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ABSTRACT

THE MONUMENTAL ARCHITECTURE OF THE CYCLADES IN THE CLASSICAL AND HELLENISTIC PERIODS

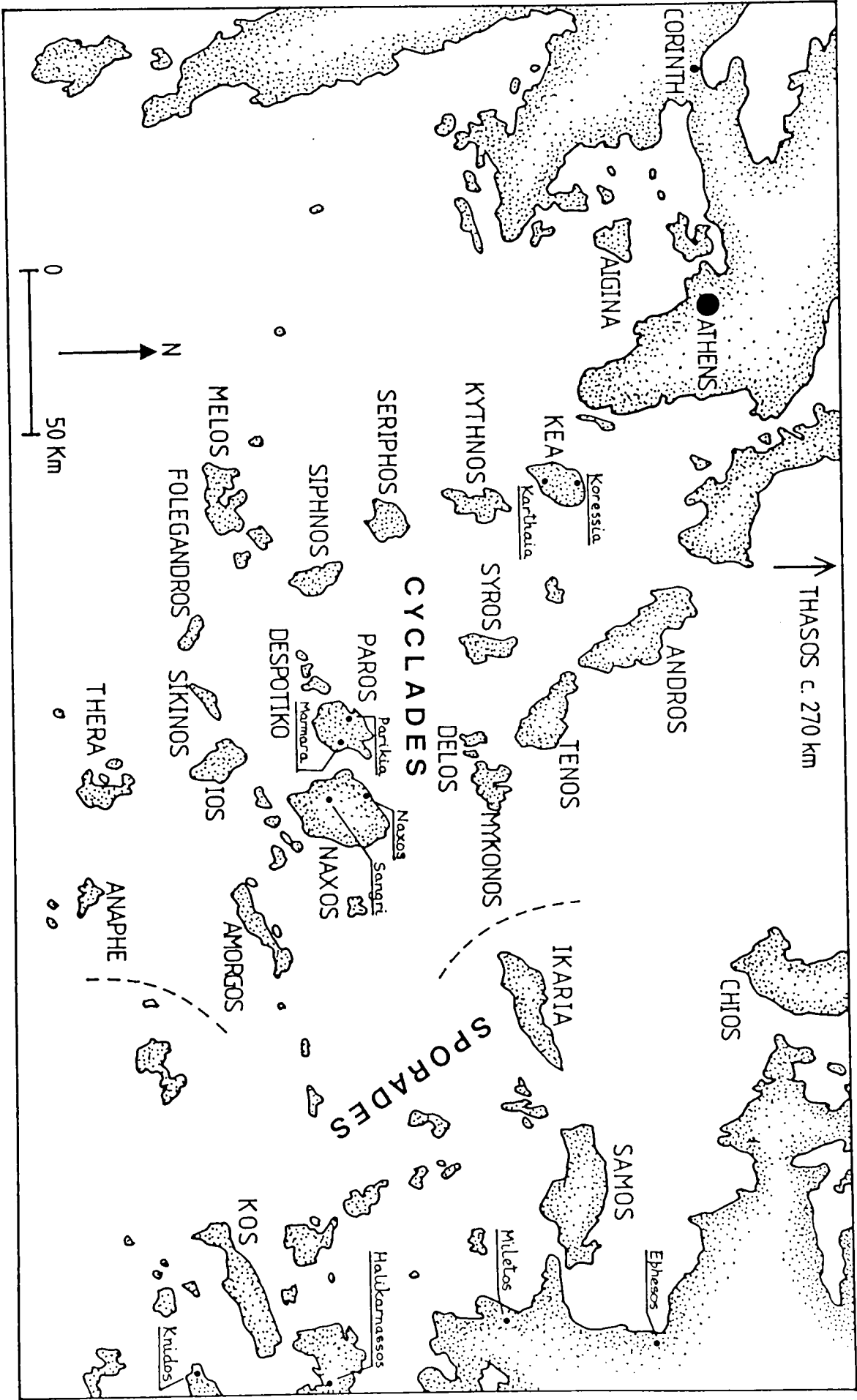
The aim of this study is to establish the existence of a distinct regional architecture on the Cycladic islands during the Classical and Hellenistic periods. It presents a record of materials and of certain constructional techniques, proportions and forms of Cycladic monumental architecture, from which it is possible to establish and explain the differences and similarities of Cycladic practice with other Greek architectural traditions. It is based on a close examination of all the known major buildings and many fortifications on the Cyclades and Thasos, a colony of Paros with certain similar architectural traits.

The first section of the thesis (Chapters 2-4) treats the principal constructional techniques, with separate detailed examinations of the various materials employed, the types and nature of foundation, euthynteria and wall construction. The materials available to the builders played a major part in the nature of these parts, all of which display a pronounced conservatism in technique despite strong influences from outside the archipelago. The second section (Chapters 5-6) looks at a number of significant proportions within Doric colonnades and entablatures, principally outlining the Cycladic tendency for slender columns and a less well established tendency for relatively low architraves throughout the Archaic, Classical and Hellenistic periods; accompanying tables and graphs detail and illustrate the proportions discussed. The final section (Chapters 7-8) studies two particular architectural forms – the tops of triglyphs and Ionic capitals; in the former, particular regional preferences of form are noted, while in the latter there are both conservative and innovative tendencies, as well as strong outside influences.

There emerges from this study a local architecture that is conservative in many aspects of its architecture while being receptive to outside influences and even having a certain notable originality of its own.

Appendix 1 lists many of the typical traits of essentially Archaic Cycladic architecture, some of which continue into the Classical period. Appendix 2 includes graphs detailing the effect of lower column diameter and column height upon column slenderness. A Catalogue of the Classical and Hellenistic Cycladic and Thasian monuments, together with their bibliography, is included at the end of Volume I.

THE CYCLADES

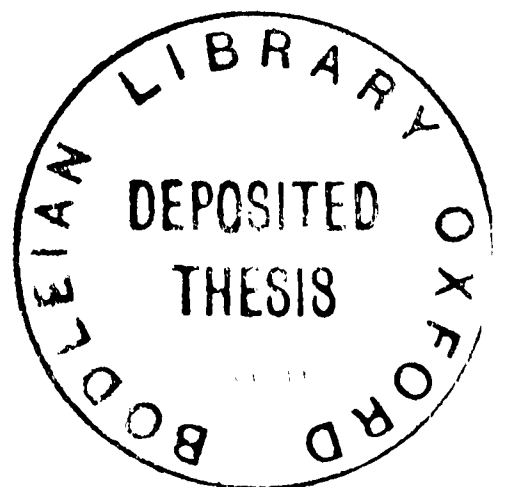


**THE MONUMENTAL ARCHITECTURE
OF THE CYCLADES
IN THE
CLASSICAL AND HELLENISTIC PERIODS**

~ VOLUME I ~

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ABBREVIATIONS

A. BIBLIOGRAPHICAL

<u>AA</u>	<u>Archäologischer Anzeiger.</u>
<u>AA</u> , 1968, pp.693-717	G. Gruben, W. Koenigs, 'Der "Hekatompedos" von Naxos', <u>AA</u> , 1968, pp.693-717.
<u>AA</u> , 1970, pp.135-153	G. Gruben, W. Koenigs, 'Der "Hekatompedos" von Naxos und der Burgtempel von Paros', <u>AA</u> , 1970, pp.135-153.
<u>AA</u> , 1972, pp.319-379	G. Gruben, 'Naxos und Paros', <u>AA</u> , 1972, pp.319-379.
<u>AA</u> , 1972, pp.421-430	H. Fastje, 'Der Rundbau von Paros', <u>AA</u> , 1972, pp.421-430.
<u>AA</u> , 1978, pp.333-342	A. Ohnesorg, 'Ein parisches Marmordach', <u>AA</u> , 1978, pp.333-342.
<u>AA</u> , 1978, pp.375-384	W. Koenigs, 'Dorische Hallenanlagen auf Paros', <u>AA</u> , 1978, pp.375-384.
<u>AA</u> , 1982, pp.159-195	G. Gruben, 'Naxos und Paros: I. Archaische Bauten', <u>AA</u> , 1982, pp.159-195.
<u>AA</u> , 1982, pp.197-229	G. Gruben, 'Der Burgtempel A von Paros', <u>AA</u> , 1982, pp.197-229.
<u>AA</u> , 1982, pp.231-244	M. Schuller, 'Der Artemis Tempel im Delion auf Paros', <u>AA</u> , 1982, pp.231-244.
<u>AA</u> , 1982, pp.245-264	M. Schuller, 'Der dorische Tempel des Apollon Pythios auf Paros', <u>AA</u> , 1982, pp.245-264.
<u>AA</u> , 1982, pp.265-270	K. Schnieringer, 'Der dorische Tempel bei Marmara auf Paros', <u>AA</u> , 1982, pp.265-270.
<u>AA</u> , 1982, pp.271-290	A. Ohnesorg, 'Der dorische Prostylos des Archilocheion auf Paros', <u>AA</u> , 1982, pp.271-290.
<u>AA</u> , 1982, pp.621-689	G. Gruben, 'Naxos und Paros II: Klassische und hellenistische Bauten auf Paros', <u>AA</u> , 1982, pp.621-689.
<u>AA</u> , 1987, pp.569-621	V. Lambrinoudakis, G. Gruben, 'Das neuentdeckte Heiligtum von Iria auf Naxos', <u>AA</u> , 1987, pp.569-621.
<u>ADelt</u>	' <u>Αρχαιολογικὸν Δελτίον.</u>
<u>AE</u>	' <u>Αρχαιολογικὴ Ἐφημερίς.</u>
<u>Aegae</u>	R. Bohn, C. Schuchhardt, <u>Altertümer von Aegae</u> , (Berlin, 1889).
<u>AHHD</u>	R. Vallois, <u>L'Architecture hellénique et hellénistique à Délos jusqu'à l'éviction des Déliens (166 av. J.-C.).</u>
-- <u>AHHD</u> , I	<i>ibid.</i> , (Paris, 1944).
-- <u>AHHD</u> , II.i	<u>AHHD: Grammaire historique de l'architecture délienne</u> , pp.1-292, (Paris, 1966).
-- <u>AHHD</u> , II.ii	<u>AHHD: Grammaire historique de l'architecture délienne</u> , pp.293-627, (Paris, 1978).
<u>AJA</u>	<u>American Journal of Archaeology.</u>
Alzinger, <u>JOAI</u>	W. Alzinger, 'Von der Archaik zur Klassik. Zur Entwicklung des ionischen Kapitells in Kleinasien während des fünften Jahrhunderts v. Chr.', <u>JOAI</u> , 50, 1972-75, pp.169-211.
<u>AntJ</u>	<u>Antiquaries' Journal.</u>
<u>Aphaia</u>	H. Bankel, <u>Der spätarchaische Tempel der Aphaia auf Aegina</u> , (Berlin, 1993).
Ashton, <u>SiphTwrs</u>	N. G. Ashton, <u>Siphnos, Ancient Towers B.C.</u> , (Athens, 1991).
<u>Assos</u>	F. H. Bacon, J. T. Clark, R. Koldewey, <u>Investigations at Assos 1881-1883</u> , (Cambridge, Mass., 1902-21).

<u>AM</u>	<u>Mitteilungen des deutschen archäologischen Instituts, Athenische Abteilung.</u>
<u>Bassitas, IV</u>	F.A.Cooper, <u>The Temple of Apollo Bassitas, IV, folio drawings</u> , (Princeton, 1992).
<u>Bingöl</u>	O. Bingöl, <u>Das ionische Normalkapitell in hellenistischer und römischer Zeit in Kleinasien</u> , (Tübingen, 1980).
<u>BCH</u>	<u>Bulletin de correspondance hellénique.</u>
<u>Bouras</u>	Ch. Bouras, <u>'Η 'Αναστήλωσις τῆς στοᾶς τῆς Βραυρῶνος</u> , (Athens, 1967).
<u>Bruneau, CDH</u>	Ph. Bruneau, <u>Recherches sur les cultes de Délos à l'époque hellénistique et à l'époque impériale</u> , (Paris, 1970).
<u>BSA</u>	<u>Annual of the British School of Archaeology at Athens.</u>
<u>Büsing-Kolbe, 'Türen'</u>	A. Büsing-Kolbe, 'Frühe griechische Türen', <u>JdI</u> , 93, 1978, pp.66-174.
<u>CAD</u>	R. Vallois, <u>Les Constructions antiques de Délos: Documents</u> , (Paris, 1953).
<u>Chron.</u>	<u>Chronique des fouilles, as published in BCH.</u>
<u>Corinth</u>	<u>Corinth, Results of Excavations conducted by the American School of Classical Studies at Athens</u> , (Cambridge, Mass., 1932 -).
-- <u>Corinth, XIV</u>	C. Roebuck, <u>The Asklepieion and Lerna</u> , (Princeton, 1951).
<u>Coulton, Architects</u>	J. J. Coulton, <u>Ancient Greek Architects at Work: Problems of Structure and Design</u> , (Oxford, 1988).
<u>Coulton, BSA, 1968</u>	J. J. Coulton, 'The Stoa at the Amphiaraion at Oropos', <u>BSA</u> , 63, 1968, pp.147-183.
<u>Coulton, BSA, 1973</u>	J. J. Coulton, 'The Columns and Roof of the South Stoa at the Argive Heraion', <u>BSA</u> , 68, 1973, pp.65-85.
<u>Coulton, BSA, 1975</u>	J. J. Coulton, 'Towards Understanding Greek Temple Design: General Considerations', <u>BSA</u> , 70, 1975, pp.59-99.
<u>Coulton, ParthKong</u>	J. J. Coulton, 'The Parthenon and Periklean Doric', <u>Parthenon Kongress</u> , (Basel, 1982).
<u>Coulton, Stoas</u>	J. J. Coulton, <u>The Architectural Development of the Greek Stoa</u> , (Oxford , 1977).
<u>CRAI</u>	<u>Comptes rendus de l'Académie des Inscriptions et Belles-Lettres.</u>
<u>Dictionnaire</u>	<u>Dictionnaire méthodique de l'architecture grecque et romaine.</u>
-- <u>Dictionnaire, I</u>	R. Ginouvès, R.Martin, <u>Matériaux, techniques de construction, techniques et formes du décor</u> , (Athens, Rome, 1985).
-- <u>Dictionnaire, II</u>	R. Ginouvès, <u>Eléments constructifs: supports, couvertures, aménagements intérieurs</u> , (Athens, Rome, 1992).
<u>Didyma</u>	T. Wiegand, <u>Didyma</u> .
-- <u>Didyma, I</u>	H. Knackfuss, <u>Die Baubeschreibung</u> , (Berlin, 1941).
<u>Dinsmoor, AAG</u>	W. J. B. Dinsmoor, <u>The Architecture of Ancient Greece</u> , (London, 1950).
<u>EAD</u>	École française d'Athènes, <u>Exploration archéologique de Délos</u> , (Paris, 1909 -).
-- <u>EAD, II.i</u>	G. Leroux, <u>La Salle hypostyle</u> , (Paris, 1909).
-- <u>EAD, II.ii</u>	R. Vallois, G. Poulsen, <u>Nouvelles recherches sur la salle hypostyle</u> , (Paris, 1914).
-- <u>EAD, IV</u>	L. Cayeux, <u>Description physique de l'île de Délos</u> , (Paris, 1911).
-- <u>EAD, V</u>	F. Courby, <u>Le Portique d'Antigone ou du nord-est et les constructions voisines</u> , (Paris, 1912).
-- <u>EAD, VI</u>	Ch. Picard, <u>L'Établissement des Poseidoniastes de Bérytos</u> , (Paris, 1921).

-- <u>EAD</u> , VII.i	R. Vallois, <u>Le Portique de Philippe</u> , (Paris, 1923).
-- <u>EAD</u> , VIII	J. Chamonard, <u>Le Quartier du théâtre</u> , (Paris, 1922-24) <i>in 3 vols.</i>
-- <u>EAD</u> , XI	A. Plassart, <u>Les Sanctuaires et les cultes du Mont Cynthe</u> , (Paris, 1928).
-- <u>EAD</u> , XII	F. Courby, <u>Les Temples d'Apollon</u> , (Paris, 1931).
-- <u>EAD</u> , XVI	F. Chapouthier, <u>Le Sanctuaire des dieux de Samothrace</u> , (Paris, 1935).
-- <u>EAD</u> , XIX	Ét. Lapalus, <u>L'Agora des Italiens</u> , (Paris, 1939).
-- <u>EAD</u> , XX	F. Robert, <u>Trois sanctuaires sur le rivage occidental</u> , (Paris, 1952).
-- <u>EAD</u> , XXII	E. Will, <u>Le Dôdékathéon</u> , (Paris, 1955).
-- <u>EAD</u> , XXIV	H. Gallet de Santerre, <u>La Terrasse des lions, le Létoon, le monument de granit</u> , (Paris, 1959).
-- <u>EAD</u> , XXV	J. Delorme, <u>Les Palestres</u> , (Paris, 1961).
-- <u>EAD</u> , XXVII	Ph. Bruneau <i>et al.</i> , <u>L'Îlot de la Maison des comédiens</u> , (Paris, 1970).
-- <u>EAD</u> , XXVIII	J. Audiat, <u>Le Gymnase</u> , (Paris, 1970).
-- <u>EAD</u> , XXXII	M.-Chr. Hellmann, Ph. Fraisse, <u>Le Monument aux hexagones et le portique des Naxiens</u> , (Paris, 1979).
-- <u>EAD</u> , XXXIII	P. Courbin, <u>L'Oikos des Naxiens</u> , (Paris, 1980).
-- <u>EAD</u> , XXXV	E. Will, <u>Le Sanctuaire de la déesse syrienne</u> , (Paris, 1985).
<u>Eleusis</u>	F. Noack, <u>Eleusis. Die baugeschichtliche Entwicklung des Heiligtumes</u> , (Berlin, 1927).
<u>Eretria</u> , V	P. Auberson, 'Le Temple de Dionysos' in <u>École suisse d'archéologie en Grèce, Eretria, Fouilles et recherches</u> , V, (Bern, 1976).
<u>Ergon</u>	<u>Ἔργον τῆς ἐν Ἀθῆναις Ἀρχαιολογικῆς Ἐταιρείας</u> .
<u>ET</u>	École française d'Athènes, <u>Études thasiennes</u> , (1944 -).
-- <u>ET</u> , I	M. Launey, <u>Le Sanctuaire et le culte d'Héracles à Thasos</u> , (Paris, 1944).
-- <u>ET</u> , VI	R. Martin, <u>L'Agora I</u> , (Paris, 1959).
-- <u>ET</u> , IX	<u>Alikī</u> , I: J. Servais, <u>Les Deux sanctuaires</u> , and J.-P. Sodini, A. Lambraki, T. Koželj, <u>Les Carrières de marbre à l'époque paléochrétienne</u> , (Paris, 1980).
-- <u>ET</u> , XII	Y. Grandjean, <u>Recherches sur l'habitat thasien à l'époque grecque</u> , (Paris, 1988).
<u>ÉtDél</u>	<u>BCH</u> , <u>Supplément I: Études déliennes publiées à l'occasion du centième anniversaire des fouilles de l'École française d'Athènes à Délos</u> , (Paris, 1973).
<u>FD</u>	École française d'Athènes, <u>Fouilles de Delphes</u> , (1908 -).
-- <u>FD</u> , Colonne	P. Amandry, <u>La Colonne des Naxiens et le portique des Athéniens</u> , (Paris, 1953).
-- <u>FD</u> , Temple	F. Courby, <u>La Terrasse du temple</u> , (Paris, 1927).
-- <u>FD</u> , TerrAtt	G. Roux, <u>La Terrasse d'Attale I^{er}</u> , (Paris, 1987).
-- <u>FD</u> , Tholos	J. Charbonneaux, <u>La Tholos; Le Sanctuaire d'Athéna Pronaia</u> , (Paris, 1925).
-- <u>FD</u> , TmpCalc	J.-P. Michaud, <u>Le Temple en calcaire</u> , (Paris, 1977).
-- <u>FD</u> , TrAth	J. Audiat, <u>Le Trésor des Athéniens</u> , (Paris, 1933).
-- <u>FD</u> , TrCyr	J. Bousquet, <u>Le Trésor de Cyrène</u> , (Paris, 1952).
-- <u>FD</u> , TrSiph	G. Daux, E. Hansen, <u>Le Trésor de Siphnos</u> , (Paris, 1987).

