in post-mortem material of known biological age at death (Comas, 1966, p. 359-360), although obliteration of the spheno-occipital suture (very rarely preserved in ancient material) is usually completed in the late twenties of an individual's life-span. The age of eruption of wisdom teeth (in any case congenitally absent in from 5 - 15% of individuals depending on the population under study) is in the range 20 - 30 years of age in Western Europe to-day, but may be very much earlier in other groups (e.g. as early as 13 years of age in Kikuyu tribesmen in Africa). Tooth wear may roughly correlate with biological age in modern populations, but it seems unwise to rely too heavily on that criterion when dealing with ancient populations whose teeth may have erupted at different biological ages and whose diet differed markedly

from/

from modern populations' diets.

Accordingly, the foregoing criteria must be used with great caution when applied to prehistoric populations. The following criteria have been chosen:

(a) visibility/obliteration of spheno-occipital suture

(b) eruption of wisdom (molar 8) teeth.

Where the suture is obliterated and the wisdom teeth fully erupted, the classification 'mature adult' is employed, and the state of the suture and dentition in those cases will be used as a guide to other skulls for which the spheno-occipital suture and wisdom teeth could not be inspected.

Seven skulls had obliterated spheno-occipital sutures. Four of these had erupted wisdom teeth. Five of these skulls had varying degrees of obliteration of vault sutures, but two showed no such obliteration of the vault sutures. Where tooth wear could be observed, it varied from flattening of the cusps of the cheek teeth to exposure of dentine or even wear of the tooth down to its neck (in one of the cases with open vault sutures) .

Eleven skulls had visible spheno-occipital sutures. All but one had vault sutures showing no degree of obliteration, though the exception showed some obliteration of other sutures. Apart from one juvenile among these skulls (showing an erupting right maxillary sixth tooth), where the wisdom teeth could be inspected (ten of the remaining skulls), they had all erupted. In one case with visible vault sutures, one of the wisdom teeth was worn down to the neck. More usually, the cusps were sharp on the wisdom teeth, but other teeth might have exposed dentine, especially sixth teeth (first molars), or flattened cusps.

Eruption of wisdom teeth occurred before obliteration of spheno-occipital sutures, though not long before in most cases, to judge from the small degree of wear on those teeth. Possibly the biological ages of those events were not widely different from modern European populations. The

correlation/

correlation between the state of obliteration of vault sutures and those events suggests that obliteration might well commence as early as the onset of adult maturity, though in other cases it might not commence until some time after adult maturity, as defined by the aforementioned two events had been attained. In plain English, obliteration of vault sutures might perhaps begin from as early as age twenty to as late as age forty.

In view of the cautions of Comas, and of the observations just referred to, it seems pointless to classify vault sutures in a more detail than as (a) all vault sutures visible and unobliterated, (b) some degree of obliteration of vault sutures (from incipient obliteration to total obliteration).

With regard to dental wear, four stages have been noted, (a) cusps sharp, (b) cusps flattened, (c) some dentine exposed, (d) tooth worn down to neck. Presence of caries and of periodontal disease and resorption has been noted (see Introduction to computer print out of data). More important from the viewpoint of age determination than the degree of wear overall, seems to be the order in which the teeth of a quadrant undergo the various stages of wear. Overall degrees of wear corresponding to (c) and (d), especially if combined with loss of teeth, alveolar resorption, dental caries or periodontal disease, is suggestive of adult maturity, even where only fragmentary remains are available for inspection lacking wisdom teeth and sutural evidence.

There clearly were many skulls in which the state of the spheno-occipital suture was incapable of inspection, but which had wisdom teeth. Where these showed degrees of wear corresponding to (a) and (b), with degree (c) on no more than one or two teeth in each quadrant, and lacking teeth with degree (d), these have been classed as Young Mature Adults by analogy with the eleven skulls with erupted wisdom teeth and visible spheno-occipital sutures. Skulls in which the wisdom teeth (or other permanent teeth) were erupting or unerupted have been classed as Juvenile

This/

This category includes individuals with any permanent teeth at all, regardless of presence of milk teeth. Skulls represented only by milk teeth have been classed as Young Children and Infants.

The overall break-down is as follows:

Young Children & Infants	Juveniles	Young Mature Adults	Mature Adults	Total Adults	Other Oper
18	44	39	36	163	55

out of a total of 389 cases (disregarding the upper palaeolithic case from Parpalló and the fossilised skull from Alicante), from which subtraction indicates that 34 cases could not be classified. The number of cases listed in the computer print-out of craniometric data is 375, but the discrepancy is accounted for quite simply because in the Introduction to the computer print-out which lists the remains by site of origin, - skull remains are referred to on which measurements could not be made, and to which no series number was given therefore for statistical purposes of computation .. Probably the word 'case' rather than 'individual' is to be preferred, because at some sites where mandibles had become separated from crania and where it was impossible to determine which mandible ought to go with which cranium, they were assigned separate case numbers. The occasional duplication probably is of little consequence provided that ratios of cases of different age groups at particular sites are taken, rather than absolute numbers of cases. It should be self-evident from what has been said in the foregoing paragraphs that there may be cranial remains which cannot clearly be distinguished as Young Mature or Mature Adults (e.g. vault fragments with some sutural obliteration, or more intact skulls with erupted wisdom teeth, intermediate stages of tooth wear, missing sphenoid and basiocciput bones, and visible vault sutures). These have been classed as 'adult' and figure in the colum headed Total Adults. Likewise, there are skull fragments showing no

signs/

signs of sutural obliteration which could easily be Juveniles, Young Mature or Mature Adults, and these have been placed under the column heading Other Open (i.e. other skull remains with open vault sutures).

The overall breakdown by biological age groups, despite the rather special criteria chosen, seems very similar to other ancient series in that Juveniles and Young Mature Adults, representing perhaps age ranges roughly corresponding with the second and third decades of life, are more commonly represented than the Mature Adults of whom there are but 36 clearly identifiable cases for all decades of life from age 30 (roughly speaking) onwards.

There are four sites from which data seem fairly reliable and which support the overall breakdown. These are collective burial sites, viz. (1) Cueva de la Pastora, Alcoy, (2) Cueva del Palanqués, (3) Camí Real d'Alacant, Albaida, (4) Beni Sid, Vall d'Ebo :-

Site	No.	Young Children and Infants	Juveniles	Young Mature Adults	Mature Adults	Total Adults	Other skulls open sutures
(1)	57	0	4	9	7	34	14
(2)	35	0	1	8	7	16	4
(3)	36	1	0	8	2	12	6
(4)	40	7	13	6	2	9	3

The Young Children and Infants category probably approximates to a biological age of under five years, whilst Juveniles spans the time from the eruption of the first permanent molar to the last , a variable period from about 6 years of age to between 15 and 25 years of age. It is the view of this writer that a biological definition is preferable to the notional absolute biological ages proposed by most physical anthropologists and which are little better than inspired guesswork, given that we have no clear way of sexing the cases, nor yet any data about the physiological growth curves and attainment of maturity of prehistoric populations. Despite the different criteria selected and difficulty of making direct comparisons, nevertheless, the age spread are similar to those of Fusté

(1957

(1957) who examined some of the Levantine skeletal material studied by the present writer, with the curious exception that Fusté reported that at the cave of Beni Gid, Vall d'Ebo, (Alicante), infant remains (according to him, under a biological age of twelve years) constitute 60% of the cases. However, from the published figures given by Fusté from the various sites and the pencil marks on the boxes he examined at the Valencia Museum of Prehistory, it seems likely that Fusté did not include some of the cases included by the present writer at Beni Gid, as well as at other Levantine sites.

Pathology

There are twelve - healed skull fractures. (For details, see Introduction to computer print-out of skull data.) One remarkable case (skull SP0101) has a healed parietal fracture of a long, cleft-like nature which is still patent despite its healed edges. The skull is from a copper or bronze age settlement site, El Puig, near Alcoy, (Alicante)

Surgical traumas of the trepanation (trephination) type have been observed on various crania. The skull from the burial cave of Los Blanquizares de Lébor, Totana, (Murcia), has two such healed lesions. A healed trepanation is present on a skull from the Cueva d'En Pardo. A skull from the Cueva Frontó, Candía, (Valencia), has a patent hole through the frontal bone, which could be an unhealed (unsuccessful) attempt of such surgery, and possible cause of death.(skull SP0146). Another unsuccessful trepanation attempt occurs at the Cueva de la Pastora (skull SP 0181), along with four cases of healed trepanation SP0182, (/SP0183,0185,0186). Rincón and Fenollosa (1950) report four healed and one unhealed, and Fusté (1957) reports five healed trepanations, including the unhealed case of the former workers, and an unhealed case which he states they overlooked. One of the healed cases is probably not surgical, but some other traumatic accident, and has been classed by the present writer in the twelve healed skull fractures of the previous paragraph. Trepanations are shown in Plates CLXVI, CLXX, CLXXV.

A/

A number of skulls which have gone unremarked by other investigators manifest pitting of the tables of skull bone. These may be classified as follows:-

(1) cribra orbitalia, pitting of the orbital plate of the frontal bone, found in skull SP0081 from Les Llometes, Alcoy, (Alicante), skull SP0129 from Cueva de la Pastora, Alcoy, SP0061 from La Bastida, Totana, (Murcia). See Plate CLXIII.

(2) multiple pitting of the external table of the skull vault, e.g. skulls SP0126, SP0127 from Cueva de la Pastora. See Plate CLXII .

(3) multiple, pathological pitting of the inner table, found on the inferior part of the intracranial aspect of the frontal bone in association with impressions of branches of middle meningeal arteries and where the frontal bone seems pathologically thickened in skull SP0130 from Cueva de la Pastora, and on the inner surface of the vault of SP0198 from the same site which also has extraordinarily thick and heavy frontal and parietal bones, and seems to have been a Mature Adult at death as manifested by complete sutural obliteration. See Plate

Another group of pathologies may be subsumed under the general description of excavations, depressions and dome-like elevations of the cranial bones unrelated to traumas. Skull SP0013 from Monte de la Barsella Torremanzanas, Jijona, (Alicante), has a strange concavity of the back of the skull in the region of the obelion. Skulls SP0114 and 0154 from the Cueva del Rebolcat, Alcoy, (Alicante) and Rambleta, Rótova, (Valencia), respectively, each have excavations of the inner table of the left parietal bone, in the second case associated with an elevation of the outer table, currently patent owing to small holes which are doubtless post-mortem phenomena resulting from the extreme thinness of the bone over the excavation or erosion. The excavations or erosions might well be due to aneurysms of posterior branches of the middle meningeal artery in each case. Skull SP0219 from Beni Sid, Vall d'Ebo, (Alicante), has a raised,

raised dome 13 mm in diameter on the right parietal bone (Plate CL x 1). This could be traumatic, but is probably an osteoma. The pitting of skull SP0198 (Cueva de la Pastora) also shows enlarged eroded areas along the course of the middle meningeal artery (Plate CL x 2).

Facilities for determining specific gravity and density of skull bone, or for X-raying the bones in museums were not available. Nonetheless it is worth mentioning that some skulls seemed unusually thick and/or heavy. From the Cueva de las Lechuzas, Villena, (Alicante), two skulls (SP0036, 0044) manifest generalised hyperostosis, one being a Mature Adult. Skull SP0149 from the Cueva del Palanqués seemed unusually heavy Skull SP0117 from the Cueva Frontó, Gandía, (Valencia), had a vault 10 mm thick in places. Mention has been made of the two thick skulls from the Cueva de la Pastora, one of which was a Mature Adult, and which has erosions of the inner table. Skull SP0202 from the same site is also thick.

It is tempting to explain a pitting osteoporosis with compensatory hyperostosis along the lines proposed by Angel (1966, 1971) as a response to heterozygy for thalassaemia or sickle cell anaemia or similar affection in which the oxygen-carrying capacity of the blood is reduced and therefore physiological ability, as the price paid for survival and longevity. To overcome the disability hypertrophy of the marrow of bones quiescent in normal adult life might be expected to manufacture a rise in red cell count. Hypertension might not be unexpected, with aneurysms of the middle meningeal artery. It should be remembered that malaria is the disease against which such heterozygy affords protection, and it is interesting that the sites involved are all within reach of what might have been emerging huerta or agricultural valley-bottom soils around 2,000 B.C. However, other explanations of the pathologies could be offered, and in the absence of X-rays, it would be unwise to make too much of this.

Dental pathology is often treated as a self-contained matter. Tooth wear, however, can assist in determining biological age as has been stated, but we know so little about ancient diets that taken on its own there seems little else that can be gained from a very detailed statistic-

al breakdown. It is more instructive to relate dental pathology to periodontal pathology in terms of the numbers of individuals or cases of different age groups showing such pathologies. Precise details as relating to tooth wear and caries can be obtained from the computer print-out, for what it is worth. It should be noted in that connection that loss of a tooth during life with alveolar margin resorption is classified as '1' or 'presence of pathology' for that situation of the alveolar margin. Where a tooth is signalled as 'present' in addition to pathology, then dental pathology alone is to be inferred from the computer print-out. The type of caries is not given there, however, as the present writer only became convinced of its possible relevance after he had examined some of the collections. Some data for other collections is given in the Introduction to the computer print-out, namely the ones which were studied later, roughly speaking sites 027 to 036, 038 to 040. Where presence of a tooth without indication of tooth wear is signalled, this generally means that the tooth had been damaged post-mortem - e.g. only the root apex was present, the rest having broken off.