Ginouvès, <u>Macedonia</u>	<u>Macedonia: from Philip II to the Roman conquest</u> , edited by R.Ginouvès, (Princeton, 1994).
<u>GD</u>	P. Bruneau, J. Ducat, <u>Guide de Délos</u> ³ , (Paris, 1983).
Gossel, <u>MakKamm</u>	B. Gossel, <u>Makedonische Kammergäber</u> , (Berlin, 1980).
Graindor, 'Kykladika'	P. Graindor, 'Kykladika', <u>Musée Belge</u> , 25, 1921, pp.79-108.
Gruben, <u>MüJb</u>	G. Gruben, 'Kykladische Architektur', <u>Münchner Jahrbuch der bildende Kunst</u> , 23, 1972, pp.7-36.
<u>GT</u>	École française d'Athènes, <u>Guide de Thasos</u> ² , (Paris, 1968).
Hellmann, <u>InscripDél</u>	M.-C. Hellmann, <u>Recherches sur le vocabulaire de l'architecture grecque, d'après les inscriptions de Délos</u> , (Paris, 1992).
<u>ICCA</u> , XII	<u>Πρακτικά του XII Διεθνούς συνεδρίου Κλασικής αρχαιολογίας, Αθήνα 4-10 Σεπτεμβρίου 1983</u> , IV, (Athens, 1988).
<u>ID</u>	F. Dürrbach <i>et al.</i> , <u>Inscriptions de Délos</u> , (1926 -).
<u>IG</u>	Academia Literarum Regiae Borussicae, <u>Inscriptiones Graecae</u> , (1873 -).
<u>IG</u> ²	Academia Literarum Borussicae, <u>Inscriptiones Graecae</u> , (editio minor, 1924 -).
<u>Inselwelt</u>	A. Philippson, <u>Beiträge zur Kenntnis der griechischen Inselwelt</u> , (Gotha, 1901).
<u>IstMitt</u>	<u>Istanbuler Mitteilungen</u> .
<u>JdI</u>	<u>Jahrbuch des deutschen archäologischen Instituts</u> .
<u>JHS</u>	<u>Journal of Hellenic Studies</u> .
<u>JOAI</u>	<u>Jahreshefte des oesterreichischen archäologischen Instituts</u>
Kirchhoff	W. Kirchhoff, <u>Die Entwicklung des ionischen Volutekapitells im 6. und 5. Jhd. und seine Entstehung</u> , (Bonn, 1988).
Koldewey-Puchstein	R. Koldewey, O. Puchstein, <u>Die griechischen Tempel in Unteritalien und Sizilien</u> , (Berlin, 1899).
<u>Kos</u>	R. Herzog <i>et al.</i> , <u>Kos; Ergebnisse der deutschen Ausgrabungen und Forschungen</u> , 1, (Berlin, 1932).
Krauss, <u>Athenatempel</u>	F. Krauss, <u>Die Tempel von Paestum</u> , I.1: <u>der Athenatempel</u> , (Berlin, 1959).
Lauter, 'Koressia'	H. Lauter, 'Bemerkungen zum archaischen Tempel von Koressia', <u>AA</u> , 1979, pp.6-16.
Lawrence, <u>GkArch</u> ³	A. W. Lawrence, <u>Greek Architecture</u> , (3 rd ed., Hardmondsworth, 1973).
<u>Lindos</u>	C. Blinkenberg <i>et al.</i> , <u>Lindos, Fouilles es recherches</u> .
-- <u>Lindos</u> , III	E. Dyggve, <u>Le Sanctuaire d'Athéna Lindia et l'architecture lindienne</u> , (Berlin and Copenhagen, 1960) <i>in 2 vols.</i>
Mace	H. L. Mace, <u>The Archaic Ionic Capital: Studies in Formal and Stylistic Development</u> , (PhD, 1978; Ann Arbor microfilm, 1980).
Martin, 'ChapAsclép'	R. Martin, 'Chapiteaux ioniques de l'Asclépiéion d'Athènes', <u>BCH</u> , 68-69, 1944-45, pp.340-374.
Martin, 'ChapDél'	R. Martin, 'Compléments à l'étude des chapiteaux ioniques de Délos', <u>ÉtDél</u> , pp.371-398.
Martin, 'ChapThas'	R. Martin, 'Chapiteaux ioniques de Thasos', <u>BCH</u> , 96, 1972, pp.303-325.
Martin, <u>Manuel</u>	R. Martin, <u>Manuel d'architecture grecque</u> , I: <u>Matériaux et techniques</u> , (Paris, 1965).

Martin, <u>Thasiaca</u>	R. Martin, 'Technique et chronologie des constructions thasiennes', <u>BCH</u> , Supplément V: <u>Thasiaca</u> , (1979), pp.169-189.
<u>Maussolleion</u>	K. Jeppesen, <i>et al.</i> , <u>The Maussolleion at Halikarnassos</u> , I: <u>The Sacrificial Deposit</u> , (Copenhagen, 1981).
<u>Megalopolis</u>	E. A. Gardner, R. W. Schultz <i>et al.</i> , <u>Excavations at Megalopolis, 1890-1891</u> , (Suppl. Papers for Society of Promotion of Hellenic Studies, I), (London, 1892).
<u>MetMusSt</u>	<u>Metropolitan Museum Studies</u> .
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INTRODUCTION

The architecture of the Cyclades from the Bronze Age to the Archaic period is characterised by a certain uniqueness in its materials, techniques and forms. Architecturally, the Geometric buildings on the Cyclades differ from those in the rest of Greece primarily by their use of stone rather than mud-brick, whilst the Archaic period sees the formation of a distinct 'Island style' in building-types and forms, as well as the innovative and daring use of stone in place of wood or terracotta. Similarly, the Cycladic architecture of the Classical and Hellenistic periods, although influenced by that of neighbouring areas, retains a strong regional identity.

Topography and Resources

The Cyclades, lying in the centre of the Aegean, comprise the group of islands that form a circle – κύκλος, whence they derive their name – around the small, sacred isle of Delos.¹ They stand on a relatively shallow submarine platform which is separated by deeper channels from the islands to the east (Ikaria, Samos) and south (the Dodecanese, Crete) and, in this sense at least, are a distinct group. The largest Cycladic islands are: Amorgos, Andros, Ios, Kea (also known as Keos), Kythnos, Melos, Mykonos, Naxos, Paros, Seriphos, Siphnos, Syros, Tenos and Thera (Santorini). Delos is a small rocky isle which probably would have remained insignificant had it not been believed to have been the birthplace of Apollo and Artemis; this belief led to the establishment of a major sanctuary and oracle on the island.

The physical character of the Cyclades differs a good deal from island to island. In size, they range from Delos – not quite the smallest – with an area of $5\frac{3}{4}$ square kilometres, to Naxos with an area of 440 square kilometres. In spite of miles of high and rocky coastline, there are some sizeable stretches of coastal plain where the land is often flat and fertile. Inland, the Cyclades are always mountainous but they vary in the extent to which the barren heights are alleviated by zones of flat land.

These islands are often dismissed as poor and unproductive, but this is not always the case. Andros, exposed by its situation to westerly winds has running water

¹ Strabo, *Geography*, X, 5, 3; Pliny, *Natural History*, IV, 22.

for most of the year (hence its early name of '*Hydroussa*') and is thickly wooded with olive, cypress, mulberry, oak and unusually pine; Naxos has several substantial agricultural plains and abounds with olives and oaks in its rugged interior; and Kea, today full of oaks and almonds, was productive enough in antiquity to support four independent *poleis*.² Despite the archipelago being probably quite denuded of forests by the fourth century,³ the Cyclades would appear to have been self-sufficient in staple foods (although Delos had to import large amounts of grain and even fire-wood).⁴

Other natural resources were also exploited: the metalliferous ores found on many of the islands – the gold and silver mines of Siphnos being near-legendary;⁵ obsidian and emery from Melos; *miltos* (red ochre) used in vase-painting and architecture from Kea; and, of course, the high quality marbles of Naxos and Paros which were widely exported.

History

Since the architectural developments of the Cyclades broadly follow the political and economic fortunes of the archipelago, it is appropriate here to give a brief outline of the main historical developments.

During the Archaic period Delos became the religious centre and symbolic capital of an Ionian thalassocracy called the 'Delian Amphictyony' which was at first dominated by the Naxians, who built there several important buildings, as well as dedicating a large number of sculptures. It was on Naxos that the tyrant Lygdamis gained power sometime after 540 B.C. and it was probably due to his wealth and power that the two largest temples in the Cyclades – the peripteral Temple of Apollo on Naxos and the (amphi?) prostyle 'Town Temple A' on Paros – were erected. At these Ionic temples the Cycladic innovations and peculiarities in constructional techniques, architectural plan and architectural forms, all of which had developed during the course of the sixth century, were given one of their grandest expressions.

² Virgil, *Georgics*, I, 14 mentions Kea's *pinguia dumeta* – 'rich thickets'.

³ *Kritias*, 111, c – comparing the physiology of the 'small islands of the Aegean' to the increasingly timber-stripped Attica.

⁴ Reger, *Economy*, pp.109, 125-130, 141-145.

⁵ For their 'disappearance' as much for the wealth generated; the prosperity of Siphnos seems to have come to an end in the decades around 400 B.C. Cf. Ashton, *SiphTwrs*, pp.12-20.

The end of the Persian Wars saw the liberation of the Cyclades from their Asian overlords by the Athenians and the establishment of the 'Delian League', a maritime alliance under the Athenians with its seat and treasury on Delos. However, Athens was the dominant partner in the League, assuming control of the Delian sanctuary (under an Amphictyony) and exacting tribute from, and exerting political pressure on, all of the Cyclades. Resistance and disloyalty to the Athenian state were severely punished, as several of the islands discovered: Paros, having maintained a neutral stance in the Persian Wars, was immediately afterwards besieged by Themistokles and had to surrender; Naxos tried to withdraw from the League around 470 but without success, resulting in the imposition by Athens of a 'cleruchy' or garrison colony on the island; whilst later, and most infamously, Melos having declared itself neutral at the outbreak of the Peloponnesian war, paid a terrible price in lives after succumbing to Athenian attacks in 416/5. The transfer of the League's Treasury from Delos to Athens in 454/3 ended any pretence over the nature of this 'alliance'.

The final defeat of Athens at the end of the Peloponnesian War, in 404 B.C., brought about the dissolution of the League. For some years the Cyclades seem to have regained control over their own affairs but the rapid recovery of Athens allowed her to reconstitute the League in 377 B.C., although the terms of this alliance were now less harsh in the amount of tribute paid.

In 314 B.C. Delos was freed from Athenian control by the fleets of Antigonos Monophthalmos and his son Demetrios Poliorketes; the following year the other Cycladic islands were brought into the new alliance – the Nesiotic, or Island, Confederacy. This alliance was usually subordinate to, or at least recognised the authority of, some greater non-Aegean power to which contributions were paid; initially this was the Antigonids until around 285 B.C. when control passed to the Ptolemies who held on until *c.* 260 B.C. However, control must have been less obtrusive than that of the Athenians, given that it was entrusted, in the first instance to local polis governments and then to the Confederacy which was composed of locals. Neither of these sets of outside powers or *hegemones* 'did anything to integrate the Cyclades into their kingdoms; if anything their leagues [*i.e.* the Confederacy]

reinforced the political isolation of the islands'.⁶ Their control of the Cyclades seems to have been not so much imperialistic as strategic, the islands serving as military bases from which to operate. After the Ptolemaic naval defeat by Antigonos Gonatas off Andros in 246/5, the Cyclades slipped into a political vacuum for several decades during which the Nesiotic Confederacy disintegrated (although the Ptolemies continued to maintain their base of Thera). From 245 until the end of that century it would appear that the Cyclades were genuinely free and independent, the large-scale Macedonian dedications on Delos not *necessarily* indicating political control.

This half-century of Cycladic independence corresponds with the beginnings of a period of economic prosperity: the absence of a controlling power meant that local wealth no longer went out of the islands in tribute, while the wars between the Hellenistic kingdoms in the second half of the third century did not affect the Cyclades adversely. The increased local prosperity generated more inter-island trade which naturally used Delos – already the geographic, religious and Confederacy centre – as the Cycladic redistribution centre. The resulting growth in the transit trade through Delos naturally strengthened the economy of Delos itself which is reflected not only in the rising prices of certain basic goods (indicating either demand or the increased taxation levied by the Sanctuary cashing in on the prosperity, or both), but also in increased building activity including the renovation of the harbour, and the presence of foreign financiers. Estimates of the Delian population in this period range from 3,000 - 9,000.⁷ The Cyclades in the second half of the third century and continuing up to the middle of the second century appear to be a largely self sufficient, regional economic unit.⁸

The Second Macedonian War (200-197) again saw great powers active in the Aegean. Rhodian and Pergamene allied forces drove Philip V out of the area with the result that Pergamon was granted the possession of Andros (which had been garrisoned by Philip), while Rhodes assumed control of many of the other islands, establishing a new Nesiotic Confederacy, under the direct control of Rhodian officials, with its seat and its naval base at Tenos. However, unlike in the Rhodian Peraia or in other

⁶ Cf. Reger, *Economy*, pp.15-47 (quote: p.33; my brackets).

⁷ *Ibid.*, p.84.

⁸ Cf. *ibid.*, pp.52-55, 249-264.

possessions the Rhodians did not demand tribute.

In 167/6, after the war between Rome and Perseus, Delos came under the suzerainty of the Roman Senate who ceded it to the Athenians with the proviso that the harbour be administered as a free-port.⁹ Shortly afterwards the Delian inhabitants were expelled from the island and Athenian colonists were installed; this was the period of the Second Athenian Domination which lasted until the bloody assault by the forces of King Mithridates VI of Pontus in 88 and the pirate attacks of 69 which drove away almost everyone. In between, Delos became the central exchange-point of the trade route between Rome and the East. The Athenian cleruchs were soon outnumbered by financiers and traders from Italy and many widespread parts of the Hellenistic world, the island's population reaching an estimated 20,000 - 30,000 residents at its peak in the decades around 100 B.C.¹⁰ This naturally resulted in the increased architectural activity – commercial, social, religious, and domestic – which is so evident on Delos at this time. The rest of the Cyclades, also under Roman control during this period, perhaps would have also benefitted from the heightened level of trading activity around the archipelago; certainly Tenos saw renewed architectural construction. The Hellenistic period on the Cyclades draws to a close though, as on Delos, with the Mithridatic and pirate raids of 88 and 69 B.C.

Past Studies and Present Aims

Many studies of Greek architecture assume that local practice always followed Classical Athenian tradition. Although the influence of Athens, especially in style, should not be underestimated, monumental building in other parts of Greece was also affected by local tradition, and by the limitations imposed by material and technical considerations. Certain studies have focused on so-called 'provincial' architecture, of which two in particular have been very influential. Georges Roux in a stylistic study of the architecture of the Argolid has shown that in the fourth and third centuries Peloponnesian builders adopted a unified, distinctive architectural style, and Stella Miller in her 1970 dissertation identified a Macedonian style of architecture that was

⁹ This creation of a duty-free zone was perhaps a Roman attempt to punish Rhodes for her lukewarm support during the war. Cf. D. V. Sippel, 'A Reward for Athens, A Punishment for Rhodes?', *Ancient World*, 12, 1985, pp. 97-104 (against this theory, with full prior references).

¹⁰ Cf. Rauh, *Sacred Bonds*, pp.22-29; (41-68 on trade).

innovative in its eclectism.¹¹

The architecture of the Cyclades in historical times is, of course, not a new subject of study. Since the end of the last century members of the *École française d'Athènes* have been steadily excavating and publishing the monuments and houses of Delos, and over the last twenty years a number of German scholars from the *Technische Universität* at Munich, working on Naxos and Paros, have established the sixth-century origins of monumental marble architecture on the Cyclades as well as reconstructing a number of fourth-century Parian buildings from *disjecta membra*. Other sites and buildings on many of the other islands have also been excavated and studied, most notably on Andros, Kea, Tenos, and Thera. The systematic study of Delian architecture by R. Vallois (*L'Architecture hellénique et hellénistique à Délos*) remains a major source of information on many architectural forms of both previously published and unpublished buildings and unattributed architectural pieces. However, not only is this work, of course, limited to Delos, but it is also uneven in its treatment, being very dense and laboured in parts and then quite selective and summary in others, especially in regard to the aspects of architecture treated in the following chapters of this thesis; furthermore, it stops at the end of the period of Delian Independence in 166 B.C.

In contrast, this thesis draws upon information from all of the Cycladic islands. There is still a preponderance of Delian evidence largely because the other islands have not been subjected to such extensive excavation, with the exception of Tenos. It examines in considerable detail various aspects of the constructional techniques and the proportions and the forms of the region's architecture during the Classical and Hellenistic periods. The aim of the thesis, by setting the architecture of the archipelago in its geological, historical (including periods of foreign domination and relative independence) and economic context, and by comparing it closely with contemporary architecture in the rest of Greece, is to try to establish whether there was a distinct regional style or even school of architecture in the Cyclades during the period in question. It establishes the degree to which Cycladic architecture drew upon its traditional methods and forms, the extent of innovation shown by the island architects

¹¹ G. Roux, *L'Architecture de l'Argolide aux IV^e et III^e siècles avant J.-C.*, (Paris, 1961), hereafter abbreviated as Roux, *Argolide*; S. G. Miller, *Hellenistic Macedonian Architecture: Its Style and Painted Ornamentation*, (Ph.D. diss., Bryn Mawr, 1971), hereafter abbreviated as Miller, *MacedArch*.

and the extent to which they followed a Hellenistic stylistic *koine*.

The thesis concentrates upon monumental architecture, *i.e.* constructions intended to impress and endure, and likely to display a conscious cultural image. In practice, this embraces nearly all Cycladic buildings and fortifications other than houses and minor votive and dedicatory monuments, although reference is sometimes made to these for purposes of comparison.

The Classical period is taken as *c.* 480-323 B.C., and the Hellenistic period as *c.* 323-69 B.C. The Hellenistic period, however, is mainly represented architecturally by monuments on Delos the construction of which largely reflects the political fortunes of the isle. Thus the following periods are often referred to: Delian Independence, *c.* 314-166, and the Second Athenian Domination, *c.* 166-69; no monuments are known to date from after the Mithridatic raid in 88. Special reference is also made, by way of comparison, to the late Archaic period (*c.* 550-480) when many of the characteristic traits of monumental stone architecture in the Cyclades were established.

In addition to the Cycladic islands, the northern Aegean island of Thasos plays a prominent role in the study. This island was colonised in the first quarter of the seventh century B.C. by settlers from Paros, with the result that certain Thasian architectural traits – particularly in the Archaic period – are similar to those found on the Cyclades; yet its location near Macedonia made it especially prone to influence from that region. Thasos thus provides useful architectural comparisons and contrasts with the Cyclades in the Classical and Hellenistic ages.

Structure of the Study

The thesis falls into three broad sections: constructional techniques, architectural proportions, and architectural forms. Limitation of space and time has allowed for only a number of features to be explored in each section.

The first section treats the principal constructional techniques employed in Cycladic architecture, beginning in Chapter 2 with a detailed examination of the various materials used on the islands, since their nature and availability plays a major role in establishing the general constructional form and technique of the local architecture. Following on from this, the types and method of foundation and euthynteria construction are explored in Chapter 3, while Chapter 4 deals with wall construction, detailing the various types of wall structure and the forms of wall-

jointing, as well as highlighting the notable features of stacked jointing, quoining and wall-plastering.

The second section of the thesis examines a number of significant proportions within Doric colonnades and entablatures: Chapter 5 investigates the proportions of Doric columns on the Cyclades, particularly with reference to their heights and spacing, and outlines a distinct Cycladic tendency for slender columns in the Classical and Hellenistic periods; Chapter 6 examines the proportions of various elements within the Doric entablature, especially the architrave height to frieze height ratio, and notes a less well established tendency for relatively low architraves during these periods. Accompanying tables and graphs detail and illustrate the proportions discussed.

The final section treats two particular architectural forms. Chapter 7 discusses the forms of triglyphs, detailing the changing nature of the treatment of their 'tops' in which certain Cycladic 'preferences' of form can be discerned. Chapter 8 looks at the forms of the Ionic volute capitals on the Cyclades, noting both conservative and innovative tendencies, as well as strong outside influences in their forms.

In conclusion, Chapter 9 brings together the various aspects of Cycladic architecture that have emerged in the preceding chapters, sets them in their historical context and against the architectural influences of other regions.

Appendix 1 lists (with references) many of the typical traits of essentially Archaic architecture on the Cyclades. Appendix 2 includes Graphs A1 and A2 which detail the effects of lower column diameter and column height upon column slenderness.