Twenty-nine cases show carious teeth out of a total of 253 cases for which dental and periodontal data could be inspected, or rather more than one-in-ten cases. A further twenty-nine cases show that there was loss of teeth before death and/or other periodontal lesions. Another five cases also in this latter category show carious teeth as well. Four cases show considerable mandibular destruction due to abscesses (Plate CLX1) and two have maxillary antral fistulae. The type of caries was recorded for fifteen cases, of which 3 mesio-occlusal cavities, 6 occlusal cavities, 5 interproximal cavities, 2 buccal and 1 lingual cavity were observed (two cases have two cavities each). Only in one case is the cavity on the neck of a tooth rather than the crown. The pattern of caries is rather different from that described by Miles (1964) for Anglo-Saxon skulls. It is not possible to sort the cases into Juveniles, Young Mature Adults and Mature Adults, only into Juvenile and/

and 'adults'. No cases of tooth loss or alveolar marginal resorption were found among the permanent dentition of Juveniles (i.e. cases in which there had not yet taken place complete eruption of wisdom teeth). Five instances of dental caries were observed in Juvenile permanent teeth, however. It seems reasonable to explain tooth loss and alveolar marginal resorption as largely due to dental caries, rather than, say, traumas, at least as far as concerns the cheek teeth. Surprisingly, there are few cases of osteitis . One might have anticipated there would be several cases were periodontal disease to be the principal cause of tooth loss. One case of osteitis is a Juvenile with no dental caries. This kind of lesion is uncommon. The antral fistulae mentioned earlier doubtless followed maxillary molar tooth loss. Mandibular abscesses and bony destruction seem to be diseases of adults. Whether or not these implicate periodontal processes of disease as playing a significant role in adult pathologies, it is interesting that in at least one case (Plate CLX1) there has not been an extensive loss of teeth. Possibly in that case the abscess cavity followed a traumatic lesion.

Palaeoanthropologists often prefer to quote incidence of caries in terms of a percentage of teeth investigated. Such a statistic is without meaning. It is more sensible to consider dental and periodontal pathologies in terms of the individuals (or failing that, the 'cases') affected. When this is done, it is seen that roughly one-in-five of the south eastern skulls and mandibles capable of inspection for such pathologies are affected, a much higher incidence than that usually quoted (5 - 10%) for ancient populations based on statistics of teeth alone. Percentages of total teeth alone cannot have much meaning in terms of incidence in population for another obvious reason. Namely, not all the permanent teeth erupt at the same time, and thus the degrees of wear and liability to pathological processes as between individual teeth are not comparable unless comparisons are limited to corresponding teeth (i.e. maxillary

first/

first molars; mandibular second incisors, etc.etc.).

In contrast to some other palaeoanthropological studies, it seems that the pattern of dental caries and ensuing tooth loss among prehistoric people in south-east Spain owes less to periodontal infection than to destruction by wear of the crown enamel, much as in present-day western society. It seems to have been quite common for the first molar (sixth tooth) to manifest exposure of dentine at a time not much later than eruption of the wisdom teeth. By the time of obliteration of the spheno-occipital suture, several teeth might show exposure of dentine through the crown enamel. In one instance, even the wisdom tooth was worn down to the neck before the suture had yet closed. Dental caries, tooth loss and periodontal disease mut have accelerated during the third decade of life.

It has been said that a skull (SP0157) from the Cueva del Palanqués shows platybasia or a plastic deformation of the base of the skull, possibly due to an aetiology of osteomalacia (Fusté, 1957). The present writer did not consider this skull as worthy of especial comment. (It should be recalled that the present writer examined the skulls before closely referring to Fusté in order not to be influenced, especially with regard to the values of metrical measurements.)

Skull SP0153 from the same burial cave is scaphocephalic. There is a curious patent hole through the occipital bone just behind the posterior condylar canal, and there is also an accessory tubercle between the digastric fossae and the occipital condyles. Possibly this was developed response to an enlarged sterrocleidomastoid muscle needed to nod and turn the heavy skull, providing the muscle with an ancillary bony attachment. One skull (SP0062) from La Bastida, Totana, (Murcia), has a slight degree of posteriorly cleft palate. Another from the same site (SP0061) has a right parietal bone which is much larger than the left, and congenital absence of left coronal and left lambdoid sutures, all the other vault sutures being perfectly visible. Skull SP0137 from the Cueva de la Pastora,/

Pastora, Alcoy, (Alicante), (Plate# CLXIV) has a very large left mastoid foramen and a congenitally absent left maxillary second incisor tooth. The mandible from the Cueva de los Tiestos, Jumilla, (Murcia), is a strange massive bone with massive teeth, and with a mandibular ramus rising at almost 90° from the body.

Non-metrical Observations

23 cases show complete metopic sutures, and a further 7 show a minor degree of metopic suture. Since some of the cranial remains lack frontal bones, the incidence of metopic suture is well over 10% . But the incidence varies remarkably as between some of the sites from which a reasonable number of crania are available. No instance is recorded from Monte de la Barsella, Torremanzanas, (Alicante). Two complete metopic sutures and one incomplete occur among the Les Llometes, Alcoy, (Alicante) group of skulls. Only one incomplete case occurs among the La Bastida, Totana, (Murcia), series. Only one case occurs at the Cueva del Palanqués, Navarrés, (Valencia), and only one case and two incomplete cases from Camí Real d'Alacant, (Valencia). However, from the Cueva de la Pastora Alcoy, (Alicante), there are no less than six cases of complete metopic suture, and from Beni Sid, Vall d'Ebo, (Alicante) four cases, and a further three incomplete cases.

The Cueva de la Pastora and the cave of Beni Sid, however may in turn be distinguished from the standpoint of the human remains on the basis of the almost total lack of Wormian ossicles or intrasutural bones at the former site, whereas at the latter lambdoid sutural ossicles were present in six cases out of nine capable of inspection from the group of nine cases (SP0165 - 0173) used for comparisons of non-metrical characteristics. Both sites have high incidences of frontal notches, ex-sutural mastoid foramina, zygomatic facial foramina, these features frequently going together on the same skull. However, at Beni Sid the zygomatic,

matic foramina are very unusual, in being frequently multiple on both sides.

There are difficulties in drawing comparisons between different sites with respect to non-metrical features. Some features may be incapable of investigation on one or both sides of the skull variously, due to damage to the bone. Features present unilaterally may be unequally represented as between left and right sides among a population, and present on both sides (bilateral) in other individuals of the same population. The determination of probabilities of combinations of characteristics therefore depending on how the populations are chosen, and many possibilities open up. Probably the most appropriate technique is a multivariate cluster analysis, and it is hoped to attempt this. However, there are practical difficulties in writing such a program over multistate characteristics (i.e. varying numbers of sutural ossicles, varying numbers of anomalous foramina, etc. For the moment a few statistics which look superficially to be interesting have been culled from the computer print-out of brute data, and will be presented without any attempt at determining their significances.

In the following table, the columns refer to the sites, numbered as in the computer print-out, viz.

037 = La Bastida
017 = Les Llometes
003 = Monte de la Barsella
009 = Cueva de las Lechuzas
027 = Cueva Frontó
028 = Cueva de la Pastora
029 = Cueva del Palanqués
031 = Camí Real d'Alacant
033 = Cueva de Beni Sid

The first row refers to the total number of cases per site for which at least one of the non-metrical characters could be investigated. Each character has four rows. Row (a) gives the number of cases with the character observed on both sides, and row (b) the number where it was observed on only one. Row (c) gives the number of cases where both sides were capable of investigation, and row (d) the number where only one side could be inspected.