A Catalogue, including a selective bibliography, of the Classical and Hellenistic monuments on the Cyclades and Thasos is found at the end of this Volume.

Additional Notes

I have not striven for complete consistency in the transliteration of Greek proper names. Many are direct transliterations, but in some cases (guided by personal taste) I have preferred the familiar English form: thus Cyclades, not *Kyklades*, Kea not *Keos*, Athens not *Athenai*.

Where the references to a number of buildings in the text are included in one footnote they are numbered i, ii, iii *etc.* To avoid confusion, when there are more than three monuments mentioned in the text they are also numbered in the same way.

All dates are B.C. unless otherwise specified.

MATERIALS

The materials used in the construction of buildings on the Cyclades depended, to a large extent, on their availability on each island, although of course they could be transported at some extra cost between islands or from further afield. The principal materials used for construction on the Cyclades are the same as in the rest of Greece – stone, clay, wood and metals – although the quantities and varieties employed often differ. This chapter looks at the nature, origins and basic uses of these four major materials, and is divided and sub-divided as follows:

1. Stone: Granite, Gneiss and Schist, Marble, Limestone, Poros and Volcanic rocks;
2. Clay: Mud-brick and Terracotta;
3. Wood;
4. Metals.

STONE

Greek architecture finds its greatest expression in dressed stone. The abundance in Greece of suitable stone for building was an expedient factor in its adoption from the seventh century as a major medium in architecture, whilst the diversity of stone had a strong regional character that was especially apparent in the Cyclades.

The northern and central islands of the Cycladic archipelago are formed largely of crystalline rocks such as granite, gneiss, schist, limestone and marble; however, some of the southern islands in the group, most notably Thera, Melos and Kimolos, also have an overlay of younger volcanic material, such as volcanic breccia and trachyte. It is the northern and central group of islands with which we shall be most concerned, for it is on them that nearly all the known Classical and Hellenistic monuments are located, and from them that the stone was taken for these monuments.

The ancient Greeks did not categorise stones (λίθοι) according to their petrological composition, but sometimes named them after either their general appearance or the places from where they were quarried: *e.g.* λίθος λευκός ('white stone', *i.e.* marble), λίθος μάρμαρος ('sparkling stone', *i.e.* marble); λίθος πεντελικός, λίθος πάριος, ('Pentelic', 'Parian stone', *i.e.* marble), λίθος

αἰγινναῖος ('Aiginetan stone', *i.e.* poros), ἐλευσινιακὸς λίθος ('Eleusinian stone', *i.e.* dark limestone).¹ In the mainly Hellenistic building accounts of Delos, the type of stone is not usually specified, and thus we have no record of what term, if any, may have been applied to gneisses, schists and granites, all common building stones on the Cycladic islands, which we shall now examine in turn to elucidate their specific architectural uses.

GRANITE

Granite, the most abundant rock in the crust of the Earth, is a visibly crystalline, coarse-grained, igneous rock composed primarily of feldspar and quartz, and to a lesser extent of mica (muscovite and biotite). Its physical composition makes it an extremely hard, brittle and durable material, although parallel banding can occur thus providing good cleavage properties along one or several planes. Granites are usually light in colour, grey predominating, but pink, red, yellow and even green hues sometimes occur.²

In ancient Greece granite was not particularly common as a building material, a circumstance linked not just to its hardness, but probably also to the fact that it largely occurs in areas that were uninhabited or sparsely populated in ancient times.³ Granite is naturally present, though, on some of the Cycladic islands, most notably:

- Delos: where there is a wide range of granites; their texture being generally porphyroid, often gneissitic; those with a high content of black mica (muscovite) and amphibole being perhaps the most common (Pl.1).⁴
- Naxos: which has different types of granitic rocks, the largest concentrations being on the western side of the island ('granodiorites') and in the centre-west and north-west

¹ Cf. Orlandos, Matériaux, II, pp.2-13; A. Burford, The Greek Temple Builders at Epidauros, (Liverpool, 1969), pp.169-171; A. Dworakowska, 'Notes on the Terminology for Stones used in Ancient Greece', Archeologia (Poland), 28, 1977, pp.1-18. For 'poros', see pages 22-25.

The Delian accounts of the Classical and Hellenistic periods make numerous references to λίθοι, and from the contextual and archaeological evidence it appears that most of the stones they refer to are of marble: cf. Hellmann, InscripDél, pp.247-249.

² The New Encyclopaedia Britannica, 15th edition, (London, 1974).

³ A. Dworakowska, Quarries in Ancient Greece, (Wrocław, 1975), p.151; for the general use of granite in Greek architecture, cf. Martin, Manuel, pp.125-126.

⁴ EAD, IV, pp.41-87, pl.II (geological map); Inselwelt, p.32. For the use of granite in construction on Delos: cf. EAD, VIII, pp.234-235 (houses); AHHD, II.i, pp.8, 12-15, 20-23, 70-74, 82-84, 98; GD, pp.46-47.

of the isle ('gneiss-granite').⁵

--Tenos: which has a large area of granite in the north-east part of the island.⁶

--Ios: which has 'gneiss-granite' present in the south.⁷

--Mykonos: where the higher mountainous areas are of granite.⁸

Lesser amounts of granite are found on Paros, Seriphos and Anaphe.⁹

It is only on Delos though, where granite is by far the most predominant rock, that it was extensively exploited. From the earliest times the Delian inhabitants would have gathered granite boulders from the rock-fields which are widespread on the island; later these outcrops were more systematically quarried (Pl.2).¹⁰ Yet the stone's hardness and resistance to being chiselled into well-dressed blocks with tight-fitting joints, prevented it from being exclusively used in construction, especially as gneiss – a much easier stone to work – is also present in adequate quantities on the island. Delian granite is mostly brown and grey in colour, although reddish tints and patches occur intermittently.¹¹ Despite claims otherwise, there seems no sufficient reason and certainly no analytical evidence to believe that Cycladic granite (in particular that from Tenos) was either exported to the mainland or even transported between islands.¹²

⁵ R. Dalongeville, J. Renault-Miskovsky, 'Paysages passés et actuels de l' îles de Naxos', in R. Dalongeville, G. Rougemont (eds.), Recherches dans les Cyclades: Résultats des travaux de la RCP 583, (Lyon, 1993), p.12, fig.3 (superseding Inselwelt, pp.71-72, table 4).

⁶ Inselwelt, pp.22-23, table 4.

⁷ Inselwelt, pp.92, 95-96, table 4.

⁸ Inselwelt, pp.30-31.

⁹ i. Inselwelt, pp.64, 68, 71, table 4; ii. *ibid.*, p.57, table 4; iii. *ibid.*, pp.109-111.

¹⁰ EAD, IV, p.234, but A. Dworakowska, Quarries in Ancient Greece, (Wrocław, 1975), p.151 doubts whether Delian granite possesses good cleavage planes. She lists nine granite quarries on Delos (A. Dworakowska, 'Starożytne Kamieniołomy Cyklad' ['Ancient Quarries in the Cyclades'], Archeologia [Poland], 22, 1971, pp.91-93), although the geological map (EAD, IV.i, pl.II) indicates more. Main areas with known quarries are the environs of the Theatre Quarter (some houses are built on the site of the extracted granite, e.g. House of the Masks: cf. J. Chamonard, 'Fouilles à Délos', BCH, 57, 1933, p.101), the slopes of Mount Kynthos, and the Stadium Quarter (Pl.2).

¹¹ Vallois' assertions (AHHD, II.i, p.8) that red or pinkish granite is the main type of granite used on Delos in the Archaic period, while grey granite ('*est-ce le granit gris ... de Tinos?*') only becomes the common type after Delian Independence in 314, appear completely erroneous according to my own examination of the material. Brown, grey and red hues appear with sufficient frequency in all periods for one to assume that no colour preference was ever continuously exercised – if reddish tints appear in a building it is almost certainly due to all the blocks coming from the same 'vein' of rock.

¹² Virlet (in A. Blouet, *et al.*, Expédition scientifique du Morée, II, [Paris, 1831-38], chp. II, p.48) believed that the granite for the columns he saw at Sparta and Megalopolis came from Tenos because '*Tine est le seul lieu de la Grèce où nous ayons rencontré une semblable roche...*'; Vallois (AHHD, II.i, p.8 + n.2) is undecided on the issue – see preceding note.

It is during the Archaic period on the Cyclades that granite comes to be used on a substantial scale for constructional purposes, perhaps because a favourable quality of granite is that large-size blocks are attainable in quarrying, and that they can then be transported and quite roughly handled without breaking.¹³ During this period granite is mainly used as roughly shaped blocks in the foundations of buildings although it is also employed for a number of superstructure walls.¹⁴

As shown in later chapters, in the Classical period granite is almost abandoned as a building material, being replaced by marble and gneiss, although again coming into favour in the Hellenistic age. In this latter period granite is now sometimes dressed into complete rectangular blocks, although very tight right-angled joints are never achieved. In both monumental and domestic contexts, these ashlar are used for foundations, the *antithemata* of steps, the internal core of monuments and bases, stylobates and superstructure walls.¹⁵ However, granite is usually used as rubble in the Hellenistic age, either by itself (usually when the building is very near a source of granite), or, more usually, together with gneiss.¹⁶ Finally, there are two particular uses of granite that occur on Delos in the Hellenistic period: extremely long blocks of the stone are occasionally used as quoins on walls of gneiss;¹⁷ and it is fairly frequently used for column shafts, often monolithic, particularly during the period of the Second Athenian Domination after 166 B.C. (Pl.3).¹⁸

¹³ These qualities were well exploited by the Egyptians who were the first to quarry large amounts of granite for architectural elements and statuary soon after the beginning of the Old Kingdom (c. 2600 B.C.), and who during the 18th and 19th Dynasties (c. 1550 - 1185) produced dozens of huge obelisks, some over 30 m. high, and numerous colossal statues: e.g. Obelisk of Hatshepsut, Karnak, Obelisk of Tuthmosis III, Heliopolis, now in London ('Cleopatra's Needle'); cf. D. Arnold, *Building in Egypt*, (New York, 1991), pp.36-40, 47-52. The Romans, after their conquest of Egypt, also made much use of granite, especially as monolithic pieces: e.g. columns of the Pantheon, Rome. Cycladic monumental sculpture is limited to marble, see page 18, note 33.

¹⁴ E.g. Oikos of the Naxians on Delos (late 7th C.) - the orthostates are c. 1.50 m. long x 0.80 m. high, one block exceeding 2 m. in length: *EAD*, XXXIII, pp.19-24, pls.38-40; Temple (of Dionysos?) at Iria on Naxos (c. 580-550): *AA*, 1987, p.591, fig.33; G. Gruben, 'Anfänge des Monumentalbaus auf Naxos', in A. Hoffmann, *et al.* (eds.), *Bautechnik der Antike: Internationales Kolloquium in Berlin...1990*, (Mainz am Rhein, 1991), p.64, fig.2.

¹⁵ See Chapter 3 (foundations) and Chapter 4 (walls).

¹⁶ See pages 47-48, 106-109.

¹⁷ See page 114.

¹⁸ E.g. Theatre Quarter: House of Granite Columns (VI N) and House of the Masks - peristyles; Palaestra of Granite - peristyle and northern portico; Stadium Quarter, western road portico. Cf. *AHHD*, II.i, p.98.

GNEISS and SCHIST

Gneisses and schists are the most common natural rocks on the Cyclades.

-- **Gneiss** is a medium to coarse-grained metamorphic rock that has distinct parallel banding, and which is relatively easy to split (Pls.4-5). It is formed principally from quartz and feldspar, together with lesser quantities of various minerals including mica and hornblende. Its well-developed parallel banding or foliation (which distinguishes the rock from mineralogically-similar granite) is due usually to the differing proportions of minerals in the bands or even due to the various grain sizes of the same minerals; the quartz and feldspar bands often alternate with those of mica and amphibole. 'Mica-gneisses' are the commonest types of gneiss, often appearing grey or pinkish according to colour of the prevalent feldspar; the parallel arrangement of the mica flakes causes the rock to split more readily in the direction in which the mica plates are disposed (not necessarily the same direction as the banding). However, this fissility, or schistosity, is not so great as in schists or slates, and the split faces are not so smooth as in these latter rocks. Ferro-magnesium minerals result in many gneisses having green, red and brown hues.¹⁹

-- **Schist** is a medium-grained metamorphic rock (Pl.6). Foliation, or banding, is typically poorly developed or absent, but the rock has a highly developed schistosity, easily splitting into layers. Most schists are composed largely of 'platy' minerals, the crystals of which readily assume parallel structures, such as mica, chlorite and talc; feldspar and quartz (which rarely assume platy forms) although present are much less abundant in schist than in gneiss. When the constituent minerals have a parallel or sub-parallel orientation, which is not necessarily the same orientation as the foliation, the rock will split along planes. Schists are usually classified on the basis of their mineralogy, with varietal names that indicate the characteristic mineral present, *e.g.* 'mica-schist' which is in fact one of the commonest forms of schist, grey in colour and easily recognisable owing to its glistening nature.²⁰

Thus, these two types of rocks are essentially composed of the same minerals but in different quantities, and gneisses may be merely further stages in the crystallization of schists that have been subjected to greater pressures and heat. In

¹⁹ The New Encyclopaedia Britannica, 15th edition, (London, 1974).

²⁰ *Ibid.*

certain areas these two rocks literally blend into each other, resulting in visibly similar rocks, some of which are termed 'gneiss-schists'.²¹ The subtle differences between these varieties of rock have often led to them being either undifferentiated, confused or incorrectly distinguished in the past;²² in this thesis the distinction is made, if known, in reference to a particular building, otherwise in general discussion 'gneiss' is often used to cover schists and the other intermediate forms.

Gneisses and schists, especially mica-schists, occur on virtually every Cycladic island except the volcanic ones in the southern part of the group (Thera, Melos, Kimolos);²³ they are also quite common on the western coast of Asia Minor.²⁴

The tendency of these stones to split away easily from the bedrock, often in large slabs, in the form of quasi-rectangular blocks with level beds and often flat, if sloping, sides, as well as their ability to further splinter into smaller pieces which were then used to create neat piles of stone in the gaps between larger blocks, provided convenient and economical building material. Thus, on the Cyclades, gneisses and schists are the most commonly used building stones from the Bronze Age through to the Hellenistic period.²⁵ The stones were taken from accessible outcrops of rock; many such 'quarries' are still visible today (Pl.7) but no traces of tooling survive owing both to the fact that minimal use of tools was made, picks and wedges being the only necessary aids needed to cleave the rock, and to the fact that subsequent weathering

²¹ E.g. on Kea, cf. E. N. Davis, Geological Map of Greece, sheet Keos island, (Greek Institute of Geology and Mineral Exploration, Athens, 1982).

²² The stone at Karthaia on Kea has often been differently identified, even in recent years: 'schist' (Østby, OpAth, p.200 *et passim*), 'gneiss' (Schuller, JdI, pp.368, 372); 'schist/gneiss-schist' (E. Kolaiti, L. G. Mendoni, 'The Relation between a Quarrying Site and a City-Centre. The Case of the Ancient City of Karthaia, Keos Island, Greece', in M. Waelkens, *et al.* [eds.], Ancient Stones: Quarrying, Trade and Provenance, [Leuven, 1992], pp.29-31). The stone in the Sanctuary of Poseidon on Tenos has also proved problematic: 'schist' (H. Demoulin, 'Fouilles de Ténos', BCH, 26, 1902, p.44; P. Graindor, 'Fouilles et recherches', Musée Belge, 14, 1910, p.240), 'local gneiss' (Ténos, *passim*).

²³ Mica-schist – Andros (Inselwelt, pp.8-9), Tenos (*ibid.*, pp.21-22), Kea (*ibid.*, p.43), Kythnos (*ibid.*, p.52), Ios (*ibid.*, pp.92-93), Folegandros (*ibid.*, p.84), and Sikinos (*ibid.*, pp.89-90). Gneiss – Paros (*ibid.*, p.64), Naxos (*ibid.*, pp.73-77), Seriphos (*ibid.*, p.57), Ios (*ibid.*, pp.92-93) and the northern part of Rheneia (*ibid.*, p.33). Cf. Inselwelt, table 4. Mica-Gneiss – Delos (EAD, IV, pp.2-8, 11-25, pl.II); and Thasos (Martin, Thasiaca, p.170; ET, I, p.83).

²⁴ Cf. Martin, Manuel, pp.127-128.

²⁵ Early instances beyond the scope of this study include the Bronze Age (Middle Helladic) buildings at Aghia Irini on Kea (J. L. Caskey, 'Investigations in Keos...', Hesperia, 40, 1971, p.388 *et passim*), the late Geometric houses at Zagora on Andros (A. Cambitoglou, J. J. Coulton, J. Birmingham, J. R. Green, Zagora, I, [Sydney, 1971], pp.22-23), and the early Archaic Temple of Athena at Koukounaries on Paros (D. Schilardis, 'Ἀνασκαφαί', Ergon, 1989, [1990], p.54).

will have obliterated any traces.²⁶ There is also a distinct possibility that some gneiss was imported, an instance being the blue, green and black tinted stones of the euthynteria and the krepis on the west side of the Stoa of Philip V on Delos (Pl.26).²⁷

The strong banding of gneisses and the parallel mineral structure of schists which cause them to split into large slabs, makes them poor, however, at withstanding tensional forces at right-angles to the plane of cleavage (thus, for instance, they are never used as architraves) or compressional forces upon the plane of cleavage (and thus they never used as pillars or columns); in addition they cannot be carved into neat, clean curves. Their use in construction is limited to the primary constructional processes and elements – blocks and slabs used for foundations and walls. These uses are examined in detail in Chapters 3 and 4, but in broad terms one notes that gneisses and schists are nearly always the main types of stones used for foundations, with a brief respite in the sixth century when granite dominates. Their ability to cleave into huge slabs up to 2 m. in length leads to a distinct type of massive foundation originating apparently on Paros and then spreading to the other islands. In addition, slabs of gneiss and schist are commonly used for the euthynteriai or levelling-courses of Cycladic buildings. Yet, the difficulty in shaping these stones into blocks with perfectly smooth surfaces and tight-fitting joints means that they are not used for the exterior of the most prestigious buildings (normally of marble ashlar), but they are used to form the interior skin, usually in conjunction with a marble exterior skin, of many important Cycladic monuments in a type of wall structure termed 'heterogeneously-skinned'. The only significant use of 'large-block' masonry of gneiss and/or schist is on the numerous Classical and Hellenistic towers found on many of the islands, with courses of either rectangular (ashlar) or trapezoidal blocks. By far the largest use of gneiss or schist, though, is in the form of small, manageable 'rubble' stones. Rubble walls of gneiss, albeit built to various standards of regularity, are used on the Cyclades for many administrative, civic and lesser religious monuments, as well

²⁶ Cayeux (EAD, IV, pl.II) on his geological map of Delos marks numerous 'quarries' in the areas both of micaceous gneiss, which are found primarily in the north part of the island around the hills of Gamila and Patiniotis, and of amphibolitic gneiss found around the foot of Mount Kynthos; cf. A. Dworakowska 'Starożytne Kamieniołomy Cyklad' ('Ancient Quarries in the Cyclades'), Archeologia (Poland), 22, 1971, pp.88-90. On Paros, a quarry is suspected near Paroikia: *ibid.*, pp.89-90.

²⁷ EAD, VII.i, p.67; AHHD, II.i, p.8. In fact, the gneiss somewhat resembles that found on **Tenos**, and the fact that a considerable amount of marble appears to have been exported to Delos from **there** during the Hellenistic period, lends added weight to the possibility of gneiss export.

as for houses, from the Archaic period through to the end of the Hellenistic age.

Slabs of gneiss and schist are also used for such architectural features as stylobates, thresholds and stair-treads, as well as for paving-slabs.

MARBLE

The term 'marble' essentially describes metamorphosed limestones (and dolomites) which are uniformly crystalline and compact, and which are therefore able to be polished, whence the name arises – the Greek μάρμαρος meaning 'shining'.

Marble was regarded as the most precious building-stone and was used by the Greeks wherever finances permitted. Although relatively difficult to quarry and to work, its compact crystalline nature allows sharp, defining features – be they block-joints or the most intricate architectural ornamentations – to be carved in any plane. Its durability in a dry climate also rendered it a valuable building stone in antiquity.