Table/

Table

Site		037	017	003	009	027	028	029	031	033
Total cases allowing inspection for 1 or more variables		14	25	15	11	6	39	6	13	9
Frontal notches	(a)	7	16		7	6	20	3	5	5
	(b)	1	1		1	0	10	2	5	2
	(c)	13	25		11	6	28	5	11	9
	(d)	0	0		0	0	10	1	2	0
Supraorbital foramina	(a)	1	7	4	1	2	7	1	2	5
	(b)	3	1	4	0	1	7	3	9	3
	(c)	12	24	13	11	5	25	4	10	9
	(d)	0	1	0	0	0	7	2	3	0
Zygomatic foramina	(a)	7	1	6	4	0	6	0	1	5
	(b)	2	3	0	2	1	6	1	2	3
	(c)	11	12	11	10	1	9	2	3	5
	(d)	0	0	0	0	1	3	1	1	3
accessory lesser palatine foramen	(a)	4	5	4	2	1	1	1	0	2
	(b)	0	0	0	0	0	2	1	1	1
	(c)	11	13	9	10	1	9	3	1	6
	(d)	0	0	0	0	0	2	0	0	0
anterior ethmoidal foramen exsutural	(a)	3	0	0	0	0	3	0	0	0
	(b)	0	1	0	0	0	4	1	0	0
	(c)	10	6	7	9	0	4	3	1	4
	(d)	0	0	0	0	0	6	0	0	1
posterior condylar canal patent	(a)	5	0	2	2	0	5	3	3	3
	(b)	0	2	1	0	1	2	1	3	1
	(c)	11	12	10	9	1	6	4	4	6
	(d)	0	0	0	0	2	1	0	1	1
mastoid foramina absent	(a)	4	0	3	1	0	0	0	0	1
	(b)	0	1	0	0	0	0	0	1	3
	(c)	10	12	12	9	5	13	4	6	7
	(d)	0	0	0	0	0	6	2	4	0
mastoid foramina exsutural	(a)	3	5	2	0	5	3	3	4	3
	(b)	1	2	0	0	0	3	1	4	3
	(c)	10	13	12	9	5	12	4	6	7
	(d)	0	0	0	0	0	7	2	4	0

The table demonstrates the similarity between the sites of the Cueva de la Pastora and the cave of Beni Sid, to which mention has already been made. In addition, these two sites have the highest incidences of metopism of any site but it will be recalled that they differ in the incidences of lambdoid sutural bones and the multiple nature of the zygomatic foramina at Beni Sid. Two cases from Cueva de la Pastora (SP0133, 0134) each have the combination of bilaterally

ally patent posterior condylar canals, left-sided double anterior hypoglossal canals, zygomatic facial foramina and frontal notches. Perhaps these rather unique combinations signify a close relationship between the two individuals.

Frontal notches, exsutural mastoid foramina and lamdoid ossicles appear together at the Cueva Frontó, Gandía, (Valencia). At the Cueva del Palanqués there appear lambdoid/sutural ossicles (multiple in three cases) exsutural mastoid foramina, patent posterior condylar canals, supraorbital foramina and frontal notches. These seem to form a tight cluster, all being represented on some skulls. Except for frontal notches on SP0150, skulls SP0148 and 0150 all the features are found on those two skulls as well as double anterior condylar (hypoglossal) canals. At the burial cave of Camí Real d'Alacant lamdoid/sutural ossicles (frequently multiple) and asterionic ossicles occur in many cases as well as exsutural mastoid foramina, supraorbital foramina, frontal notches, and patent posterior condylar canals. At the burial cave of Monte de la Barsella accessory lesser palatine foramina seem to show a higher incidence than at the other burial cave sites, but accessory ossicles are almost completely absent. Supraorbital and zygomatic foramina are strongly represented. Two cases with the former are represented in three cases of bilaterally absent mastoid foramina. At the Cueva de las Lechuzas burial cave only zygomatic foramina and frontal notches show any high incidence.

From the Les Llometes site lamdoid ossicles and lamkdoid sutural ossicles are strongly represented. Accessory lesser palatine foramina, supraorbital foramina, frontal notches and exsutural mastoid foramina form a fairly tight cluster.

The Argaric settlement of La Bastida does not show a high incidence of lamdoid sutural bones. All anomalies of foramina listed in the table are moderately represented, but five individuals (SP0060, 0063, 0064,

0064, 0066,0069,0070) show patent posterior condylar canals, bilaterally absent mastoid foramina, zygomatic foramina, and frontal notches.

It can be seen from a cursory glance over these sites which provide most of the cases in the series, that each site can be distinguished from any other on the basis of non-metrical attributes in a rough and ready manner.

Metrical Observations

Fusté (1957) compared both mean measurements and indices of Levantine skulls with those from other Spanish series (El Argar, Tisuco, Alcazar del Rey, a Roman series, etc.) and found that relatively few mean values were more than one standard deviation from the corresponding Levantine mean. This argues against any major 'racial discontinuity' in the prehistoric physical anthropology of the Peninsula. The electronic computer permits a detailed investigation into the analysis of variance that allows those differences which there are nevertheless between sites to be investigated and their significance to be assessed. One of the difficulties of traditional methods has always been that since it has not been clearly known which metrical measurements were highly intercorrelated, and which were not, when two populations were under comparison it has not be clear whether a wide divergence between them for just one or two characteristics was to be held significant or not. Moreover, until now no thought whatever has been given to the possibility that two measurements might be statistically independent in one series and yet highly correlated in another. It will be shown that this circumstance, at first sight alarming is by no means uncommon. A further difficulty has consisted in the relative weight to be accorded to differences in overall measurements between two series as against differences in shape as indicated by ratios or indices. Again, the possibility has received scant attention that some indices might represent two variables which in some series might be inter-

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correlated, whilst in others they might not.

Some of these possible pit-falls render it inadvisable to begin with such computer classification programs as are involved in various methods of clustering. Clusters so derived may represent no more than groups of stongly intercorrelated attributes. In order to distinguish between possibly different human population groups, cluster analysis ought to be directed towards comparing and contrasting what might be termed 'identifier' attributes, selected from groups of intercorrelated attributes in the respective populations. Hitherto such identifiers have been arbitrarily chosen. Yet what is desired is to compare genetic relationships in the final analysis. Therefore it is important to choose identifier attributes which are invariably related to some particular genetic mechanism , independent of other possible genetic mechanisms. It is also necessary to remove redundant, superfluous data. An appropriate reduction technique is multivariate factorial analysis.

All the measurements and present/absent observations made by the writer in the field (over 150,000 entries) were transcribed laboriously by him onto IBM punched cards and set up as system files for the Statistical Package for the Social Sciences (S.P.S.S.), a package using Fortran IV available on the 370/155 computer at the Edinburgh Regional Computing Centre. So far investigation has been limited to the metrical attributes.

Principal factoring was carried out on nine groups of skulls (from sites 037, 017, 003, 009,028,029,031,033,100). Eight were groups examined by the present writer, and the ninth consisted of the metrical measurements published by Jacques (1887) on the El Argar series. Up to 56 attributes were used. There were various reasons why it was

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not always possible to use all of the variables. For some programs it is not permitted to use more variables than there are cases (skeletons), so that some data had to discarded. For some groups of skulls there were no entries at all for certain variables, owing to damage to the bones precluding measurement. The programs require that no variable shall be completely absent, and therefore the respective variables had to be discarded. The Argar skulls were measured according to different criteria, and some measurements taken by the present writer on his skulls had not been made by Jacques.