Marble is by no means ubiquitous throughout Greece as one would perhaps expect; indeed, the stone is notably rare in the Peloponnese for instance.²⁸ The main areas which exploited their local marble resources in the Archaic and Classical periods were Attica, Ionia, and certain Cycladic islands, while marble was also taken from quarries on Lesbos, Marmara (Proconnesus) and Thasos.²⁹ The Hellenistic age saw not only the continuing use of these sources of white marble, but also the exploitation of new quarries of coloured, variegated marbles principally at Karystos, Skyros and Chios.³⁰

Marble occurs naturally on many of the Cyclades although not only does its quantity vary from island to island, but also its appearance as distinguished by crystal

²⁸ However, parts of the Mani, including its southern tip and Mount Taygetos, are composed of white and coloured marbles, the sources perhaps of the marble used in the sculptural decorations of several Peloponnesian temples, namely Zeus at Olympia, Apollo at Bassai, Hera at the Argive Heraion, and Asklepios at Epidauros: F. A. Cooper, 'The Quarries of Mount Taygetos in the Peloponnesos, Greece' in N. Herz, M. Waelkens (eds.), *Classical Marble: Geochemistry, Technology, Trade*, (Dordrecht, 1988), pp.65-74. There is also a small area of greyish-white marble at Doliana to the south-east of Tegea, which was used for the bulk of the Temple of Athena Alea at Tegea, as well as for other lesser temples: cf. Martin, *Manuel*, pp.140, 143-144; Orlandos, *Matériaux*, II, p.11.

²⁹ Cf. Martin, *Manuel*, pp.135-143; Orlandos, *Matériaux*, II, pp.8-12.

³⁰ Cf. Martin, *Manuel*, p.144; Orlandos, *Matériaux*, II, pp.12-13; A. Dworakowska, *Quarries in Ancient Greece*, (Wrocław, 1975), pp.90-92; H. Dodge, B. Ward-Perkins (eds.), *Marble in Antiquity: collected papers of J.B. Ward-Perkins*, (London, 1992), pp.155-157.

size and colour.³¹ The most widely used marbles in extant Cycladic architecture are:

- Parian: a pure white marble, sometimes quarried from underground workings, which is composed of fine, homogeneous crystals lending the stone a sugary appearance (Pls.8-9).³²
- Naxian: a white marble with large crystals (Pl.31).³³
- Tenian: a white marble (Pl.76) and a foliated blue-grey/white marble (Pl.10) that was favoured especially on Delos in the Hellenistic period.³⁴
- Siphnian: a white or pinkish grainy marble with pronounced strata which alternate with more eroded 'sandy' beds (Pl.11).³⁵
- Delian: several types from different areas and varying in colour from off-white to

³¹ The principal marble-poor islands are Seriphos, Melos, Kimolos, Thera, Rheneia and Amorgos (although this latter island certainly has cipolin marble at Minoa); the largest quantities of marble are found on Naxos, Paros, and Siphnos: cf. *Inselwelt*, table 4 and *passim*.

³² This marble, known as λυχνίτης λίθος because of the lamps (λυχνία) that lit the subterranean quarries at Marathi (Pl.8), was especially renowned in antiquity, and as Strabo confirms (*Geography*, X, 487) was the favoured material for sculptors: cf. Orlandos, *Matériaux*, II, pp.8-10. Some believe it may not have been used for architectural purposes, that type of marble coming from the open-air quarries nearby, as well as at Paroikia: *FD, TrSiph*, pp.31-32, fig.12; cf. geological map in K. Germann, G. Gruben, *et al.*, 'Provenance Characteristics of Cycladic (Paros and Naxos) Marbles - a Multivariate Geological Approach' in N. Herz, M. Waelkens (eds.), *Classical Marble: Geochemistry, Technology, Trade*, (Dordrecht, 1988), pp.253, fig.1; Philippson, *Inselwelt*, pp.63-70 also mentions a grey or grey-striped marble with large crystals; cf. Martin, *Manuel*, pp.137-138

A grey-blue marble, presumably local, was also used for the euthynteria of the late Archaic Temple of Artemis in the Delion (Schuller, *Artemis-Tempel*, p.9), and probably for the socle of the late fourth-century Archilocheion (*AA*, 1982, p.272) on Paros, in contrast to the white marble superstructures; cf. L. T. Shoe, 'Dark Stone in Greek Architecture', *Hesperia*, Suppl. VIII, (1949), pp.341-352. At Karthaia on Kea there are two notable instances of contrasting coloured stones: at the late Archaic 'Building D' the lowest two steps are of the local blue-grey marble while the stylobate is of white marble, and at the contemporary Temple of Athena the krepis is of blue-grey marble while the superstructure is of white marble.

³³ *FD, TrSiph*, pp.27-29; Orlandos, *Matériaux*, II, p.10; Martin, *Manuel*, p.138; cf. geological map in R. Dalongeville, J. Renault-Miskovsky, 'Paysages passés et actuels de l'île de Naxos', in R. Dalongeville, G. Rougemont (eds.), *Recherches dans les Cyclades: Résultats des travaux de la RCP 583*, (Lyon, 1993), pp.12, fig.3. Philippson, *Inselwelt*, pp.73-80 also mentions a 'grey-blue' marble with large crystals. The ancient marble quarries at Flerio and Apollonas are also well known due to the presence in them of giant, unfinished *kouroi*, cf. W. Ekshmitt, *Die Kykladen: Bronzezeit, geometrische und archaische Zeit*, (Mainz am Rhein, 1993), pp. 201-202, pls.68-69.

³⁴ *Ténos*, pp.122, 151; *Inselwelt*, p.21 (the marble occurs in a few areas on the north and south coastline); *AHHD*, II.i, pp.9-10. Tenos also furnishes a greenish to red marble, but this does not seem to have been used by the ancient Greeks: cf. Orlandos, *Matériaux*, II, p.10; Martin, *Manuel*, p.139.

³⁵ The marble sea-cliffs on the north-east side of the island are heavily stratified with faults running at right-angles providing 'ready-made' blocks, many of which have fallen to the base of the cliff; this source may well have provided the ancients with their marble: *FD, TrSiph*, pp.26-27; cf. *Inselwelt*, p.58; Martin, *Manuel*, p.138.

dark mottled blue-grey with large crystals (Pls.12-14).³⁶

--Kean: a whitish-grey marble and a foliated blue-grey/white marble, both with medium to large crystals (Pl.15).³⁷

The other marble-yielding islands of the Cyclades have few, or no, marble architectural remains.³⁸ In the northern Aegean, Thasos has two varieties of marble: a white to grey marble with very large grains originating from near the *polis* itself, and the renowned, fine-grained white marble from Aliki in the south of the island (Pl.16).³⁹

Of course, each island normally used its own native marble in its buildings; however, marble was sometimes imported from another island either because a better quality marble was desired,⁴⁰ or because the local marble source was too inaccessible and it was deemed more economic to ship in another island's marble by sea,⁴¹ or from a combination of these two factors.⁴² Indeed, certain islands obviously regarded their marble with a sense of pride and as a kind of 'trade-mark', for we see it especially in

³⁶ These marbles are rich in mica, and are thus also known as 'cipolins' (*Dictionnaire*, I, p.33). Quarries are located on to the south-east of Mt. Kynthos on the coast (white to whitish-grey marble – Pl.14), on the slopes of the theatre hill ('dazzling white' marble), the edge of the Inopos reservoir ('white' marble) and on Ghlastropi hill ('white' and 'grey-blue, clearly veined'); the Delian marbles are almost uniquely differentiated by the size of their crystals. Cf. *EAD*, IV, pp.8-10, 90-91, pl.II (geological map); *AHHD*, II.i, pp.8-9; Martin, *Manuel*, p.137; P. Fraisse, T. Koželj, 'Une carrière de marbre au sud-est du Cynthe', *BCH*, 115, 1991, pp.283-296.

³⁷ *Inselwelt*, pp.43-44; E. N. Davis, *Geological map of Greece, sheet Keos island*, (Greek Institute of Geology and Mineral Exploration, 1982). Østby, *OpAth*, p.193 + fig.2 calls it limestone.

³⁸ Philippson notes marbles on: Andros, 'blue or white' (*Inselwelt*, p.9); Mykonos, 'white large crystals' (*Ibid.*, p.31; Syros, 'blue-grey, occasionally white', 'differing sizes of crystal' (*Ibid.*, p.36); Kythnos, 'blue', 'bluish' (*Ibid.*, pp.52-53); Folegandros, 'white to bluish-white and grey, mostly fine crystals' (*Ibid.*, pp.83-86); Sikinos, 'white, fine crystals', 'large crystals, grey-blue', 'dark grey' (*Ibid.*, pp.89-91); Ios, 'white with grey-blue veins' 'grey-blue' (*Ibid.*, pp.93-95); Anaphe (*Ibid.*, pp.108-111). On Amorgos the cipolin marble has a stripey bluish-grey hue.

³⁹ Some varieties also have a blue tint and smaller crystals; cf. Martin, *Thasiaca*, p.170; *ET*, IX, pp.81-126; N. Herz, 'Classical Marble Quarries of Thasos' in G. A. Wagner, G. Weisgerber (eds.), *Antike Edel- und Buntmetallgewinnung auf Thasos*, (Bochum, 1985), pp.232-240.

⁴⁰ E.g. Parian marble for the colonnade paving and simas of the Great Temple of Apollo, Delos: *EAD*, XII, p.86; Ohnesorg, *InsMarmDäch*, p.118. Herodotus (*Histories*, III, 57) relates that in the 6th C. the Siphnians 'adorned their agora and prytaneion with Parian marble'.

⁴¹ For transportation costs in antiquity, cf. Martin, *Manuel*, pp.170-172; Orlandos, *Matériaux*, II, pp.29-31; A. Burford, *The Greek Temple Builders at Epidauros*, (Liverpool, 1969), pp.15, 167-175.

⁴² The use of imported marble on Delos seems a case in point: the pinkish-hued marble used on Delos especially in the late Archaic and early Classical periods, appears to me to come from Siphnos rather than from Paros as thought by Vallois (*EAD*, II.i, p.9), for Paros has no record of such a stone while the ancient walls of Kastro on Siphnos are composed of pinkey-white marble, as 'are some Siphnian towers (e.g. 'Stoi Spilia Megaloyianni', cf. Ashton, *SiphTwrs*, pp.140-141). The extensive use of Tenian marble on Delos in the Hellenistic age, in both monumental and domestic buildings, may also be due to one or both of these factors.

the Archaic period being exported – sometimes far afield – for use in their buildings on other islands or indeed on the mainland, *e.g.* the Naxian Oikos on Delos and the Siphnian Treasury at Delphi.⁴³ Island marble was also frequently exported for use in 'non-Cycladic' buildings, such as for the front of the 2nd Temple of Apollo at Delphi (*c.* 514-506),⁴⁴ and more usually for architectural sculpture and smaller architectural elements such as simas and roof tiles.⁴⁵

On the Cyclades themselves, the ready availability of marble was exploited by the islanders from the seventh century for sculpture and from the start of the sixth century onwards for structural architecture, as more fully examined in succeeding chapters. The final century of the Archaic period is significant for the frequent use of worked marble in foundation construction (a practice soon abandoned, perhaps when the value of marble was realised) as well as being the time of the greatest use of marble in 'heterogeneously skinned' walls – a typical Cycladic wall structure. In the Classical period marble is also used for walls of 'full ashlar construction', the normal technique throughout Greece. Marble is used in both heterogeneously skinned and full ashlar walls in the Hellenistic period, as well as now sometimes being used with other stones in rough rubble walls.

The first Cycladic buildings which employed marble were of the highest status, namely temples. Not long after, buildings of 'secondary' status, such as treasuries and stoas, were also using marble. The rough lumps of marble used in rubble walls must be mostly reused pieces or are off-cuts from larger blocks. The marble quoins found on some gneiss and granite walls – even of houses – are outward symbols of wealth and status more than merely being structural reinforcements.⁴⁶ Similar reasons lie behind the use of marble in domestic architecture for some door and window-frames, stylobates and peristyle columns; although in the case of columns, curved surfaces can better be achieved with marble than with gneiss or granite.⁴⁷

⁴³ Naxian Oikos: *EAD*, XXXIII, *passim*; the Siphnian Treasury (which also uses Naxian and Parian marble for the architectural sculpture): *FD*, *TrSiph*, pp.27-32.

⁴⁴ Herodotus, *Histories*, V, 62; *cf.* *FD*, *Temple*, pp.92-117. The rest of temple is of local limestone.

⁴⁵ *E.g.* at: Athens – Temple of Athena Polias, the Hephaisteion; Delphi – Doric Treasury at Marmaria, the Athenian Treasury; Olympia – Temple of Zeus, the Sikyonian Treasury, Philippeion; Epidauros – the Tholos; *cf.* Ohnesorg, *InsMarmDäch*, pp.37-52.

⁴⁶ See page 113.

⁴⁷ *Cf.* *EAD*, VIII, pp.235-236; *EAD*, XXVII, p.132.

LIMESTONE

Limestone is a sedimentary rock composed mainly of calcium carbonate. It is widespread in mainland Greece and so is a very common material for architectural construction.⁴⁸ On the Cyclades, however, most of the limestone has been metamorphosed into marble, although small areas remain untransformed.⁴⁹ Its most significant occurrence is on Thera, where the few high mountains are of limestone surrounded by volcanic material which make up the bulk of the island;⁵⁰ the ancient city of Thera is itself located on a steep limestone ridge, and all of its buildings, both public and private, are built of the local greyish limestone. With the exception of the sixth-century Temple of Apollo Karneios, nearly all the monuments and houses in Thera belong to the Hellenistic or Roman Imperial period.⁵¹ In general, large ashlar blocks of stone are used for the public buildings, but unfortunately in the majority of cases only their lower sections have survived, thus limiting our knowledge of their architecture. In contrast to the public buildings, the walls of the houses are built of small, irregular limestone rubble with ashlar blocks confined to the corners, thresholds, lintels and staircases *etc.*⁵²

There are a few other sporadic instances of limestone used in architectural contexts on the Cyclades. On Siphnos, several towers are said to be of grey limestone.⁵³ On Kea, the late Archaic Temple of Apollo at Koressia is partly built of the local brown limestone of which the prominent outcrops of the ridge behind the temple are composed. I have also come across a very dark limestone threshold in the main entrance of Theatre Sanctuary C on Delos, *c.* 250-166 (Pl.17). Finally, on Thasos a shelly limestone is occasionally used from the start of the Classical period for the foundations and walls of a few monuments.⁵⁴

⁴⁸ For the widespread architectural uses of limestone in ancient Greece *cf.* Martin, Manuel, pp.128-135, and Orlandos, Matériaux, I, pp.5-7.

⁴⁹ *Cf.* Inselwelt, table 4.

⁵⁰ Thera, I, pp.47-53.

⁵¹ The main Hellenistic monuments to have survived extensive Roman remodelling are the Ptolemaic Garrison (*c.* 275 B.C.), the Royal Stoa and the Temple of Dionysos (probably 3rd C.); *cf.* C. Doumas, Santorini; a Guide to the Island and its Archaeological Treasures, (Athens, 1985), pp.67-77.

⁵² Thera, I, pp.252-254, 264-267; also Thera, III, pp.137-191.

⁵³ *E.g.* 'Sti Phengara', 'Stou Moutsou', 'Sto Phlambouro': Ashton, SiphTwrs, pp.52, 62, 86.

⁵⁴ GT, p.95.

POROS

Poros, a term generally unrecognised in scientific geology, is much used by modern writers on Greek archaeology and architecture to refer vaguely to any 'buff or brown limestone, soft and coarse'⁵⁵ or indeed 'any building-stone other than marble'.⁵⁶ It is probably advantageous therefore to examine the origin of the word and the exact nature of the stone it refers to.

Πῶρος (or *λίθος πῶρινος*) is an ancient Greek term the exact meaning of which is still not clear; the word occurs fairly infrequently, seemingly with a variety of meanings, some of which appear contradictory; however, 'poros' would seem to have had a loose, non-scientific meaning, along the lines of 'the ordinary/usual building stone'. Moreover, one can determine from certain ancient texts that a distinguishing feature of this stone was its lightness in weight.⁵⁷ Thus, from the actual remains on the ground one can reasonably assume that to the ancient Greeks the word 'poros' covered a wide range of workable stones, basically soft to semi-soft limestones, including limestone tufas,⁵⁸ but, of course, excluding the crystalline metamorphosed limestones that were capable of taking a polish, *i.e.* marbles.⁵⁹

'Poros limestones', as perhaps they should more correctly be referred to, are granular (both fine and coarse) in nature, although not necessarily porous (Pls.18, 19, 25, 35, 40, 52).⁶⁰ The denser and more homogenous their composition, the better suited they are to being finely carved while being less susceptible to the adverse effects of weathering. Their colouring ranges between shades of white, grey, brown and pale yellow, although a creamy yellow/buff hue appears to be quite common. The differences in their composition and colour is presumably caused by the amount and nature of the 'additives' to the main constituent of the stone, as well as to the degree of transmutation caused by geological processes.

⁵⁵ Dinsmoor, *AAG*, p.394

⁵⁶ Robertson, *GkRmArch*, p.387.

⁵⁷ Theophrastus, *De Lapidibus*, I, 7. See page 26.

⁵⁸ A porous, sedimentary rock of calcium carbonate, generally deposited near the sources and along the courses of mineral springs. Not to be confused with 'volcanic tufa' - see page 26.

⁵⁹ A fuller appraisal of both the ancient and modern usages of the term is given by R. E. Wycherley, 'Poros. Notes on Greek Building-stones', in D. W. Bradeen, M. F. McGregor (eds.), *ΦΟΡΟΣ: Tribute to B. D. Meritt*, (New York, 1974), pp.179-187.

⁶⁰ *Pace* Cayeux, *EAD*, IV, p.28; *cf.* Hellmann, *InscripDél*, p.365, n.6.

Poros was one of the first stones to be dressed and used in monumental Greek architecture, at least in the areas where it was naturally abundant – Attica, Aigina, the north-eastern Peloponnese, Elis and Sicily – and it remained a very common building material in many of these regions.⁶¹ Its use was attractive because it can be cut and shaped fairly easily and is relatively light-weight, thus facilitating its handling and transportation, all factors that bestow economic advantages.⁶²

Poros, along with all other types of sedimentary rock, is not a common stone in the geological composition of the Cyclades. However, natural deposits of poros do occur sporadically on the neighbouring islands of Delos, Rheneia and Mykonos. On Delos there are four, isolated 'pockets' of poros, each quite small in area, which do not appear to have been extensively quarried.⁶³ In contrast, Rheneia has considerable deposits of poros on its large northern peninsula, where five different variations in its composition have been distinguished.⁶⁴ On Mykonos, the poros is located on the north side of the island around ancient Panormos, from where, according to the Delian building accounts, the stone was quarried and exported to Delos.⁶⁵

The sparsity of naturally occurring poros on the Cycladic islands obviously has direct repercussions on its use as a building material there. Indeed, poros is only known to have been anciently used on Kea and Delos, and then it was obviously never

⁶¹ Early examples: Isthmia, Temple of Poseidon (c. 675-650); Delphi, 1st Temple of Athena Pronaia, columns at least (late 7th C.); Syracuse, Temple of Apollo (c. 575-570); Samos, 3rd Temple of Hera, columns (c. 570); Corinth, Temple of Apollo (c. 540); Athens, Old Temple of Athena (c. 529-515). Orlandos (Matériaux, II, p.3) terms the native Sicilian stone as 'poros', although Gruben uses the more general term 'plain, native limestone' (H. Berve, G. Gruben, Greek Temples, Theatres and Shrines, [London, 1963], p.420). Technically, the stone (at least around Selinus) is a 'sandy limestone': A. Peschlow-Bindokat, Die Steinbrüche von Selinunt, (Mainz am Rhein, 1990), pp.9, 49 and *passim*.

For a general account of its uses, cf. Martin, Manuel, pp.117-126; Orlandos, Matériaux, II, pp.2-4.

⁶² Of course, in the case of transportation, if distances were too great, the extra cost incurred would eliminate the advantage of poros as a cheap building stone; for the costs involved in transportation in general, see page 19, note 410. However, Burford notes that there are many instances where stone from distant sources has been used even when there were suitable sources closer at hand (e.g. at Selinus): A. Burford, The Greek Temple Builders at Epidauros, (Liverpool, 1969), p.189.

⁶³ In the depression along the Bay of Fourni; to the south of the Delian agora; in the north-east part of the island; and along Skardhana Bay: EAD, IV, pp.28-30, pl.II (geological map).

⁶⁴ EAD, IV, p.31, pl.II (geological map).