In order to overcome the difficulty that it is not permitted in certain programs to have more variables than there are cases, a principal factor solution without iteration was performed on each series, (that is, where this difficulty presented itself), since the restriction was not in force for that solution. In fact, usually very few iterations were required in any case, and the results between the iterated and non-iterated solutions for principal factoring were virtually identical.

Basically, a correlation matrix of up to 56 x 56 in space was computed for each group of skulls chosen, and product-moment correlation coefficients were printed. It had occurred to the present writer that a covariance matrix might have been more suitable, in order to overcome possible scaling difficulties as between measurements of very different magnitude. In fact, this transpired not to be a difficulty, since the factoring proved that very small and very large measurements differing by as much as ten times and which had been taken on different parts of the same bone of a skull (e.g. glabella-nasion and glabella-bregma distances) were strongly correlated, rather than that all measurements of low order of magnitude showed high correlation and all of high value likewise, as might perhaps have been anticipated due to observer-based error in reading sliding calipers or spreading compasses. This was a

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gratifying discovery, since the programs automatically produce product-moment correlation coefficient matrices as the basis of subsequent computations, whereas alternative matrix in-puts would have had to be separately computed and fed in.

The total part of the variance shared by all of the variables is calculated and 'principal components' extracted in so far as the individual variables account for the residual variance. This is based on communality estimates of unity in the case of the non-iterative principal factor program used. On the basis of the squared multiple correlation coefficients which are then calculated, the communalities are adjusted, and the orthogonal 'principal factors' extracted. The normalised cosine values of the correlation coefficients are determined, and for a Gramian matrix it is possible to resolve the scalar eigenvalues so derived in terms of orthogonal eigenvectors. The scalars are themselves derived from the correlation coefficients of the data, and it is therefore possible to print out a factor matrix in which the contribution provided by each of the original variables of the data in-put to each successive orthogonal vector (factor loading) is listed. These may also be printed graphically in terms of the locations of the variables with respect to pairs of orthogonal eigenvectors.

The advantage of factorial analysis is twofold. First, it does not matter if some or all of the data in-put are intercorrelated, since it will be reduced to a few (or one) factors. Secondly, these factors can be used as working hypotheses in the sense of referring to hypothetical causative 'factors' responsible for the ordering of the data, each being independent of the next (orthogonality). In terms of physical anthropology of ancient skulls, this means that one might wish to interpret them as possible genetical and/or environmental aspects underlying morphological polymorphic variation, and to examine

alternative possible models of population genetics, demography, and human ecology to try to determine which best fit the data with the least number of tacit assumptions having to be made (Occam's Razor). Possibly one might then wish to carry out projected surveys on living populations believed to best resemble the simplest models, in order to determine over a period of years (generations) whether this or another explanation is the most plausible.

The factors extracted are printed in descending order with regard to the extent to which they account for the variance in the matrix. The first factor accounts for the largest part. The next accounts for the largest part of what is left, and so on. However, the order of the factor is perhaps not to be relied on with respect to clusters of loadings from measurements on different parts of the skull on respective different factors in the present study. The reason for this is because the numbers of skulls are often small (ranging from 14 to 83 individuals). Also, in order to maximise the advantage capable of being taken of all the data recorded, it was decided not to delete any individual for which one variable was recorded as absent, but rather to assume homogeneity in each sub-group of skulls and use all the measurements recorded. Furthermore, there is the possibility of random variance unrelated to any major factors. For the same reason, only the first five factors at most have been held to be of interest.

The cost of the programs prevents their triplication for publication in the thesis, and the sheer size of the matrices prevents their being copied by hand and duplicated. They are available for inspection, however, and it is hoped to publish some at least in the near future. By and large, factor loadings greater than 0.70 were held to be significant, and values of 0.60 - 0.69 as perhaps significant, following visual inspection of the matrices and graphical plots.

For some of the larger skull collections (e.g. Pastora) other factoring techniques were also employed, viz. alpha factoring and Rao's canonical factoring (not to be confused with canonical correlation). The results were very similar to the principal factoring solutions. The rotation usually employed was the 'Varimax' rotation, but trials with 'Oblique' rotations were carried out, and again the results were similar, perhaps with some improvement of clarity as between heavily-loading and trivial variables. These programs could not always be run, since they require that there be more cases than variables, and for small groups it means that in order to run the programs the number of variables has to be drastically cut — almost to the point where it ceases to be possible to use the factoring as a data reduction technique. However, the confirmation of the non-iterated principal factoring solution suggests that reliance may be placed on this solution provided only the first few factors are accepted.

Results of Factor Analysis

These may be divided into two groups:-

(i) General

Factorial analysis suggests that some 'indices' used in traditional physical anthropology may be less useful than others, and that some measurements often used to distinguish between different 'groups' may be of doubtful taxonomic value. Taking the nine collections of skulls (corresponding to sites 003, 009, 017, 028, 029, 031, 033, 037, 100) individually, measurements of the nasal and orbital apertures invariably loaded heavily on the same orthogonal factor. These measurements, and the indices derived from them therefore, are probably of taxonomic value in distinguishing between different skulls, being independent of other measurements such as those of the cranial vault, for example. Maxillary and palatal measurements also seem to load heavily on the same factor in

most, although not all, instances. Mandibular measurements, whether of the body or ramus, on the other hand, always load heavily on another orthogonal factor. It seems inappropriate, therefore, to use compound measurements such as total facial height for comparison between skulls and for computing indices. The bizygomatic diameter loads less heavily than the other facial measurements on the 'facial factor', and sometimes loads only trivially on it. Sometimes it is associated with measurements of foramen magnum breadth, and sometimes with maxillary dimensions unrelated to other facial measurements, loading on different orthogonal factors to the 'facial factor' . It does not load especially heavily on factors associated with the cranial vault, and therefore it seems inappropriate to relate it to the diameters of the frontal or parietal bones in 'indices' as is sometimes done.

The transverse and anteroposterior measurements (diameters and circumferences) of the bones of the vault do not load on separate factors, whereas the basibregmatic height loads on a separate factor. It seems inappropriate therefore to compute indices which relate the former types of measurement to basibregmatic height. However, transverse and posterior measurements do not load as heavily on orthogonal factors as do the measurements of individual vault bones. Thus anteroposterior and transverse maximal cranial diameters do not seem the best indicators of taxonomic groups, when contrasted against the measurements of frontal, parietal and occipital squamous bones, respectively. This is because sometimes two or three of these bones (their measurements, that is) load heavily on one orthogonal factor, but sometimes on more than one factor, when different groups of skulls (chosen by site of origin) are considered. Measurements of the temporal bone are closely linked on the same factor to those of the parietal (e.g. auriculobregmatic height, biporionic, bimastoid and biasterionic diameters). The measurements of the occipital squamous bone above the inion often seem correlated

with those of the parietal and frontal bones, rather than with the basal part of the occipital bone. Generally, the breadth and length of both the foramen magnum and of the basal part of the occiput load heavily together with basibregmatic height, and basion-nasion and basion-prosthion lengths, on a separate orthogonal factor.

These observations demonstrate that 'factors' responsible for the development of the different vault bones of a skull (frontal, parietals, occipital, temporals) operate independently of one another, at least sometimes, to a greater or lesser degree. Thus far from expressing a meaningful parameter of skull morphology, measurements of the vault which include more than one bone (e.g. maximal antero-posterior skull length)are compounded of independent developments in two or three bones. It is therefore unwise to use such a measurement in association with one which refers to one of those bones only (e.g. biparietal maximal transverse diameter), or a quite separate bone with its own determinants of development (e.g. basi-occiput, as when basibregmatic height is used with maximal anteroposterior and transverse diameters in 'indices') If any bone is of especial importance in determining maximal antero-posterior length, it seems to be the parietal, but it must be emphasised that other parietal measurements (bregma - lambda diameter and curve; glabella-lambda ditto; nasion-lambda ditto;auriculobregmatic height etc.) load more heavily on the parietal bone factor, indicating the 'hybrid' nature of maximal anteroposterior length as a criterion. Thus the underlying belief of Howells (1953) that maximal skull length could be taken to be a useful criterion, which underlay his choice of centroid factoring, is not substantiated for the present south-east Spanish skull groups, and it might be proposed tentatively that his choice of centroid factoring (which involves underlying assumptions about the data, in contrast to principal factoring) was an unhappy choice. (It was determined by the lack of a large enough electronic computer.)

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(ii) Levantine Skulls

Great doubt must be cast on profiles based on indices which purport to show comparisons and contrasts between different skull collections, since the underlying assumption that different groups of indices vary independently of each other, and that the constituent variables of each index do vary in some kind of relationship one to another, may not hold for all human skull populations.

The following 'factors' seem to underlie the factor loadings of the 56 metrical characters listed in the Introduction to the computer print-out (see appendix). They are given in an arbitrary order and represent the maximum number of underlying factors from a consideration of the nine south-eastern Spanish sites under review:-

Facial or splanchnocranial	(F)
Mandibular	(M)
Frontal	(Fr)
Parietal	(P)
Occipital squame	(Os)
Basiocciput	(B)
Maxillozygomatic	(Z)
Temporal & parietal breadth	(T).

At some sites the variables loading heavily on two or more of the foregoing at other sites, loaded heavily on just one orthogonal factor. The assumption has been made that such a factor is compounded of more than one biological 'factor'. The biological mechanism might be genetic, environmental, or both. In such a case, the orthogonal factors are referred to as (Fr+P+Os) etc.. Roman numerals refer to the order in which the factors were extracted for each collection of skulls. This ordering differs from site to site, but it may also differ according to the factoring technique used, and for other reasons aforementioned, it may not in fact be very significant taxonomically. The types of factoring used are as follows: PA1 = principal factoring without iteration but with communalities computed

PA2 = ditto, with iteration.

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The results are as follows:

El Argar (site 100)

Methods: PA1, PA2

Factors: I (P+Fr+Os+B)
II (F)
III (M)
? IV (Z+B) ?

La Bastida (site 037)

Methods: PA1,PA2

Factors: I (F)
II (P+Os+B)
III (Fr)
IV (M)
? V (Z+B) ?

Cueva de la Pastora (site 028)

Methods: PA1,PA2, alpha factoring, Rao's canonical factoring

Factors: I (F)
II (P)
III (Os+ B)
IV (M)

Cueva de Beni Sid (site 033)

Methods: PA1, PA2

Factors: I (F)
II (P)
III (B)
IV (B)
V (M)
VI (Fr)

Camí Real d'Alacant (site 031)

Factors: I (P)
II (Os+B+Z)
III (F)
IV (M)

Methods: PA1, PA2

Cueva del Monte de la Barcella (Site 003)

Methods: PA1, PA 2

Factors: I (F + Os)
II (F)
III (M)

Cueva del Palanqués (Site 029)

Methods: PA1, PA2

Factors: I (F + Fr + P)
II (Os + B)
III (B)

Cueva de las Lechuzas (Site 009)

Methods: PA1, PA2

Factors: I (B + ?F)
II (P + T)
III (M)
IV (Os)

Cueva de les Llometes (Site 017)

Methods: PA1, PA2

Factors: I (B + F)
II (P)
III (Os)

Whilst it has not yet proved possible to assess the significance of the differences between the sites, probably in any case a rather dangerous procedure given the small numbers of cases for some sites, nevertheless one might propose a degree of heterogeneity as between the various cave sites, and some similarity between El Argar and La Bastida, the two Argaric settlement sites from the more southerly part of the research area (southern Murcia and northern Almería). Unfortunately, Jacques did not record non-metrical observations of the type used in a previous section of this chapter, so that it is not possible to compare the two Argaric settlements from that standpoint.

It seems reasonable on anatomical grounds to relate difference in numbers of foramin through which nerves pass to developmental

effects associated with neurogenesis, and in particular the connective tissue of the perineurium, since this precedes ossification. On the other hand, differences between the metrical measurements of the various parts of the cranium as between different skull series is most likely to be due to variation of the effects of ossification. Since two different types of tissue are involved at different biological stages of embryology, there is no particular reason to suppose that the pattern of incidence of non-metrical characters for a number of different series of skulls will of necessity be reflected in the metrical observations. However, where, as in the instances of the various collective cave burials referred to above, both types of data appear to vary as between neighbouring locations in an aimless manner, and where some degree of homogeneity might have been expected as regards non-metric and metric observations respectively between the different locations geographically close together, then it is reasonable to postulate random effects operating independently on both types of characteristic. Whether such effects are genetic or environmental, or a mixture of both, for one or either type of characteristic, is open to discussion.

Results of Bivariate Statistics on Metrical Data

In order to test whether different skull series between different pairs of sites manifested homogeneity or heterogeneity as regards individual metrical measurements, T-tests were carried out using the computer on corresponding pairs of the 56 measured variables between each of the nine sites. 72 such programs were therefore run. The indices, although computed and stored on the tapes, were not used for reasons aforementioned, and also owing to programming difficulties. The results were only held to be significant where the variance ratio gave a greater than one-in-ten probability that the variances of the two series were comparable, and where the pooled and separate variance estimates gave a less than one-in-ten probability for the t-test that

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the pair of variables were likely to be drawn from a non-homogeneous population. One-way statistics permitted kurtosis, skewness and standard deviations in each case to be examined with respect to the parent series of skulls. Small measurements such as those between glabella and nasion were ignored altogether as being possibly unreliable. The following table indicates what may be significant differences between the pairs of sites, based on lumped data from each. Only mean values are given in each case, for sake of space. Standard abbreviations are used for cranial reference points, with D indicating a distance projected and C a circumference or arc. In addition the following are used: MSL = maximum skull length; MSB = maximum skull breadth; MFB = maximum frontal breadth; mFB = minimum frontal breadth; HC = horizontal circumference; SH = symphysial height; mm = minimal height of zygomatic process of maxilla; MA = mandibular ramus angle. Maxillary alveolar and palatal dimensions are not given for comparisons with El Argar, since Jacques appears to have used criteria different from the present writer in taking his measurements (there are also other measurements on the skull taken by the present writer which Jacques did not apparently record).