⁶⁵ IG, 165, 1.21: specifying poros for the columns of the exedra and the peristyle of a certain 'palaestra', which is almost certainly to be identified with the Palaestra of the Lake where poros column shafts still remain. For the sedimentary deposits of Mykonos, cf. Inselwelt, p.31. Other Delian epigraphical references to 'poros', the only stone mentioned in the accounts besides marble, are listed in Hellmann, InscripDél, pp.364-366, and in Orlandos, Matériaux, II, p.2, nn.1-2.

considered as a major building stone by the islanders. In fact, its first known use on the archipelago is for the superstructure of the 'Poros Temple' on Delos (c. 540-528) (Pl.18) which was most likely not a native Cycladic construction but an Athenian one, built by the Athenian tyrant Peisistratos after his 'purification' of the island, and the poros may even have been imported from Attica.⁶⁶ Another import from the mainland may be the poros used for the columns (Pl.42) and frieze of the peripteral Temple of Athena at Karthaia (c. 500-480) in the south-east of Kea, an island that is devoid of poros or similar rocks.⁶⁷ Although the stone may have come from another island the fact that the temple's architect is likely to have been from the Peloponnese may point to the stone's provenance.⁶⁸

In fact, a significant amount of the poros used on the Cyclades is in buildings that were probably designed by non-Cycladic architects. In addition to the two temples mentioned above, poros is also used – interestingly, always for either the foundations, the euthynteriai and/or the krepis antithemata – at the Temple of the Athenians (Pl.35) and 'Building GD 42', both of Athenian design, and at the Stoa of Antigonos (Pl.25), the Stoa of Philip and the West Stoa (Pl.40), all three of known or probable Macedonian design.

However, in 'native' monumental architecture, poros is used mostly in the Hellenistic period and then mainly for columns, upper-floor interior walls and pillars, and arches. Its use for columns is probably because it was the most suitable and economic stone available since gneiss was excluded owing to its inability to be shaped into, or be structurally effective as, columns and granite was difficult to cut and unduly heavy to move (although during the Second Athenian Domination granite columns become quite common on Delos);⁶⁹ thus, a client effectively had a choice of

⁶⁶ The earliest references (4th C.) to this building call it the '*Delian Naos*', then from around 280 it is referred to as the '*Porinos Naos*'. Cf. GD, pp.20, 128-129; EAD, XII, pp.207-215; Bruneau, CDH, pp.52-62. See also pages 191-194.

The poros used resembles that from Akte on the Piraeus peninsula: EAD, XII, p.210. In using this stone, Peisistratos was perhaps making a solid, architectural statement of his and Athens' power and supremacy.

⁶⁷ Cf. Østby, OpAth., p.198 (columns); Schuller, JdI, p.375 (mutule and triglyph fragment). No deposits of poros or similar stone are shown on E. N. Davis, Geological Map of Greece, sheet Keos island, (Greek Institute of Geology and Mineral Exploration, 1982).

⁶⁸ Certain design features in the plan of the temple may be ascribed to an architect familiar with Peloponnesian traits: cf. Østby, OpAth., pp.213-223.

⁶⁹ See pages 16 (gneiss) and 13 (granite).

either marble, the most 'prestigious' material, or poros, a less costly stone which was easier to shape and lighter to transport.⁷⁰ Its lightness in weight made poros ideally suited for both the interior walls and peristyle pillars on the upper storeys of buildings (both monumental and domestic), as well as for the voussoirs of the arches of the many water-cisterns on Delos (Pl.19).⁷¹

Some of the poros used on Delos came from the Panormos quarries on neighbouring Mykonos as indicated by a Delian building account.⁷² And, accepting the attributions of provenance of earlier scholars – albeit tentatively for they are apparently based solely on visual evidence – some poros also came from Rheneia,⁷³ and some even from Delos.⁷⁴

Finally, on Thasos in the northern Aegean, a type of poros (a coarse yellow tufa) crops out in jagged seams in the Maries valley on the western side of the island.⁷⁵ It, too, is only occasionally used in Thasian architecture, appearing only in the second and first centuries of the Hellenistic period.⁷⁶ Its most visible applications were for the orthostates, and perhaps for the rest of the now vanished upper wall, of the 'Poros Building' in the agora, and the retaining wall of the *Lesche* in the Herakleion.⁷⁷ In Thasian houses, poros is sporadically found among other stones in the walls.⁷⁸

⁷⁰ E.g. Delos – Palaestra of the Lake, temple at the Sanctuary of the Bastion, 'Great Colonnade' at the Sanctuary of the Foreign Gods, House II D in the Theatre Quarter. Many of the entablatures are either missing (thus presumed to be of wood) or of marble. Cf. *EAD*, VIII, p.236. Thus, the use of poros for the entablature (in addition to the columns) of the Doric peristyle at the so-called 'Thesmophorion' on Delos (c. 480-450) is notable; moreover, as this building is probably to be identified with the Hestiatorion of the Keans, the use of this stone for the colonnades at two roughly contemporary Kean monuments (this building and Temple of Athena at Karthaia – see page 24) may perhaps be more than coincidental.

⁷¹ Cf. *EAD*, VIII, p.236.

⁷² See page 23, note 65.

⁷³ Courby: *EAD*, XII, p.108 (Temple of the Athenians); Delorme: *EAD*, VIII, p.236 (Theatre Quarter houses).

⁷⁴ Vallois: *EAD*, VII.i, pp.66-67 (Stoa of Philip, West Stoa); Courby: *EAD*, XII, p.108 (Temple of the Athenians).

⁷⁵ Cf. Martin, *Thasiaca*, p.171; *GT*, p.95; see also page 22 on 'tufa'.

⁷⁶ An imported yellow poros, probably from the Thracian coast where it was commonly used, was employed in the 7th C. at the monument of Glaukos in the agora: cf. *GT*, p.30; Martin, *Thasiaca*, p.171.

⁷⁷ i. *BCH*, 74, 1950, Chron., pp.342-343; the building is variously dated: 3rd - 2nd C. (*ibid.*, p.346; *GT*, p.25); 2nd - 1st C. (Martin, *Thasiaca*, p.171). ii. Roux, *Thasiaca*, p.206.

⁷⁸ Martin, *Thasiaca*, p.171; not elaborated upon in *ET*, XII, p.362, n.1.

VOLCANIC STONES

Volcanic breccia

A light-weight, porous stone produced by the consolidation of volcanic ashes and other erupted material, similar to, and sometimes termed, Volcanic Tufa or Tuff.⁷⁹ Grey to brown in colour, it is extremely friable although its texture varies according to the exact nature and quantities of its constituent materials (Pl.20).⁸⁰ Not surprisingly, there are no natural deposits of this volcanic stone either on Delos or on neighbouring islands, and one should probably look to the volcanic group of isles around Thera and Melos for the origin of this material.⁸¹

Volcanic breccia is used only very occasionally on Delos. It is mainly used, much like poros and for the same reasons, for column shafts: at the Stoa of Antigonos (c. 246-239), the Hypostyle Hall (c. 210-200) and at the House of Kerdon and the House of the Masks (II - I centuries).⁸² At the Stoa of Antigonos, the presence both of a bed of volcanic breccia chips along the length of its rear, and of squared blocks of volcanic breccia (of an appropriate size for the side walls) in an interior column foundation, makes it seem most likely that volcanic breccia was also used for the main walls of the stoa.⁸³

The import of this stone from the volcanic Cycladic islands, approximately 90 kilometres distant from Delos, would not have significantly increased building expenditure, sea-transport being cheaper than land-transport mile for mile. This is borne out by the extant pieces of volcanic breccia which come from private houses (where in two cases the stone is used even as a stylobate,⁸⁴ an element that could easily be fashioned from local gneiss) as well as large public monuments.

⁷⁹ In French: '*brèche de ponce*', and '*tuf*' (the latter, confusingly, also used for limestone tufa – see page 22 and note 58).

⁸⁰ Cf. *Dictionnaire*, I, p.32.

⁸¹ Cayeux supposes Melos, cf. *EAD*, V, p.14, n.2.

⁸² At the Hypostyle Hall the columns are actually specified in the building accounts (*ID*, 365, l.33, 37) to be of '*poros*', indicating the geologically non-specific nature of this word; see page 22.

⁸³ Cf. *EAD*, V, p.27.

⁸⁴ House of the Masks, south and west stylobates; Theatre Quarter, House VI O: personal inspection.

Trachyte

The ancient architectural uses of this characteristically rough or gritty volcanic stone are confined to two volcanic islands – Melos and Thera. The considerable remains of the ancient Melian city wall are constructed of red and grey trachyte (Pl.21); the individual stones are shaped into both polygonal blocks and ashlar, the former perhaps dating to the sixth century while the latter may be a century later.⁸⁵ Large blocks of red trachyte also form the southern bank of seats of the stadium on Melos, dating presumably to the Hellenistic period or later.⁸⁶ Since the ancient city has not been excavated, it is impossible to estimate how widely this stone was used, other than to suppose from the instances cited above that it had a prime use in utilitarian, functional wall construction.

In the ancient city of Thera, blocks of reddish-brown trachyte are sporadically interspersed among the much more common building material of limestone; more specific uses sometimes include the lintels and door-posts of the Hellenistic and Roman houses in the city.⁸⁷

Andesite

The only use, of which I am aware, of this fine grained, reddish-brown volcanic stone, probably from Thera, is for the northern stylobate of the Agora of the Italians on Delos, c. 110-88 (Pl.27).⁸⁸ The contrast between this coloured stone and the three surrounding stylobates of white marble is striking, if a little odd. Since the rest of the superstructure is in marble, financial economy can probably be ruled out for its use; it has been suggested, quite plausibly, that the pavement of this northern colonnade was of brick (indicated by cuttings on the back of the stylobate blocks) rather than beaten earth as on the other sides of the peristyle, and thus the red andesite was chosen for this stylobate to match the brick in colour.⁸⁹

⁸⁵ See pages 96 and 102.

⁸⁶ C. Smith, 'Excavations at Melos', *BSA*, 2, 1895-96, p.74.

⁸⁷ F. Hiller von Gaertringen believed, without explanation, that this coloured trachyte (or '*lava-stein*') was first used only in Roman times: *Thera*, I, pp.241, n.31, 267, 292. Cf. C. Doumas, *Santorini: a Guide to the Island and its Archaeological Treasures*, (Athens, 1985), figs.47-49.

⁸⁸ *EAD*, XIX, pp.12-13, 93.

⁸⁹ Rauh, *Sacred Bonds*, p.313.

CLAY

Clay played quite a significant – if unassuming – role the architecture of both public and private buildings on the Cycladic islands. As well as being used in the construction of flat roofs which were common in Cycladic domestic architecture,⁹⁰ clay was also used for unbaked mud-bricks and fired-clay terracottas. These last two uses are detailed below.

MUD-BRICK

The simplicity and cost-effectiveness of manufacturing mud-bricks (clay mixed with cut-straw and water, placed in wooden moulds and then left to dry in the sun) meant that they were widely used for building in the ancient world including many parts of Greece, although they were susceptible to weathering and relatively frail. On the Greek mainland mud-brick was used in the Classical and Hellenistic periods for a few status buildings (the usual material now being cut stone) as well as for domestic buildings.⁹¹ On the Cyclades, however, mud-brick construction had always been and remained fairly uncommon. Finding suitable deposits of clay may have presented more of a problem, than using the widely available and easily split gneisses and schists.

The only surviving remains of mud-brick constructions on the islands are several of the interior walls of the second-century House of Comedians on Delos.⁹² Yet, the Delian accounts of the Hellenistic period make several references to mud-bricks (πλίνθοι; πλίνθινος) being used either for temporary walls around a building-site, or for repairs (to presumably weathered mud-brick walls), or for new walls.⁹³ New walls are the main recipients of the large orders of bricks detailed in the

⁹⁰ E.g. the buildings at Geometric Zagora on Andros (Zagora, I, p.28); most of the houses in the Hellenistic Theatre Quarter on Delos (EAD, VIII, pp.319-321): cf. Hellmann, *InscripDél*, pp.200-201 (with further refs.). However, some of the Delian houses had sloping clay-tiled roofs: e.g. at the Stadium Quarter, the *Insula* of the Comedians and the House of the Seals.

⁹¹ E.g. Tholos in the Athenian Agora (c. 465), Temple of Despoina at Lykosoura (c. 175-150). For houses of mud-brick, cf. *ET*, XII, pp.361 + n.2, 363 + n.3; J. E. Jones, 'Town and Country Houses of Attica', in H. Musche, P. Spitaels (eds.), *Thorikos and Laurium in Ancient Greece*, (Ghent, 1975), p.138. For general discussion of mud-brick in Greece, cf. Orlandos, *Matériaux*, I, pp.51-66, and Martin, *Manuel*, pp.46-63.

⁹² EAD, XXIX, pp.37-39, 133. However, walls of continuous pressed beds of clay have been found at the House in Skardhana Bay (BCH, 86, 1962, Chron., pp.963-964), and in houses in the Inopos Quarter (EAD, VIII, p.436) and in the 'Rue à Colonnes' (BCH, 84, 1960, Chron., p.855).

⁹³ Cf. Hellmann, *InscripDél*, pp.341-344.

accounts: i. 3000 bricks for the 'Palaestra'; ii. 1500 for the 'Sosileia Oikia'; iii. 1450 for the peribolos of the Archegeion; and iv. 2500 for the peristyle of the Asklepieion.⁹⁴ In the Sanctuary of Apollo there was also a building known as the 'Plinthinos Oikos' which presumably had walls of mud-brick.⁹⁵ The accounts imply that some mud-bricks were manufactured on Delos, although perhaps the clay was imported from Syros or Mykonos (known tile-producing centres) since Delos is short of good clay,⁹⁶ while others were imported 'ready-made' from these two neighbouring islands.⁹⁷

TERRACOTTA

Clay fired in a kiln is known as 'terracotta'. Terracotta bricks are virtually unknown in Greek architecture,⁹⁸ but fired clay is employed widely for Greek roof construction, specifically tiles, simas, decorative antefixes and akroteria.⁹⁹ However, on the Cyclades there are very few examples of Archaic roof terracottas, perhaps because of a lack of suitable clay on some of the islands, and because flat roofs were then even more common than in the Classical and Hellenistic ages.¹⁰⁰ The first reason provides a material basis for the innovative transition to the use of marble tiles on sixth-century Cycladic monuments, although the well-attested desire of the Naxians for large-scale works of art and architecture in marble could also account for the

⁹⁴ i. IG XI 2, 156, A, 1.57, 62-63; ii. IG XI 2, 156, A, 1.37; iii. IG XI 2, 287, A, 1.98-99; iv. ID, 290, 1.228.

⁹⁵ Vallois (AHHD, I, pp.19, 14-16) proposes that this undoubtedly ancient monument be identified with Building Γ (GD 7), an attribution doubted by Bruneau and Ducat (GD, p.123).

⁹⁶ IG XI 2, 219 A, 1.51; cf. Martin, Manuel, p.70. For Mykonos and Syros, see page 30 + note 104.

⁹⁷ IG XI 2, 165, 1.6; cf. Hellmann, InscripDél, p.343.

⁹⁸ In the House of the Masks (2nd - 1st C.) on Delos baked bricks cemented together with a lime mortar are used for a wall leading off from a bathroom: J. Chamonard, 'Fouilles à Délos', BCH, 57, 1933, pp.164-165, fig.19. Cf. Martin, Manuel, pp.63-64; Orlandos, Matériaux, I, pp.67-69.

⁹⁹ Cf. Martin, Manuel, pp.65, 87-112; Orlandos, Matériaux, I, pp.75-96. For Delos, cf. AHHD, II.ii, pp.347-352 (simas), 376-382 (tiles).

¹⁰⁰ Ohnesorg, InsMarmDäch, pp.5, 135. The oldest Cycladic roof terracottas come from the Heraion A (antefixes) and also 'Building Δ' (tiles) on Delos, both mid 6th C. Late Archaic examples come from Delos, Paros, Naxos and Tenos: cf. N. A. Winter, Greek Architectural Terracottas, from the Prehistoric to the End of the Archaic Period, (Oxford, 1993), pp.259, 261, 268; Ohnesorg, InsMarmDäch, p.5. Thasos is more richly endowed with Archaic terracotta tiles and simas, notably those from the Polygonal Building in the Herakleion; a tile workshop has also been found at Phari in the south-west of the island: N. A. Winter, *ibid.*, pp.254-272.

change.¹⁰¹

Yet, it would seem that clay tiles never completely yielded to their more expensive counterparts, and remained the standard way of covering a sloping roof on the Cyclades, as elsewhere in Greece, throughout antiquity; for tiles (κεραμίδες; κέραμος) are referred to many times in the mainly Hellenistic Delian inscriptions,¹⁰² and although their material is never actually mentioned, from their price¹⁰³ and their import from Mykonos and Syros,¹⁰⁴ it seems safe to conclude that the majority of tiles in the accounts were of clay. Clay tiles may even have been applied on prestigious buildings where one might expect a more opulent roof, such as at the Great Temple of Apollo on Delos (properly roofed during the third century), although in this case the simas and akroteria were of marble.¹⁰⁵ Unfortunately, many of the Classical and Hellenistic monuments on the Cyclades leave no clues as to the type of tiles they possessed. The complete absence of any tile sherds often suggests that the roof was stripped in antiquity. This, however, does not necessarily imply that the tiles were of marble, the more valuable material, because even clay tiles were considered valuable.¹⁰⁶ In fact, the only Cycladic monumental building where there is material

¹⁰¹ The first known use of marble tiles is on the Oikos of the Naxians on Delos, c. 580-570: Ohnesorg, *InsMarmDäch*, pp.9, 51-59, pls.1-4, 34-35. Their use here coincides with the period of Byzes of Naxos who is accredited with their 'invention' by Pausanias (*Description of Greece*, V, 10, 3). The interest of Pausanias' statement lies not so much in the (probably erroneous?) naming of the 'inventor', but of the ancient acknowledgement of Naxos as being the creative centre of marble tile production.

¹⁰² Cf. Hellmann, *InscripDél*, pp.199-203; Martin, *Manuel*, pp.72-78, 82-83; Orlandos, *Matériaux*, I, p.81, n.2 + p.91.

¹⁰³ Cf. J. O. A. Larsen, 'The Price of Tiles at Delos from 210-180 B.C.', *Classical Philology*, 36, 1941, pp.156-166; Martin, *Manuel*, pp.82-83; Orlandos, *Matériaux*, I, pp.89-91.

¹⁰⁴ Mykonos: *IG* XI 2, 144, B, l.12-13; Syros: *IG* XI 2, 158, A, l.84-85; cf. *AHHD*, II.ii, p.377 + nn.5-7. According to Chamonard, the tiles of grey or blackish clay in the Theatre Quarter are made from Delian clay and these are very sparse in number; the more numerous red tiles are either made on Delos of imported clay, or are imported 'ready-made': *EAD*, VIII, pp.319-320.

¹⁰⁵ *AHHD*, II.ii, pp.377-378; Ohnesorg, *InsMarmDäch*, p.118. However, Courby (*EAD*, XII, pp.39-40) believed the roof tiles to be of marble due to their complete disappearance; but see note 106 following. Other clay tile roofs edged with stone tiles include the late Archaic temples of Artemis at Kerkyra, of Aphaia and of Apollo on Aigina, the early Classical temple at Himera in Sicily (limestone simas), and the 4th C. Temple of Asklepios at Epidauros: Ohnesorg, *InsMarmDäch*, p.118.

¹⁰⁶ Thus, the fact that the tiles of the 'Keraton' and the 'Pythion' were re-sold and there was a 'model' for the tiles of the 'Keraton' does not necessarily mean that they were of marble (*pace* Vallois, *AHHD*, II.ii, p.379); cf. Hellmann, *InscripDél*, p.203. Will (*EAD*, XXII, p.66) also favours, although with reservations, marble tiles for the Dodekatheon owing to their complete disappearance. House tiles, like doors, were considered as one's own personal property in ancient Greece, and they were removed if one moved house: e.g. *IG* II 2, 2499; *IG* XI 2, 287, A, l.165.

evidence for clay tiles is Stoa L (c.140-110) in the Sanctuary of Poseidon and Amphitrite on Tenos.¹⁰⁷ It is also interesting to note that there is evidence on Delos that red clay tiles were occasionally painted white to resemble marble.¹⁰⁸

A so far unique use of terracotta tiles on the Cyclades occurs in the House of Masks (II - I Century), where tiles covered over with a cement are used to pave the floor of the 'bathroom'.¹⁰⁹

Crushed terracotta is also used in the lowest layers of the thick plaster, stucco, which is commonly applied to the interior and exterior rubble walls of Hellenistic buildings on the Cyclades.¹¹⁰

WOOD

Wood was an extremely important and valued resource in ancient Greece, which, besides being used for fire-wood, was a major element in the construction both of ships and buildings.¹¹¹ The Delian accounts, which date mostly to the Hellenistic period, make frequent references to wood (ξύλον), and detail precisely the procuring, stocking, re-using and maintaining of the timber.¹¹² Indeed, the accounts reveal that all the wood used on Delos – not just building-timbers but also firewood and charcoal – was imported.¹¹³ This dependency on imported wood was undoubtedly not the case on some of the other Cycladic islands, although it would seem that the archipelago as a whole was not thickly forested.¹¹⁴ Some of the larger fertile islands probably had plenty of oaks and olives, as they do today, and cypress may have been grown as building timber, but the Delian accounts reveal that large architectural timbers

¹⁰⁷ Ténos, pp.139, 154; the local clay was used.

¹⁰⁸ AHHD, II.ii, pp.379-381.

¹⁰⁹ J. Chamonard, 'Fouilles à Délos', BCH, 57, 1933, pp.164-165.

¹¹⁰ See page 116.

¹¹¹ For origins, types and use of wood in Greece, *cf.* Martin, Manuel, pp.2-46; Orlandos, Matériaux, I, pp.1-49; also *cf.* R. Meiggs, Trees and Timber in the Ancient Mediterranean World, (Oxford, 1982).

¹¹² *Cf.* R. Meiggs, *ibid.*, pp.441-457; Hellmann, InscripDél, pp.275-281, 301. The ancient Greek word ξύλον means not only 'wood' but also 'beam'.

¹¹³ The single known exception is the use for timber of one of the palms, growing in the sacred grove on Delos (IG XI 2, 144, A, l.64), but this was surely a rare occurrence.

¹¹⁴ See page 2.

(presumably of pine or fir) had to be imported from outside the Cyclades.

There are no surviving wooden architectural elements from the Cyclades – their use can only be determined from secondary evidence and the building accounts of Delos. Thus, from the start of the Classical period (the earliest accounts), wood was primarily used in architecture for the roof and ceiling beams,¹¹⁵ coffers, certain window and door-frames, as well as the shutters and doors themselves; less frequent and/or less significant uses of wood include pillars, architraves, 'half-timbered' walls, veneering, *empolia* for joining column drums, and even door-hinges.¹¹⁶

However, from the sixth century on the Cyclades, the roof beams, ceiling beams and coffers at some temples are made of marble rather than wood. The islands were the first area in Greece to engage in the 'petrification' of these particular forms, reflecting perhaps not just the lack of local timber but also, perhaps more significantly, the islanders' all-round striving for monumentality in their sculpture and architecture, as well as a desire to exhibit their skills in stonemasonry.¹¹⁷ One can also note the lack of wooden thresholds in public and private buildings (stone being used exclusively), and the greater use of stone for staircases, door and window-frames than elsewhere (Pl.79).

In the majority of timber references in the Delian accounts the species of tree is not given, but of the many types of wood that are specified, the commonest are the oak and fir, followed by the elm and cedar.¹¹⁸ Pine, rather oddly, is not mentioned as an architectural timber but it may, along with fir and oak, be behind the phrase 'ξύλα μακεδονικά'.¹¹⁹ Fir was often used for roof timbers because of the long lengths it

¹¹⁵ For a detailed account, cf. *AHHD*, II.ii, pp.398-411 (roof-work), 412-417 (ceilings).

¹¹⁶ See Appendix 1 for a description of the Cycladic continuous door-hinge.

¹¹⁷ The first attested use of marble ceiling and roofing beams is in the mid 6th C. temple at Sangri on Naxos, where complete beams of up to 4 m. in length are still visible today (B. K. Lambrinoudakis, G. Gruben, M. Korres, 'Ἀνασκαφή Νάχου', *Praktika*, 1977, p.384); more remarkable are the marble porch beams of 'Town Temple A' on Paros for they had spans of over 6 m. – one that has been cut in half is used as double posts on the façade of Ekatontapyliani church in Paroikia, Paros: *AA*, 1982, pp.215-217. No piece of coffering has survived from this early date, but the presence of marble beams in this major temple would seem to imply the existence of marble coffering.

¹¹⁸ There is also evidence for ash, beech, box, cornel, cypress, lime, mulberry, olive, palm, a nut-wood, and ebony: Hellmann, *InscripDél*, pp.278; R. Meiggs, *Trees and Timber in the Ancient Mediterranean World*, (Oxford, 1982), pp.443-445.

¹¹⁹ *IG* XI 2, 199, A, 1.57.

could provide, as well as being strong and easy to work;¹²⁰ oak is mentioned in connection with lintels and grilles;¹²¹ cedar for roof timbers and doors (of the Great Temple of Apollo);¹²² and elm for doors and one unusual instance where it was used for the coffer-rests in the Great Temple.¹²³

Of the localities from where the wood was exported, the Delian accounts say nothing, save for the single mention of an unspecified species from Macedonia. However, from the ancient authors and inscriptions, one can suppose that fir and pine came from Macedonia, Thrace or even Mt. Ida in the Troad; cedar from Cyprus, Syria or Lebanon; and oak could probably have been bought from Macedonia or Samos (or perhaps even Andros, Kea or Naxos).¹²⁴ It is also possible that the mountains of Lycia and Caria, where today there are extensive pine forests and many stands of cedar, once provided these particular timbers.

METALS

Metals had the same important architectural uses in the Cyclades as in other regions of Greece. Apart from occasional sheathing and decoration for which gold, silver and bronze were employed, the metals used for constructional purposes were bronze (χαλκός), iron (σίδηρος) and lead (μόλυβδος).¹²⁵

All three metals were used in the common processes of clamping and dowelling stone blocks – specifically bronze and iron for the clamps and dowels (Pl.22), and lead primarily for 'setting' these elements in their cavities, although

¹²⁰ The longest length recorded in the Delian accounts is 30 cubits (45 m.), presumably of fir, for the theatre skene (IG XI 2, 199, A, l.58).

¹²¹ ID, 290, l.164; ID, 440, l.88; ID, 366, l.47.

¹²² IG XI 2, 203, B, l.96; IG XI 2, 287, B, ll.144, 147, 150-151.

¹²³ IG XI 2, 161, D, l.132; IG XI 2, 161, A, l.112.

¹²⁴ R. Meiggs, *Trees and Timber in the Ancient Mediterranean World*, (Oxford, 1982), p.454. Theophrastus, *Enquiry into Plants*, I-V, and Pliny, *Natural History*, XII-XVII are two of the main ancient writers to deal with trees. Cf. Martin, *Manuel*, pp.30-31, and Orlandos, *Matériaux*, I, pp.12-13 for specific references.

¹²⁵ For a general account of the origins, extraction, uses and costs, cf. Martin, *Manuel*, pp.155-162; Orlandos, *Matériaux*, I, pp.97-129.

occasionally also used for actual clamps.¹²⁶ These clamps and dowels were normally used on worked blocks of marble and poros; very occasionally they were used on gneiss and granite and then only when these stones were employed for euthynteriai, krepis antithemata or stylobates.¹²⁷

Other architectural uses of these metals on the Cyclades are best listed separately.

BRONZE

Bronze is occasionally used for nails,¹²⁸ door-hinge sockets,¹²⁹ window-grilles and perhaps even large door-grilles.¹³⁰ The most notable *possible* architectural use of bronze on the Cyclades is for a decorative moulding course between the frieze and the cornice of the fifth-century Temple of the Athenians on Delos; all remnants of this c. 0.08 m. high course have vanished, thus leading some to suggest that it was of metal, although it is more plausible that the intermediate course was of a coloured stone.¹³¹

IRON

A major use of iron is for nails.¹³² It was probably used also for a number of door and window-grilles.¹³³ Two unusual items probably made of iron are mentioned in a mid-third century building account of the Great Temple of Apollo on Delos (c.

¹²⁶ For references in the Delian inscriptions to metals, clamps and dowels, cf. Hellmann, *InscripDél*, pp.84-87, 369-370. Vallois provides a detailed account of the use of clamps and dowels on Delos: *AHHD*, II.ii, pp.534-582. For the use and form of clamps and dowels in Greek architecture, cf. Martin, *Manuel*, pp.238-296, and Orlandos, *Matériaux*, II, pp.102-122.

¹²⁷ E.g. Gneiss: L-shaped Stoa in Delian Agora (euthynteria), Temple (D) of Artemis (euthynteria), Oblique Stoa (stylobate and krepis); Granite: Hypostyle Hall (euthynteria); L-shaped Stoa in Delian Agora (krepis antithemata).

¹²⁸ Cf. Hellmann, *InscripDél*, p.148.

¹²⁹ Ch. Llinas, 'Inter duas januas à la Maison du Lac', *ÉtDél*, pp.325-327, fig.31; cf. Hellmann, *InscripDél*, p.391.

¹³⁰ Cf. Hellmann, *InscripDél*, p.165.

¹³¹ Both Courby (*EAD*, XII, pp.121-124, figs.135-137, 211) and Vallois (*AHHD*, II.i, pp.250-251) supposed it to be of bronze. However, it is unlikely that an expensive metal course would stretch half-way through the wall. Its disappearance can perhaps be accounted for, even if it was of stone (possibly Eleusinian limestone, as used for the statue-base in the temple) since, for instance, it was a convenient height for paving slabs. Cf. I. M. Shear, 'Kallikrates', *Hesperia*, 32, 1963, pp.405-406.

¹³² Cf. Hellmann, *InscripDél*, pp.148.

¹³³ Cf. Hellmann, *InscripDél*, pp.210-211. The usual material specified in the accounts for grilles is wood.

475-450); these are the `κύλινδρους' or door-rollers on the bottom edges of the main doors so as to ease their opening and closing, and the 88 `χοινικίδας' which could well be the hollow cylinders (presumably replacements in this case) that are the basic components of a continuous type of door-hinge that was especially characteristic of Archaic Cycladic architecture.¹³⁴ There is no evidence, however, of any Cycladic building using iron as a reinforcement for highly stressed stone blocks (used most notably by Mnesikles in the Propylaia's Ionic architraves¹³⁵).

LEAD

At the Fountain-Exedra (c. 320-280) in the Sanctuary of Poseidon on Tenos, lead, poured into continuous grooves around the joint faces of the stone elements of the water basins, would have acted as a sealant (Fig.3).¹³⁶ Lead is also used for sheathing the end of wooden roof beams in a Delian house in the Theatre Quarter;¹³⁷ for the water pipes leading into the cisterns under the peristyles of Delian buildings;¹³⁸ and, most peculiarly, for a 'lead tile' mentioned in a fragmentary Delian building account which unfortunately offers no certain context.¹³⁹

Many of the Cyclades have evidence of ancient mining on them, and a variety of metal ores appear to have been extracted. Andros, Kythnos, Seriphos, Kea and Mykonos all have iron-bearing deposits, with all but the last island also possessing ancient workings.¹⁴⁰ Kimolos has silver and lead ore deposits, as well as mining

¹³⁴ Door-rollers: IG XI 2, 287, A, l.115-116 (250 B.C.) – cf. Hellmann, *InscripDél*, p.244. They ran along iron tracks sunk in the floor (EAD, XII, p.83, fig.103). Hinges: IG XI 2, 287, A, l.102 (250 B.C.) – cf. EAD, XII, p.228; Hellmann, *InscripDél*, pp.391-392. For the Cycladic-type door-hinge, see Appendix 1.

¹³⁵ Cf. Orlandos, *Matériaux*, I, pp.112-114, fig.75.

¹³⁶ *Ténos*, pp.75-76.

¹³⁷ EAD, VIII, p.335.

¹³⁸ EAD, VIII, p.341, fig.206.

¹³⁹ ID, 444, B, l.105. 'Lead tiles' were also used on the exterior of the hull of a massive ship built by Hieron II of Syracuse, under the direction of Archimedes the mathematician: Athenaeus of Naukratis, *Deipnosophistai*, V, 207 a-b.

¹⁴⁰ R. Shepherd, *Ancient Mining*, (London, 1993), pp.111-112. Apart from the *miltos* mines, iron ore galleries and deposits of copper slag have recently been found on Kea: L. G. Mendoni, N. Belogiannis, 'Μεταλλευτικές και μεταλλουργικές δραστηριότητες στην αρχαία Κέα', *Ἀρχαιογνωσία*, 7, 1991-1992, pp.91-104. The substantial deposits on Mykonos may have been the source for the forges on Delos: Hellmann, *InscripDél*, pp.369-370.

galleries.¹⁴¹ Some of the most famous mines in antiquity, however, were the gold and silver mines of Siphnos (which according to tradition had apparently 'sunk' by the Classical period¹⁴²), and it has only been recently proved that silver and lead mining actually took place on the island, while there is an increasing possibility that gold extraction – until quite recently thought to have been a fable – was also practised.¹⁴³ Finally, Thasos was also famous in antiquity for its rich gold mines, the ancient working of which (along with lead and silver) has also recently been confirmed.¹⁴⁴

Of all the constructional materials used on the Cyclades, it is most notably the local types of stone that were instrumental in creating a distinct, regional style of architecture. The abundance and physical properties of these stones naturally determined their treatment and uses; their influence on the nature of foundation and wall construction is fully examined in the following two chapters.

¹⁴¹ R. Shepherd, Ancient Mining, (London, 1993), p.112.

¹⁴² Herodotus, Histories, III, 57; Pausanias, Description of Greece, X, 11, 2.

¹⁴³ Aghios Sostis is the most obvious and well known of the ancient silver and lead underground workings; the only possible source of gold is from the mines in the south of the island: G. Weisgerber, 'Die Blei- und Silbergruben von Agios Sostis' in G. A. Wagner, G. Weisgerber (eds.), Silber, Blei und Gold auf Sifnos: prähistorische und antike Metallproduktion, (Bochum, 1985), pp.113-158; G. A. Wagner, G. Weisgerber, 'Andere Blei- Silbergruben auf Sifnos', in *ibid.*, pp.159-173; E. Pernicka, G. A. Wagner, 'Goldgruben auf Sifnos', in *ibid.*, pp.174-184; R. Shepherd, Ancient Mining, (London, 1993), pp.116-127.

¹⁴⁴ G. Gialoglou, M. Vavelidis, G. A. Wagner, 'Die antiken Blei-Silberbergwerke auf Thasos', in G. A. Wagner, G. Weisgerber, (eds.), Antike Edel- und Buntmetallgewinnung auf Thasos, (Bochum, 1988), pp.75-87; T. Koželj, A. Muller, 'La Mine d'or de l'acropole de Thasos', in *ibid.*, pp.180-197; R. Shepherd, Ancient Mining, (London, 1993), pp.128-135.

FOUNDATION and EUTHYNTERIA CONSTRUCTION

The foundations of a building are its buried load-bearing parts which form a solid base for the superstructure. Mentioned in the ancient building inscriptions as θεμέλια,¹ foundations were thus regarded as distinct from the *euthynteria*, the levelling-course between foundations and superstructure; this Chapter also treats both elements separately. Foundations of Cycladic buildings, like those elsewhere in Greece, are usually built into trenches cut into the soil, although if this is only of shallow depth terracing is usually built up around the foundations; it is not a prerequisite for the foundations to touch the bed-rock although this was obviously often regarded as preferable.² However, it is unusual for foundations to be cut into bed-rock for any great depth. Only one Delian inscription details the depth required: at the Temple of Asklepios the foundations are to be 'three feet' deep or otherwise a fine would be levied.³ Naturally enough the depth and width of foundations vary according to the size of the superstructure as well as the quality of the soil (always fairly shallow on Delos) and bedrock.

The following examination of Cycladic foundations and euthynteriai, however, concentrates on the types of foundation and the various methods of foundation and euthynteria construction which are often determined by the type of stone used (features, incidentally, that are never mentioned in the Delian building inscriptions). Comparisons between the uses of the different materials, and reasons both for their use and for the methods of construction are explored in the conclusions at the end of the chapter.

Table 1 lists the materials used for the foundations of the main Classical and Hellenistic monuments on the Cyclades and Thasos.

Table 2 lists the materials used for the euthynteriai of the same buildings.

¹ For examples cf. Martin, *Manuel*, p.308, n.4; for Delos in particular cf. Hellmann, *InscripDél*, pp.154-155.

² Prescribed by Philon of Byzantion, *Belopoeia*, 79, 2-3, and Vitruvius, *De Architectura*, III, 4, 1.

³ *ID*, 500, B, 1.10 (297 B.C.).

FOUNDATION TYPES

The types of foundation used on the Cyclades are the same as occur in the rest of Greece; they can be categorised into four types: i) platform foundations; ii) continuous foundations; iii) isolated foundations; and iv) linked foundations.

PLATFORM FOUNDATIONS

Here the foundation mass covers the entire area of the construction. This type of foundation is not common in Greek architecture; architects and builders realised that the extra labour and expense involved in their construction was structurally unnecessary for the vast majority of buildings. Platform foundations are thus sometimes employed on buildings whose construction was probably regarded as problematic for various reasons: at the Tholos at Marmaria at Delphi (c. 370) not only is the type of building still quite novel, but there are subterranean waters in the vicinity, and the area in general is prone to earth tremors and slippage; at the Mausoleum at Halikarnassos (c. 340) the huge structure is built over the subterranean chambers and passageways of an older necropolis; and at the Temple of Ares in Athens, more solid foundations than usual were deemed necessary after the temple's transfer to, and re-erection in, the agora at the end of the first century.⁴

Problematic ground would also seem to be the reason for the use of platform foundations at the earliest of the two Cycladic instances of its use on large-scale⁵ architecture. The so-called 'Building GD 42' on Delos (c. 360-340), a large Ionic prostyle edifice (17.33 m. x 23.38 m.) perhaps to be identified as the *Pythion*, had a foundation raft composed of a mass of poros blocks, most of which have now disappeared.⁶ Significantly, the building is situated only about 20 m. from the ancient harbour on ground that was perhaps as marshy then as it is today, and this may have led the builders to construct the platform foundation. However, the other buildings lying on or near the harbour neither possess this type of foundation nor show any

⁴ Cf. Martin, Manuel, pp.308-310. For new ground-plans of the Mausoleum cf. Maussolleion, p.14, figs.1-2.

⁵ Platform foundations are also sometimes used at small monuments such as altars, exedrae and statue bases because of their very compactness; e.g. on Delos, bases in front of the South Stoa (EAD, VII.i, plan 1, no.41) and Stoa of Antigonos (EAD, V, plan 1).

⁶ AHHD, II.i, p.20; for an 'actual-state' ground-plan, cf. G. Roux 'Le Vrai temple d'Apollon à Délos', BCH, 103, 1979, p.121, fig.3.

evidence of their foundations being specially treated.⁷ At the Monument of the Bulls on Delos (c. 306-290) it is difficult to cite any specific reason for the use of a platform foundation for its pronaos, where the whole of this area (c. 45 m.²) is covered by interlocking blocks of granite (Pl.23).⁸

CONTINUOUS FOUNDATIONS

These are the most common kind of foundations employed in ancient Greek architecture. They are essentially buried walls following and upholding the superstructure walls and, very often, the peristyle columns where they exist. Continuous foundations are also the principal type used on the Cyclades (Pl.24), although no known Cycladic monument uses these 'strip' foundations under its interior columns, as sometimes occurs on mainland temples.⁹

ISOLATED FOUNDATIONS

These are subterranean piers of masonry built directly below individual columns or pillars. They are used most often under interior columns, not just in many temples but in virtually all stoas and halls throughout Greece, as well as being found under exterior columns at numerous Archaic temples and some large Hellenistic temples in Asia Minor.¹⁰ On the Cyclades isolated foundations are known to have been used in the interiors of the following Classical and Hellenistic monuments: i. Treasury

⁷ Marshy or soft ground is sometimes specially treated before foundations are laid; this often involves the use of layers of either charcoal, sand, stone chips or rubble, or combinations of these: cf. Martin, *Manuel*, pp.313-314. Ancient authors also speak of this problem: Vitruvius recommends driving piles of charred wood into the ground and filling the intervals with charcoal (*De Architectura*, III, 4, 2); The foundations of the 1st dipteral Artemision at Ephesos, built c. 560-550, were bedded on a 'layer of charcoal and fleeces' (Pliny, *Natural History*, XXXVI, 21, 95). It has recently been established that on Samos the cella foundations of the 2nd dipteral Heraion c. 525, are separated from the soft ground by a 0.20 m. layer of limestone chips atop a 1 m. layer of sea-sand: H. J. Kienast, 'Fundamentieren in schwierigem Gelände; Fallstudien aus dem Heraion von Samos' in A. Hoffmann, *et al.* (eds.), *Bautechnik der Antike*, (Mainz am Rhein, 1991), pp.125-127, figs.4-5. The occasional use of sand in Greek foundations would seem to principally derive from Egypt where it was quite common in mud-brick and stone architecture (cf. D. Arnold, *Building in Egypt*, [New York, 1991], pp.110, 113) perhaps via Theodoros of Samos, one of the architects of the 1st dipteral Heraion, c. 560-550, who spent time in Egypt mastering their arts (Diodoros Siculus, I, 98, 5-9).