(Means are given to one decimal place only for brevity.)

Skulls at a given site are not necessarily homogeneous, but an examination of the one-way frequency distribution statistics, especially kurtosis and standard deviation, will reveal any gross deviations from the Normal Curve of Errors. In fact, the only striking deviations show that for Les Llometes, Camí Real d'Alacant, and El Argar the non-facial measurements of the frontal bone, and the measurements of the parietal vault, tempro-parietal breadths and occipital squamous bone sometimes are very closely bunched, indicating a greater than chance homogeneity within the respective skull series, although at Camí Real a contrary wider than chance spread is shown by the minimal frontal breadth, nasion-opisthion length and lambda-opisthion circumference.

To avoid chance random effects, sampling error, and possible sexual dimorphism, it would seem unwise to place much emphasis on those pairs of sites where possible non-homogeneity is present for half-a-dozen characteristics or less, especially where those are characteristics usually loading on different orthogonal factors.

The Cueva de Beni Sid in particular appears to show non-homogeneity with respect to some other collective cave burial sites in the Valencia-Alicante region, viz. Les Llometes, Cueva de la Pastora, Camí Real d'Alacant, and Cueva del Monte de la Barsella, and to a lesser extent El Argar and La Bastida. The Cueva de la Pastora skulls are very similar to those from the Cueva del Palanqués and Camí Real d'Alacant, but a number of differences strike the eye between it and the other sites in the comparison.

El Argar and La Bastida are probably not heterogeneous, though the former site seems to differ more from the Valencia-Alicante cave burial collections than the latter which is geograph-ically closer to them.

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In the factorial study Beni Sid showed a somewhat different pattern of variables loading on orthogonal factors from the other Java sites, especially with regard to the neurocranial constituent bones. Argar and Bastida showed a rather similar pattern. As was mentioned previously, Pastora and Beni Sid share in common various non-metrical character complexes, although there are noteworthy differences (lambdoid sutural bones; zygomatic foramina). These two sites were the only ones to manifest non-homogeneity as regards variables loading on the facial element. However, this, and the other differences in the metrical measurements between the two sites, may be due largely to the fact that the Pastora skulls seem to have the greatest values for all measurements, and the Beni Sid skulls have among the lowest. The Argar skulls also have large metrical values. The small Lechuzas group have low values, but this unreliable sample has many missing values and is probably not strong enough for useful statistical conclusions be drawn from it The rigour in selecting the variables deemed to be non-homogeneous as between pairs of sites possibly precludes meaningful conclusions being made as to changes in sign as between metrical observations loading on different orthogonal factors at the respective pairs of sites in the study.

Interpretation

In comparing the Valencia-Alicante collective burial skulls with other Spanish series, including Argar, Fuste (1957, pp. 105 - 107) ignored both the heterogeneity of the Argar skulls proposed by Jacques (1887), and the tentative heterogeneity as between 'gracile Mediterranean' and 'Eurafrican' skulls which he himself proposed for the Valencia-Alicante sites. In fact, he suggested that there was no great diversity between any of the

prehistoric Spanish sites published. The difference he noted between the palatal dimensions of Argar and the other series is very probably due to the non-conventional reference points which Jacques seems to have employed (he was working before the Monaco convention standardised anthropometric referents). In general, Fusté's conclusions are doubtless true. However, this underlines the need to use more sophisticated and reliable statistical tools than mere indices. The approach tentatively begun here suggests that there may be small but significant differences between neighbouring sites. (It must be recalled that the sites are not necessarily contemporary even its widest sense.)

It must be stressed that the present investigations are not complete. The factorial analysis, as well as being possibly useful for its own sake as a classificatory and interpretative statistical procedure, provides a data reduction technique which allows selected variables independent of one another to be used in comparing the various collections from the standpoint of cluster analysis and multidimensional scaling, thereby avoiding spurious correlations. It is hoped to incorporate the non-metrical data into such programmes, though there are problems over multistate characters to be overcome. Only then is it proposed to perform chi-square probability tests.

If it is felt that this partial study is somewhat unsatisfactory, it should be remembered that despite the suggestion of Berry (1968) that non-metrical observations on human skulls might be worthy objects of inquiry, little has so far been done by physical anthropologists. The recording and transcribing of the data for the present study was itself an enormous task. Its aim was to see whether the data might help the archaeological inter-

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pretation of the geographical region in prehistory. At the commencement of the research programme, it was not known even if there would be enough osteological specimens for this purpose, and hence osteological investigations were accorded an ancillary role in the overall programme.

Traditionally, physical anthropological data have been used, as for instance by Fusté v. supra, for comparisons over a much wider geographical area. However, the size of the task in transcribing published data from neighbouring Mediterranean countries, combined with the lack of non-metrical published data from those countries, must lead to post-ponement of that endeavour to a future occasion. Recently much new material has been published. From North Africa Chamla (1968, 1970) and Briggs (1956) have demonstrated the diversity of early prehistoric physical types in traditional terms. The Oranian and Capsian of pre- and early neolithic facies shows an early (Oranian) mixed group of various strands ranging from hyperdolichocrany to brachycrany with a predominance of robust mesocranials of 'Afalou' type. Subsequently, at least in the more northern areas away from the central Sahara, there appears to have been a progressive gracilisation , with a tendency toward dolicho-mesocranial forms. It is suggested that brachycrany might have been a local development. (' Negroid' elements are also said to be discernible in certain regions.) In view of what has been said earlier, such descriptions based on indices are probably unreliable. In connection with brachycranial development, probably a function of the differential effects of the frontal, parietal and occipital squamous 'factors', one might mention that the dolicho-mesocrany of European mesolithic populations such as from the Portuguese Muge middens and the Breton burial grounds, and especially the Bavarian cave of Ofnet with no less than four brachycranial skulls in a group of 32 of which only 2 were dolichocranial. An increasing incidence in brachycrany is documented for the later prehistoric periods (e.g. bronze age) in many areas of the Near

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East and Europe (Ferembach, 1966). However, there are other signs for early presence of this characteristic, e.g. in the Rumanian neolithic (Necrasov & Cristescu, 1965). There is also a high incidence of mesocranial skulls from various copper age Greek and Turkish sites (Angel, 1971, pp. 100 - 101), and from the early Cypriot neolithic (Walker, MS submitted, 1973).

From France, Riquet (1966, 1968) has examined many neolithic and copper age skulls, and from Italy Corrain and his colleagues have carried out much detailed work (Corrain, 1959; 1960; 1963;1966; Corrain & Scarpari, 1966; Corrain & Gallo, 1967; Corrain & Capitanio, 1967, 1968; Capitanio,1969, 1969a) on prehistoric skeletal material. From the Aegean mention must be made of the work of Angel (1951, 1961, 1971). From Spain itself, there is work in progress currently by Garralda (1971, 1971a). Clearly, a great deal of work is needed to correlate the measurements and treat them statistically in an appropriate manner, far beyond the scope of the present thesis. Schwidetzky and her colleagues have used the Penrose distance coefficient in studies on prehistoric European skulls (Schwidetzky, 1967, 1967a, 1967b, 1967c; Bernhard & Brabender, 1967; Knussman, 1967), but their results seem so generalised as to be of little use in resolving archaeological problems of population change and/or movement.

Working within the Iberian Peninsula itself, there is a wealth of published metrical data, though there are few large collections of skulls from archaeologically secure locations outside the Levante. Enormous numbers of skulls were recorded as having been found by the Sirets (Siret & Siret, 1887; Leisner & Leisner, 1943) — sometimes as many as 100 from just one collective tomb, frequently twenty or thirty ! — which seem to have disappeared without trace. Sizeable groups are known from some Segovia cave sites (Barras de

Aragón, 1933, 1933a) and the Alcázar del Rey cemetery (Barras de Aragaón, 1931). Other Spanish prehistoric osteological measurements are given in Cabré (1921 - 1923); Barras de Aragón (1916; 1925; 1926; 1928; 1930;1930a;1930b;1930c; 1932; 1932a; 1932b;1932c;1932d; 1933b;1933c;1933d;1933e;1933f;1933g;1934); Anton (1931); Batista i Roca (1923); Becerra (1898); Paula e Oliveira (1884); Deselaers, (1917); Eguren (1917); Fusté (1955; 1956; 1957a, 1957b); Fusté & Fletcher (1953); García Sánchez (1961); Lebzelter (1946); Hoyos Sainz (1925; 1947; 1950); Riquet (1953). Some of these data have been included in the present writer's computer store (see print-out of computer data in Appendix II) for possible use. Other data are to be added eventually.

It is within the narrower geographical confines, however, that modern physical anthropology prefers to direct its techniques, as admirably demonstrated in the studies of J.L. Angel mentioned above. However, the problem remains - a problem encountered by Fusté and which he was unable to resolve - of what to do with metrical observations when the geographical region is so circumscribed that traditional methods cannot distinguish between neighbouring populations. It is here that more powerful statistical tools involving the electronic computer and numerical taxonomy are needed. The factorial analysis, although not the best, provides a suitable data reduction technique on which to base further investigations, and highlights basic differences between populations at different sites as has been demonstrated. It is strange that factorial analysis has been less widely used in physical anthropology, since its use in archaeology is growing in acceptability (Binford & Binford, 1966; Binford, 1972 , for instance). It has been employed in palaeontology by Eldredge (1972), and in physical anthropology by Tattersall (1968)and Howells (1953). One might hope

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8:45

to compute eventually discriminant functions and linear profiles for particular prehistoric populations using such factorial analyses, so that small groups and individual skulls from solitary locations might be allocated (or not, as the case may be) to particular populations, especially if non-metrical characters be included. Discriminant techniques have been used by Howells (1966), Ashton et al. (1957), Giles & E Elliot (1964), and generalised distance statistics such as D^2 (Mahalanobis, 1946) by Giles (1960) and Weiner & Campbell (1964).

The use of factorial analysis in formulating hypotheses to explain the variances (see Thurstone, 1947; Rummel, 1970) is of particular importance to palaeoanthropological investigations within a highly circumscribed area such as the south-east of Spain. It suggests a way of extending the kind of 'in depth' palaeoanthropological study of which J.L. Angel has been the leading exponent. Combined with variations in non-metrical characteristics, one might wish to use it in order to propose mechanisms for population change in southeastern Spain. Non-metrical characteristics have been recently used in non-human mammalian studies (e.g. Berry, 1963). Berry proposed that variations between different populations of house mice might be explained on the basis of a stabilising selection combined with genetic drift. Genetic drift may explain variations between some human populations where the appropriate conditions of small populations from which there is continuing emigration exist (Cavalli-Sforza, 1966; 1969). In other cases, human populations might owe their distinctiveness to 'founder effect'. The 'area effect' described by Clarke (1968) might also play a part. So too do nutritional factors and consanguinity, as is well known.

It is hard to explain apparently meaningless variations in perineurial histogenesis (and the consequent distribution of foramina and other anomalies of membrane bone) on the one hand, and of the orthogonal factors responsible for differences in the dimensions of

the bones themselves on the other, except in terms of a combination of the aforementioned genetic mechanisms, since it is a priori hard to envisage how environmental factors might have such widely varying effects on different embryological aspects of development when several different populations are considered. The larger size of the Argaric culture townships of El Argar and La Bastida might well have had sufficient contact and mobility of population to overcome the vagaries of sampling error and produce a more-or-less homogeneous population. By contrast, the Valencia-Alicante skeletal collections, whilst being much closer together geographically than are El Argar and La Bastida, are separated by a rugged geographical terrain of steep mountainsides and narrow valleys. The 'founder effect', consanguinity, areal effects, and genetic drift may all have played a part. It is interesting that porotic hyperostosis is a feature of many of these collections, and one might ask whether or not this was associated with agricultural practice rather than pastoralism. A shift towards arable cultivation might have involved continual depletion of many upland communities as people emigrated to exploit the alluvial sediments which were consolidating at lower altitudes and nearer the coast. This loss of people might explain variations between neighbouring village communities in the upland zone (c.p. Cavalli-Sforza, 1966, 1969), implicating genetic drift as a possibly important mechanism. Perhaps the population had become too large to be sustained by an upland zone economy, hence the small size of the Beni Sid skulls. The Pastora burial does not necessarily argue against this, since it was a 'rich' burial, and its bodies may have been those of a socially well-off group with better-than-normal diet. The incidence of caries, also, might be explained on the basis of a shift to a carbohydrate-rich diet. It seems to the present writer that this kind of interpretation is a more useful way of treating skeletal material than are comparisons with outside populations, although clearly there is much more work to be done, both as regards the populations of cases used here, and the relationship to those of smaller groups and individual

In short, whilst it is not possible to dis-prove the theory that the Argaric population represents an alien and intrusive group of invaders with a distinctive material assemblage, such a theory fails to explain the enormous variation within the montane Valencian-Alicante copper age populations. The most economical and parsimonious working hypothesis for future research is that the Argaric townships represent the normative physical type, maintained homogeneously by means of human mobility within and between the townships. The upland Valencian-Alicante populations represent smaller groups varying perhaps on account of genetic drift as emigration took place to exploit a new agricultural economy in more low-lying areas (and to the Argaric townships too, possibly) (c.p. Cavalli-Sforza on the Po valley villages, towns, and genetic drift in the former), as well as on account of consanguinity (Hulse, 1957, on Swiss villages, for example), founder effect, dietetic factors and perhaps an area effect. In other words, the variation observed can be satisfactorily explained in terms of what is known about the archaeological processes of cultural development within southeastern Spain and known genetic mechanisms and environmental effects on physical development, without the need to implicate the deus ex machina of invaders of different physical type. It has earlier been argued that such invaders are not necessary either to explain the Argaric cultural assemblages. However, none of this can exclude the possibility of such invaders. It merely seems that they are not at present necessary or useful concepts for the interpretation of either the archaeology or physical anthropology of the period and region, nor are they the most parsimonious assumption on which to erect the most economical working hypothesis to which it is proposed further research might profitably be directed if priorities have to be selected.

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