⁸ This mass of blocks is still technically a foundation for it can be seen to go down to the course below the *euthynteria* despite the majority of the visible mass being at the krepis level.

⁹ E.g. Athens, Temple of Athena Polias (c. 525); Isthmia, Temple of Poseidon (interior re-arrangement c. 390); Delphi, 3rd Temple of Apollo (c.366-326); Epidauros, Tholos (c. 340).

¹⁰ Cf. Martin, *Manuel*, pp.311-312 for examples.

IV (c. 480); ii. the Ionic rooms of the 'Thesmophorion' (c. 480-450); iii. the Stoa of Antigonos (246-239) (Pl.25); and iv. the Hypostyle Hall (c. 210-200), all on Delos; and on Thasos at: v. the Monument of Thersilochos (late IV century); and vi. the 'Galerie aux Piliers' (II – I centuries).¹¹ There is also a single Cycladic instance where isolated foundations are used for exterior columns: the small, single-aisled colonnade (c. 17.50 m. in length) added, without a stylobate, to the front of the North Building on Delos probably in the third century.¹² Several factors seem to have led to their employment in this case: the stoa's exceedingly small scale, the probable use of a wooden entablature, and its construction over a century after that of the main building; in other words, the use of isolated foundations under these particular exterior columns, as indeed their use under interior columns in general, was structurally sufficient and thus more economical than using continuous foundations.

LINKED FOUNDATIONS

This type of foundation is, in reality, a combination of continuous and isolated foundations, where the individual foundation piers are linked to each other by less well-built foundation 'walls'.¹³ Linked foundations are thus a feature of colonnades, although they are only very infrequently used, for example at the Hellenistic Didymaion (begun c. 300).¹⁴ However, there are three instances of linked foundations on Delos, the buildings dating from around the mid third century to the mid second century: i. the proskenion and surrounding porticoes of the Theatre Skene; ii. the façade colonnade of the Hypostyle Hall; and iii. the Ionic interior colonnade of the West Stoa.¹⁵ In all cases they are composed of massive, well-built, foundation piers

¹¹ i. *EAD*, V, plan 1; ii. Vallois, 'TopDél', pl.9; G. Roux, 'Salles de banquets à Délos', *ÉtDél*, p.537, fig.8; iii. *EAD*, V, pp.14-15, figs.16-17, plan 1; iv. *EAD*, II.i, pp.12-13, fig.12 section y-d; v. *BCH*, 105, 1981, Rapports, pp.924-926, figs.1-2; vi. *BCH*, 80, 1956, Chron., p.413, fig.19. See also pages 44 and 60.

¹² Vallois, 'TopDél', pp.307-308.

¹³ As categorised in *Dictionnaire*, II, p.11.

¹⁴ Martin, *Manuel*, p.312; cf. *Didyma*, I, pp.49-50, pl.78, F 158 (photo. vol.), pl.18, Z 157 (drawings vol.). At the Temple of Artemis at Sardis the mass of masonry between the isolated foundations of the peristyle would appear to date to the Roman rebuilding – even Butler describes it as 'concrete': *Sardis*, II/I, pp.19-20, pl.1.

¹⁵ i. and ii. *EAD*, II.ii, p.22, fig.43; iii. *EAD*, VII.i, p.80-81, figs.109-110, pls.1, 11. An early forerunner of linked foundations occurs at Treasury V (c. 550-500) where the single, roughly shaped blocks
(continued...)

joined by a line of more economical rubble packing which thus forms the foundations of the intercolumnar stylobate.

The incidence of linked foundations within a century of each other during the Delian Independence would indicate that this was a foundation technique that had some vogue on Delos during this time. These three buildings were all probably built by the Delians themselves,¹⁶ and the construction of linked foundations was thus also a technique employed by Cycladic builders, although it is possible that influence was derived from the earlier Temple of Apollo at Didyma.

Linked foundations as described above should not, however, be confused with smaller foundation walls 'crossing' between the main, parallel continuous foundations. These smaller walls, again not common, are intended to retain the intermediate fill within the foundations; the only example of their use on the Cyclades known to me is at the 'Monumental Altar J' in the Sanctuary of Poseidon and Amphitrite on Tenos.¹⁷

FOUNDATION MATERIALS AND METHODS

The constructional method employed for foundations depended to a large extent upon the type of stone used. On the Cyclades, granite and gneiss are the most common stones for foundations, while marble, limestone and poros are very occasionally used. The primary factors determining the choice of stone for use in foundations were its availability and suitability. An island would normally make use of its own native stone, especially if locally available, for the further the stone had to be transported the greater the costs although up to a certain distance sea-transport from another island would be cheaper than from a distant point on the same island;¹⁸ indeed, as we shall see, the importation of stone from other islands or the mainland was an option which was sometimes taken up. The suitability of a particular type of stone was

¹⁵(...continued)
of granite (c. 0.50 m. x 1.00 m. x 0.50 m.) under each façade column are linked by rubble; cf. AHHD, II.i, pp.14-15.

¹⁶ Despite the Hypostyle Hall having certain architectural indications that it was heavily influenced by the Macedonian constructions on Delos; see page 205 note 58.

¹⁷ Ténos, p.109, pl.82.2, plan 6; cf. Martin, Manuel, p.312.

¹⁸ See page 19, note 41. Local stones were also usually used in the rest of Greece.

also important: poros is hardly ever used in foundations presumably because, especially given its natural rarity, its softness and relative friability were considered by Cycladic architects as unsuitable for foundations when more suitable stones were to hand, whilst its lightness in weight made it fit for use in upper storeys. Marble, on the other hand, despite its relative abundance was considered as too valuable a commodity to use in parts of a building that would be buried and unseen.

The type of stone also determined the way it was handled and treated. Granite and gneiss were never cut into perfectly squared, rectangular blocks for use in foundations; in the case of granite it would not have been worth the effort to meticulously shape such a hard material, while gneiss is even more difficult to make into a right-angled block owing to its physical composition. Thus, *anathyrosis* is never found on any gneiss or granite blocks (either in foundations or walls); it was also not employed on the Cyclades on more easily cut stones, such as marble and poros, which were destined for use in foundations.¹⁹ As elsewhere in Greece, clamps and dowels were virtually never used on foundation courses; their only occurrence on the Cyclades is at the late second-century Hypostyle Hall on Delos where the blocks of the 'isolated' foundations below the interior columns are bound together with iron dove-tail clamps.²⁰

The following examination will consider individually each type of stone used in the construction of Cycladic and Thasian foundations – granite, gneiss, marble, limestone and poros – charting its role and its physical treatment with occasional brief recourse to the Archaic epoch in order to better illustrate and amplify a particular stone's use in the Classical and Hellenistic periods.

GRANITE

It is only on Delos that granite was extensively exploited for constructional purposes, undoubtedly because it is the predominant rock of the island; Naxos is the one other Cycladic island where this very hard, resistant stone is known to have been used, despite there being fairly large amounts of it naturally present on Tenos, Ios, and

¹⁹ Anathyrosis only rarely appears on mainland foundations, e.g. Delphi – 3rd Temple of Apollo (c.366-326), the Tholos at Marmaria (c. 370).

²⁰ *EAD*, II.i, p.13, plan 1. For their use elsewhere in Greece, cf. Martin, *Manuel*, p.315.

Mykonos.²¹ Thus, as Delos furnishes us with the vast majority of cases where granite is used in foundations, it is that island which engages our attention the most and on which all the buildings mentioned are located, unless otherwise stated.

The most significant feature in the use of granite on Delos is that after being employed in virtually every Archaic foundation, there is a significant and very real fall in its use during the Classical period. This trend is then reversed at the start of the Hellenistic age when granite once again plays a major role in foundation construction throughout the Delian Independence (314-166) and the island's Second Athenian Domination (166-69). The reasons for this fluctuation are discussed at the end of the chapter.

Throughout the Classical and Hellenistic periods granite is worked to varying standards, ranging from dressed rectangular blocks with fairly close-fitting joints, via summarily worked blocks, to quarry-like rubble. This series of gradations does not follow a strict chronological progression, although granite ashlar nearly all date to the period of Delian Independence, while the subsequent period of Athenian Domination is characterised by the use of rubble (granite and other stones) in foundations. Sometimes, however, the care bestowed upon the granite foundations appears to be related to the status of the building involved, although this determinant is not as strong as with gneiss foundations. It thus seems appropriate here to discuss granite foundations according to the way in which the individual stones are treated, beginning with the most regularly squared blocks.

a) Regularly worked granite

The cutting of granite into well-squared blocks or ashlar is the least common treatment found in foundations; moreover, the granite is never so precisely worked as to give it sharp, right-angle edges. Apart from one Archaic instance – the upper foundations of Heraion B (c. 500) where the medium-sized blocks (up to c. 0.75 m. in length) are exceptionally squared and jointed for this date²² – every known example of regularly cut blocks of granite in foundations of buildings dates to the Hellenistic

²¹ See pages 11-12.

²² *EAD*, XI, p.185, fig.102.

period and, within that period, virtually all date to the Delian Independence.²³ A characteristic of these dressed blocks is their large size; in general, their dimensions are 0.30 m. - 0.50 m. in height, 0.40 m. - 0.80 m. in width, and 0.70 m. - 1.00 m. in length, although they can be up to 1.50 m. long.

Many of the examples are worth noting for various reasons. The Monument of the Bulls (c. 306-290) makes a varied use of granite ashlar in foundational use; not only are they used in the pronaos platform foundation (Pl.23), but also in the long 'gallery' where they are placed beneath its krepis and placed in rows below the floor to support the marble paving.²⁴ The foundations of the Kynthion Oikoi (c. 281-225), located on the summit of the granite massif Mount Kynthos, consist of two rows of granite ashlar which – unusually for Cycladic foundations – have headers bonding the two skins; this can be accounted for by the fact that these foundations were not sunk into the earth but were 'built-up' like a wall and later covered by earth terracing.²⁵ Likewise, the 'isolated foundations' under the inner columns of the Hypostyle Hall (c. 210-200) are notable since the courses usually alternate between one dressed square slab and two rectangular ashlar; the latter are bound by a pair of iron dovetail clamps, thus providing the only known evidence of clamping in Cycladic foundations.²⁶

b) Irregularly worked granite

When the granite has been partially cut so as to give it one or two fairly level beds, with the vertical edges being only slightly trimmed or even left rough, it is termed here 'irregularly worked'.²⁷ This treatment of granite is the most common one found on Delos from the Archaic to the Hellenistic periods. Foundations of irregularly worked blocks of granite often also include gneiss, either in equally large blocks, or as smaller pieces and tablets for packing gaps and levelling courses.

In the Archaic period granite foundation stones were normally, and up to the

²³ Ashlar blocks are still used though in the foundations of a few Delian altars and small dedicatory monuments that date to the Classical period, e.g. under the socle of the Palm of Nikias (c. 417).

²⁴ For platform foundations see pages 38-39. A notable use of granite ashlar is also made for the krepis' antithema – see Pl.39.

²⁵ EAD, XI, figs.9, 19-21, plan 3.

²⁶ EAD, II.i, pp.12-13, fig.12 section y-d.

²⁷ 'Irregularly worked' stones used in the foundations most closely correspond to the 'coursed rubble' stones of the superstructure walls (see pages 104-106) but they are rarely constructed with the same degree of care or regularity.

middle of the sixth century, always, only roughly worked, varying in dimension from 0.50 m. - 1.00 m. in length and 0.20 m. - 0.30 m. in height, although some blocks can attain twice this length. Moreover, the stones are often haphazardly laid in two rows which were sometimes bound together by an earth/rubble mix.²⁸ In the late Archaic period one finds in conjunction with granite some medium-sized blocks of gneiss.²⁹ Very occasionally foundation walls of roughly worked blocks have the internal skin composed of one type of stone while the external skin is of another type, thus echoing the wall structure above ground.³⁰

The few Classical buildings where irregularly worked granite appears in foundations date to early in the period, before the rapid demise in the use of granite in favour of gneiss which was undoubtedly occasioned by the introduction to Delos of the new-style 'Parian-type' foundations of gneiss.³¹ In the foundations of the two adjoining and very ruinous structures, known as the 'Temples of Replat', granite is the only stone used, while it is combined with gneiss in the foundations of the new peristyle of the Archegesion; in both cases the granite is only very coarsely shaped.³² However, the use of granite in these particular buildings may perhaps be related more to the fact that they are situated at the foot of Plakes, a rocky granite outcrop to the north-east of the main sanctuary, from where the stone may have been lifted directly, than from any strict adherence to the customary use of this material.

A noteworthy, if minimal, use of roughly worked granite is made in the otherwise gneiss foundations of two other early Classical buildings on Delos: at the Prytaneion (c. 500-450) there is a single, large block of granite at the south-west corner,³³ and at Treasury IV (c. 480) there is a granite block in the south-west angle.

²⁸ E.g. Naxian Oikos: *EAD*, XXXIII, pp.18-24; Naxian Stoa: *EAD*, XXXII, p.99, photos 63, 69, 73.

²⁹ E.g. Heraion B: *EAD*, XI, p.185, pl.4; Ekklesiasterion, stage I: Vallois, 'TopDél', pp.282-283, fig.40.

³⁰ E.g. Monument of Hexagons: *EAD*, XXXII, p.14, pls. II, V: granite interior skin, gneiss exterior skin (on north and west sides). For 'heterogeneously-skinned' walls, see pages 79-84.

³¹ See pages 48-52.

³² 'Replat Temples': *AHHD*, II.i, p.21 (their actual function is unknown, cf. *AHHD*, I, pp.76, 123; *GD*, p.200); Archegesion: based on personal inspection as no description of the foundations are published.

³³ It is more likely that this block belongs to the original building phase rather than the rebuilding of the southern colonnade (c. 314-283), for the use of the odd, single block of granite in a foundation occurs more usually in the Archaic period.

The appearance of each block on just one corner would make it seem that its inclusion was more of a spontaneous act than a pre-determined plan, the block being ready at hand. Nevertheless, the builders may have thought that by placing a hard granite block at the corners, regarded in general as the vulnerable areas of a building, they would better resist any adverse stresses. In fact, in the event of any earth movement the presence of a large block might have increased superstructure damage, for the movement would not be absorbed as well by this single block as by many smaller stones that could move over each other.³⁴

At the start of the Hellenistic period granite resumes its major role in foundations. Roughly worked granite, however, is nearly always used in conjunction with gneiss which also continues to play an equally prominent role in foundation construction. Often the granite is cut into medium-sized blocks and slabs (as, for example, at the Kynthion Oikoi, *c.* 281-225, and the Ionic Stoa north-east of the Artemision, *c.* 166-88), while it is sometimes used in much larger blocks up to a metre in length as can be seen at the rear wall of the Stoa of Philip V, built *c.* 216-200 (Pl.26).³⁵ At the West Stoa (*c.* 180-150) the large foundation slabs of the exterior walls are up to 1.75 m. in length, 2.20 m. in width, and around 0.40 m. in height, with the number of courses varying from one to four.³⁶ These granite foundations of the West Stoa are the closest in resemblance to the piles of large gneiss slabs used in 'Parian-type' foundations.³⁷

Finally, it is worth noting that the presence in the same foundation of granite worked to different standards is quite common during the Delian Independence (314-166) occurring in nearly half the granite foundations. Sometimes this combination takes the form of more roughly shaped blocks being below ashlar (as already noted at the Hellenistic Temple of Artemis), and sometimes the irregularly worked blocks being mixed together with granite rubble to which we shall now turn our attention.

³⁴ On the mainland also larger blocks are sometimes positioned at foundation corners, *e.g.* 3rd Temple of Apollo at Delphi (*FD Temple*, pl.3), the Ionic colonnade of the Temple of Athena at Sounion, *c.* 460 (A. K. Orlandos, in B. Staes, 'Σουνίου ἀνασκαφαί', *AE*, 1917, p.183, fig.φ).

³⁵ *EAD*, VII.i, p.29, fig.27.

³⁶ *EAD*, VII.i, pp.78-80, figs.102-104.

³⁷ See pages 48-52.

c) Unworked granite

Unworked granite stones, that is rubble, normally vary in dimensions from palm-size pieces to blocks that can be picked up by a person (around 0.30 m. x 0.30 m. x 0.30 m.); they are used in the construction of foundations on the Cyclades from the Archaic period onwards.³⁸ Up to the start of the second Athenian Domination on Delos in 166, granite rubble is usually used to fill any gaps between larger blocks of roughly worked granite. Occasionally one finds it used by itself in one area of the foundation and better worked stones used in another; an instance is the Monument of the Bulls where, although not fully excavated or published, it is known that there is granite rubble under much of the krepis, under some of the paving supports of the long gallery, and under the north wall, while squared blocks of granite are used in many other parts, as mentioned previously.³⁹ The reasons behind the variations in this case now seem lost, although in general it would seem that ashlar blocks were sometimes placed at points thought to be vulnerable either from the weight of the structure above or perhaps from suspect ground conditions. This hypothesis appears to be borne out by the linked foundations of the Hypostyle Hall façade colonnade and of the Theatre Skene colonnades where solid piles of granite ashlar, underneath the columns, are linked by granite rubble foundations supporting merely the stylobate between the columns.⁴⁰

However, from around the middle of the second century, when granite is used in foundations, it is nearly always as rubble, excavation reports describing it as 'unfashioned', 'unworked', and 'of variable form and dimensions'. The granite rubble, however, is now never used by itself, but always in conjunction with gneiss (sometimes including marble) rubble. The rubble foundations are uncoursed and laid irregularly, and in some cases have the appearance of merely having been tipped into foundation trenches. They occur not only under 'minor' walls (*e.g.* interior walls of the third stage of the Palaestra of the Lake – Pl.71), but also under the exterior walls of

³⁸ On the mainland, rubble foundations are more common in early monumental architecture (*e.g.* the Archaic Treasuries at Olympia [*Olympia*, II, pp.45-47, 50, pls. 31.3-5, 32.1, 32.6]) than that of later periods when it is much rarer (*e.g.* at Sounion, the small prostyle Temple of Athena, *c.* 500-450, and the large Temple of Athena, *c.* 460 [A. K. Orlandos, in B. Staes, 'Σουνίου ἀνασκαφαί', *AE*, 1917, p.180]). *Cf.* Martin, *Manuel*, p.318.

³⁹ *BCH*, 89, 1965, Chron., pp.992-996, figs.2, 6; see also pages 38-39.

⁴⁰ See pages 40-41.

quite prestigious buildings (*e.g.* the Monument of Mithridates – Pl.34), and even under the colonnades and exterior walls of major monuments (*e.g.* Agora of the Italians – Pl.27).⁴¹ These rubble foundations of granite and gneiss occur in over four-fifths of known foundations built during the Second Athenian Domination, and have all the appearances of having been hastily thrown together from easily available materials, with little care being bestowed on them; in fact, in this period the same rough rubble construction is given to the superstructure walls.⁴²

GNEISS and SCHIST

These similar stones, extremely abundant on the Cyclades, have the natural tendency, owing to their petrological composition, of cleaving easily into blocks and slabs with flat bedding surfaces and often with two straight sides which are themselves near parallel at times. They are thus a convenient and economic building material which the Cycladic islanders exploited to the full. The similar physical properties and often visible similarities between gneisses and schists⁴³ mean that they are here treated as one.

Gneiss, like granite, is also worked to different standards after quarrying but it is never found cut into squared ashlar or slabs for use in foundations (and hardly ever in walls). Thus, the two main divisions of its treatment are 'irregularly worked' and 'unworked'.

a) Irregularly worked gneiss

This division itself covers a range of treatments in terms of the size and the basic shape of the gneiss; and the size and shape of the gneiss nearly always determine how the foundations are constructed. Thus, irregularly worked gneiss can be categorised into basically two types: i) large slabs, and ii) small to medium-sized blocks and slabs.

-- i) Large slabs

If quarried carefully, slabs of gneiss of very large size can be broken away

⁴¹ i. *EAD*, XXV, p.83; ii. *EAD*, XVI, p.19, fig.19; iii. *EAD*, XIX, pp.9-11, 37, fig.7.

⁴² See pages 108-109.

⁴³ See pages 14-15.

from the bedrock; from known examples, the largest slabs average around 2.00 m. in length, 1.20 m. in width and 0.30 m. in height. The use of such large slabs is limited to foundation construction to which they are especially suited, for a single slab can form the entire width of the foundation providing a solid base, and the slabs need little or no trimming after breaking fairly neatly away from their quarry beds; powerful foundations can thus be fairly quickly and presumably economically assembled, dependent upon distance of site from quarry and ease of transport.

The first known occurrence of a systematic use of massive gneiss slabs is at the large (c. 17 x 35? m.) Ionic prostyle temple – known as 'Town Temple' A – in Parikia on Paros, constructed around 525 (Pl.28); many of the slabs are of the dimensions cited above, and although only roughly trimmed on all vertical joints are sufficiently close together not to require any smaller bits of gneiss packing. Moreover, a single slab spans the width of the foundation, and the slabs are piled up between nine and fourteen courses high.⁴⁴ This innovative technique of foundation construction – piles of large, irregularly worked gneiss slabs – has been termed 'Parian-type' after its striking use at this temple,⁴⁵ although the majority of other instances do not involve gneiss slabs of such great dimensions or piled in so many courses. Another fine example of 'Parian-type' foundations is found at the smaller (c. 5.95 x 9.83 m.) Doric distyle Temple of Artemis, c. 490-480, located in the Delion on Paros.⁴⁶

It is appropriate here to point out that the use of piles of large, flat slabs (as opposed to square blocks) does not seem so common in the construction of foundations in the rest of Greece. When such slabs are used they are apparently well-dressed on all sides, in contrast to 'Parian' slabs. One of the first instances of their use is at the Heraion at Olympia (c. 590-580) where 2 - 3 m. long slabs of shelly limestone are placed in just two to three courses under both the walls and peristyle columns (which were originally of wood but were perhaps always intended to be of stone);⁴⁷ however, at the second dipteral Heraion on Samos, dating to c. 525 and thus contemporary with 'Town Temple' A on Paros, the 1 - 2 m. long limestone slabs are

⁴⁴ AA, 1982, p.197, figs.4, 15.

⁴⁵ Cf. AHHD, II.i, p.18 + n.2.

⁴⁶ Schuller, Artemis-Tempel, pp.5-8, figs.4-5.

⁴⁷ Olympia, II, p.28, pl.19.

neatly piled up to twelve courses high under the north and south cella walls.⁴⁸ The foundations of the Temple of Aphaia on Aigina (c. 500-485) are also apparently formed from three courses of limestone slabs around 2 m. wide and/or long; the fact that certain architectural details on the temple show distinct and direct Cycladic influence, raises the possibility that the use of large slabs – albeit of limestone and well-worked – in the foundations was an echo of 'Parian-type' gneiss slabs.⁴⁹

Early in the Classical period 'Parian-type' foundations spread to Delos and are used at numerous monuments there in this period. The Great Temple of Apollo, mostly constructed c. 475-450, has at least five courses of large gneiss slabs under the cella walls, and at least three courses under the peristyle (Pl.24); the slabs under the latter are the largest known in any Cycladic foundation (averaging 0.30 m. in height, 0.75 m. - 1.50 m. in width and c. 2.00 m. in length), with one slab in the north-west corner having a length of around 4.50 m. Unusually, the slabs of the exposed top course of the gneiss foundation (not to be confused with the marble euthynteria) are nearly all headers, placed lengthways over the width of the foundation; moreover, the non-joint edges of the slabs under the peristyle are not even roughly trimmed but left unusually jagged (Pl.33).⁵⁰ The contemporary Treasuries (I, II, III and IV) to the north-east of the Great Temple also have 'Parian-type' foundations although the smaller scale of these buildings may account for many of the gneiss slabs not being as large as those at the Great Temple (Pl.29).⁵¹ Yet another contemporary monument on Delos with these foundations is the three-doored, marble Propylaia of the Apollo Sanctuary where the door-wall rests on five courses of gneiss. The Propylaia, however, is the last monumental building on Delos⁵² to use 'Parian-type' foundations until Temple F in

⁴⁸ Reuther, *Samos*, p.23, pls.26-27; H. J. Kienast, 'Fundamentieren in schwierigem Gelände; Fallstudien aus dem Heraion von Samos' in A. Hoffmann, *et al.* (eds.), *Bautechnik der Antike*, (Mainz am Rhein, 1991), pp.125-127, figs.4-6.

⁴⁹ A. Furtwängler, *et al.*, *Aegina, das Heiligtum von Aphaia*, (Munich, 1906), pp.22-23, pl.10.4. For possible Cycladic influence at the Aphaia Temple see page 131 and note 29.

⁵⁰ *EAD*, XII, p.8, figs.4, 8, 12, pls.3, 10; *AHHD*, II.i, p.16.

⁵¹ *AHHD*, II.i, pp.16-17; nevertheless, some slabs regularly attain 2 - 3 m. in length and 0.25 m. in height.

⁵² *AHHD*, II.i, p.17. However, some late 5th - 4th C. altars on Delos continue to use 'Parian-type' foundations: cf. *AHHD*, II.i, pp.17-18.

Sarapieion C (c. 200-150) where the long slabs are laid in three to four courses.⁵³ There are also a few other second-century foundations which appear strongly influenced by 'Parian-type' foundations but use smaller slabs.⁵⁴

On the other Cycladic islands 'Parian-type' foundations are found to a limited extent. On Paros itself, it is unfortunate that most of the Classical and Hellenistic monuments are only known via the remains of their now 'displaced' superstructures; yet at the Asklepieion the scanty remains of certain late Classical buildings include their 'Parian-type' foundations, which are in places still over 1 m. high in at least 6 courses.⁵⁵ On Tenos, at the Sanctuary of Poseidon and Amphitrite where there are a number of monumental buildings spread fairly evenly throughout the Hellenistic period, this style of gneiss foundation only occurs during a programme of construction that dates to the late second century and start of the first century. Thus, at Stoa L (c. 140-110), by far the largest building in the sanctuary with a length of 170 m., the fairly regular slabs have lengths of up to 2.60 m. which are piled up to nine courses high under the central longitudinal wall;⁵⁶ and the outer ring of foundations at the 'Monumental Altar J' (10.46 m. x 10.77 m. on the first step) is also composed of similar slabs stacked in up to six courses.⁵⁷

Finally, at Thasos, the technique of 'Parian-type' gneiss foundations is only adopted in the fourth century; they are found at: i. the winged Paraskenia Building in the agora (c. 350-300); ii. the N.W. Stoa in the agora (c. 300-280); iii. a large square building (32.10 m. x 32.20 m.) of an unknown function known as the Monument of Thersilochos (c. 300); and iv. possibly at the third-century Hestiatorion in the Herakleion.⁵⁸ The foundations of the peristyle of the Ionic temple in the Herakleion (II century) present an unique variant on the 'Parian-type' – on the east side where the foundations are four courses deep, the lowest two are of gneiss while the two above

⁵³ Cf. Ph. Bruneau, 'Le Dromos et le temple C du Sarapieion C de Délos', BCH, 104, 1980, p.181, fig.10.

⁵⁴ See pages 53-55.

⁵⁵ O. Rubensohn, 'Paros III', AM, 27, 1902, pp.207-210, figs.10-11.

⁵⁶ Ténos, pp.129-130, 151, pls.41, 43, 89.2.

⁵⁷ Ténos, pp.109-110, pl.82.

⁵⁸ i. ET, VI, p.61, pl.15.2; ii. ET, VI, p.12, pl.6.1 (slabs c. 1.00 - 1.50 m. long. and c. 0.15 - 0.25 m. high); iii. BCH, 105, 1981, Rapports, pp.924-926, figs.1-2; iv. ET, I, pp.80-82: 'many courses' of gneiss.

are of marble, the blocks of each being regularly around 0.30 m. in height, 1.00 m. in width, and 1.00 m. - 2.50 m. in length (Pl.32).⁵⁹ It is noticeable again that these substantial foundations are used on relatively large buildings whose superstructure walls were constructed from ashlar of marble; if not of the first order of importance they were of the second. However, it would appear that the use of piles of large stone slabs for foundation construction was copied earlier from their mother-colony of Paros at the end of the sixth century, although then marble was substituted for gneiss.⁶⁰

Of course, not all irregularly worked large slabs of gneiss are used in 'Parian-type' foundations, spanning the width of the foundation and being piled in numerous courses; in fact, during the Classical and Hellenistic periods 'Parian-type' foundations comprise under half of all gneiss foundations. Yet the use of the large gneiss slabs in these foundations was influential, for sometimes such slabs are employed for just one course, as exemplified at the tetra-prostyle Temple of Asklepios (c. 297) on Delos, and at the small distyle *in-antis* Temple of Zeus (c. 400-350) in the agora at Thasos.⁶¹ At certain third-century monuments on Tenos (Hestiatorion Q – krepis foundation, Building M), one finds large slabs (1.50 - 2 m. long) frequently placed across the normal two-rowed gneiss foundation structure so as to bind the skins together.⁶² At the Monument of Thersilochos (c. 300) on Thasos gneiss slabs around 2 m. long and 1 m. wide, and apparently alternating direction in each course, are also used for the isolated foundations of the inner columns.⁶³ There are also a few instances where just one or a few large slabs of gneiss are randomly used in foundations together with smaller stones (e.g. 'Thesmophorion' on Delos, c. 480-450) or even with large blocks of granite (e.g. Stoa of Philip V on Delos, c. 216-200 – Pl.26).⁶⁴

However, not all irregularly worked gneiss is cut into large slabs; in fact, it is more frequently found used on a more modest scale.

⁵⁹ Based on my own observations; cf. ET, I, pp.67-69, pls.2.1, 13.1-13.2.

⁶⁰ See pages 57-58.

⁶¹ i. EAD, XX, p.73, fig.48; ii. BCH, 74, 1950, Chron., p.336, fig.47.

⁶² i. Ténos, p.48, plan 4; ii. Ténos, p.57, pl.70.3, plan 4.

⁶³ BCH, 105, 1981, Rapports, pp.924-926, fig.1.

⁶⁴ Personal observations; cf. EAD, VII.i, p.78 (West Stoa).

-- ii) *Small to Medium-sized blocks and slabs*

The most usual aspect of gneiss for use in foundations is that of a mixture of small and medium-sized blocks and slabs (which one can define here as approximately up to 1 m. long, and which can be handled by one or two men) their dimensions normally determined by how they broke away during quarrying. There are a few examples of medium-sized slabs being piled quite high in the style of 'Parian-type' foundations, their size excluding them from being classified as 'true' examples of this genre; one can cite, for instance, the foundations of the two colonnades in the Complex of the Poseidoniasts on Delos (c. 200-150) where under the main peristyle the slabs are stacked up to twelve courses high, although, admittedly, here they are acting as the walls of the sunken cistern.⁶⁵ 'Parian-type' foundations also appear to be the inspiration at the Hypostyle Hall (c. 210-200) where the medium-sized slabs (regularly up to 1 m. long, 0.50 m. wide, 0.20 m. high) are piled up to five courses high, but are here laid in *two* rows.⁶⁶

In fact, foundations of small and medium-sized blocks of gneiss are usually composed of two 'skins' bound by a thin earth/rubble fill, thus having the same structure as the upper walls. The blocks are summarily worked on a number of faces although usually not on the rear one that is hidden within the foundation wall. Again the standard of treatment can vary, as can the care taken in laying the stones, the former often determining the latter. The more accurate shaping and the neater laying of these 'irregularly worked' gneiss stones is naturally more labour intensive and less economical than rougher treatments; it is thus less common. Where this neater treatment of the gneiss occurs it nearly always involves the gneiss being used by itself. On Delos, foundations employing this more careful treatment of gneiss come from both the Classical period and subsequent period of Independence; it can be seen on the exterior facings of the foundations of the Prytaneion (c. 500-450), and the temple in Sarapieion B (end III century).

Sometimes this more carefully worked and laid gneiss is used specifically on the upper parts of the foundations. Notable examples of this technique occur at the

⁶⁵ EAD, VI, p.34, fig.20 + p.90, figs.13-14; the foundations of the main peristyle are c. 2 m. wide in places.

⁶⁶ EAD, II.i, pp.12-13, fig.32.

Palaestra of Granite on Delos (c. 150-125),⁶⁷ and at Hestiatorion Q in the Sanctuary of Poseidon and Amphitrite on Tenos (c. 320-280). In this latter building the lowest foundations of the north wall are, on the interior, of courses of small irregular gneiss slabs, on top of which comes a section (c. 0.50 m. high) of relatively well-worked and neatly laid small slabs and blocks of gneiss, before the true marble wall begins (Pl.76).⁶⁸ That this 'upper' foundation was buried by the interior ground level is indicated by a similar transition between the carefully laid gneiss foundations and the upper marble wall in the interior of the contemporary Building B in the sanctuary (Pl.77).⁶⁹

However, the gneiss used in Cycladic foundations is much more often less well-shaped and less carefully laid. This more summary treatment occurs on every island where gneiss is present, and is used in many foundations from those of the earliest Archaic buildings⁷⁰ through to those of the Hellenistic period. Thus, as examples, one can cite on Tenos the foundations of certain buildings in the Sanctuary of Poseidon and Amphitrite: Temple E1 (early III century), Building M (c. 250-200), and Temple E2 (c. 200-150) (Pl.30).⁷¹ On Naxos, this type of gneiss foundation is found at the early Hellenistic East Stoa in the town agora; the colonnade of the partly excavated stoa sits on at least three courses of medium-sized gneiss slabs (c. 0.75 m. long) which are interspersed with smaller blocks of gneiss, while the foundations of the back wall have a unique gneiss construction – the two lowest courses are formed from irregularly worked, rectangular blocks of gneiss (0.50 - 1.50 m. long, 0.30 - 0.60 m. high) laid in two parallel rows, thus forming a 'large-block' wall structure not previously seen in gneiss foundations.⁷²

On Delos, all-gneiss foundations composed of small and medium-sized irregularly worked stones are not as common as one might expect; examples are found under the original walls of the Palaestra of the Lake (V - IV century), and at the first

⁶⁷ *EAD*, XXV, pp.17-18, fig.38; the lower foundation is a slightly wider footing composed of larger, more irregularly shaped gneiss blocks.

⁶⁸ *Ténos*, pp.47-48, pl.56.1 *right* (showing just 'upper' foundations and wall), pl.69.4.

⁶⁹ *Ténos*, p.19, pl.56.2.

⁷⁰ *E.g.* in the 7th C. on Delos, at the Temple of Hera (*EAD*, XI, pp.150-152, figs.103-104), and at the Temple of Artemis (*AHHD*, II.i, p.11).

⁷¹ i. *Ténos*, p.95, plan 3; ii. *Ténos*, p.57, pl.70.3, plan 4; iii. *Ténos*, pp.96-98, plan 3.

⁷² N. M. Kontoleon, 'Ἀνασκαφὴ Νάξου', *PAE*, 1965, pp.176-177, figs.3, 6, pls.221-222.

stage of the Temple of the Dioskouroi in the Samothrakeion (c. 350-300).⁷³ Usually, the gneiss is used together with similarly sized and shaped granite, a combination that had been practised from the early sixth century.⁷⁴ Although these 'mixed foundations'⁷⁵ are not seen during the Classical period when 'Parian-type' foundations are at their height, they are the single most popular method of foundation construction in the Independence period on Delos. Moreover, in nearly every case lesser quantities of completely unworked stones (rubble) of granite and gneiss are used for packing any gaps. As examples, one can cite the foundations of: i. the colonnade of the Stoa of Philip (c. 216-200); ii. the South Peristyle of the Asklepieion (*after* c. 246); and iii. the west wall of Stage III of the Ekklesiasterion (mid III century).⁷⁶

Only occasionally on Thasos does one find mixed foundations of irregularly worked gneiss and rubble in foundations, as at the Theatre Proskenion (early III century), and at the N.E. Stoa in the agora (probably I century) where the gneiss slabs are mixed with more roughly cut stones of gneiss and marble.⁷⁷

b) Unworked gneiss

As we have already seen unworked pieces – *i.e.* rough rubble – of gneiss are used in small amounts in many foundations of gneiss and gneiss/granite mixtures from the Archaic to the Hellenistic period. Moreover, from around the beginning of the Second Athenian Domination on Delos in 166, many foundations were entirely composed of mixed rubble of gneiss and granite, as explained above in greater detail.⁷⁸ Occasionally gneiss rubble is found used on its own, as at the second stage of the Temple of the Dioskouroi in the Samothrakeion.⁷⁹

Of the other Cycladic islands, extensive rubble foundations of gneiss are only

⁷³ i. EAD, XXV, p.79; ii. personal inspection.

⁷⁴ See pages 47-48.

⁷⁵ Vallois terms these foundations '*opus mixtum*' (AHHD, II.i, pp.14-15), which can be a misleading term as it is much used in Roman architecture. Moreover, Vallois does not distinguish between irregularly worked blocks and unworked blocks in his description of '*opus mixtum*'.

⁷⁶ i. *cf.* AHHD, II.i, pp.23-24 (the foundations are not thoroughly examined in EAD, VII.i, p.29); ii. EAD, XX, p.57; iii. Ekklesiasterion: Vallois, 'TopDél', p.287.

⁷⁷ i. GT, p.54 – the foundations could date, however, to the 2nd C. A.D. rebuilding; ii. BCH, 75, 1951, Chron., p.146 – the small pieces of gneiss and marble are not mentioned.

⁷⁸ See pages 47-48.

⁷⁹ Personal inspection.

known to have been used during the Classical and Hellenistic periods on Kea, at the Propylon of the Athena Temple at Karthaia; here the scanty remains include large and small unworked stones of limestone/marble and gneiss/schist, materials that are naturally available in the locality.⁸⁰

An explanatory analysis of the role of gneiss in foundation and euthynteria construction is presented in the 'Conclusion' of this Chapter. We now turn to a material that was also abundant on the Cyclades and for which this archipelago was famous – marble.

MARBLE

Marble, the preferred material of Greek architects for the superstructures of monumental buildings, is only exceptionally used in the foundations of buildings throughout Greece; this valuable and sometimes scarce material is not 'wasted' on invisible parts of a building when other stone is available.⁸¹ Even on the Cyclades where it is naturally abundant on many of the islands, marble is little employed for foundation construction during the Classical and Hellenistic periods. When it is used though, it is in two basic ways, either as worked blocks or as unworked stone.

a) Worked marble

Foundations of worked blocks of marble are hardly ever used on the Cyclades in the Classical and Hellenistic periods. This is in contrast to the late Archaic period on the islands when marble foundations seem to have had a certain, if slight, vogue. On Naxos the two major buildings which actually have distinct foundations – the Temple of Demeter at Sangri (c. 550), and the peripteral Temple of Apollo on Palati islet (c. 525) – employ large, well-dressed blocks of this stone up to 2 m. in length (Pl.31).⁸² On Delos, smaller blocks of imported marble are used for the exterior foundations of a diminutive (3.68 m. x 2.54 m.), late sixth-century temple (GD 68) located just to the north of the Sacred Lake; and small blocks of Delian marble are

⁸⁰ Schuller, JdI, p.380 + n.146, fig.48.

⁸¹ For instance, the marble in the west foundation of the 3rd Temple of Apollo at Delphi is in fact reused material from the previous temple (J.-F. Bommelaer, Guide de Delphes, [Paris, 1991], p.177).

⁸² i. personal inspection; ii. AA, 1968, pp.696-701, figs.4-5, 7-8.

used under a hypaethral *sekos* to the west of the Prytaneion (GD 23F).⁸³ In the case of the Temple of Apollo on Naxos and 'Temple GD 68' on Delos the marble was transported some considerable distance to the buildings,⁸⁴ and thus must have been specifically desired as a foundation material – perhaps for prestige as much as solidity – in preference to other closer and thus probably cheaper stones. On Thasos, in stark contrast to the general situation on the Cyclades, the foundations of many Archaic monumental buildings are constructed from shaped blocks or slabs of marble.⁸⁵ This usage is directly linked to the fact that at both Thasos town and Alikí the marble is extracted locally.⁸⁶

In the succeeding Classical and Hellenistic periods the use of shaped marble blocks in foundations becomes even rarer on the Cycladic islands. There are only two monumental constructions where such foundations are known to exist: at the late fifth- or early fourth-century North Building (GD 35) on Delos – probably to be identified with a picture gallery known in the inscriptions as the Γραφή (*Graphe*) – where there are two courses of bluish marble slabs, c. 0.80 m. wide, c. 0.24 m. high and of varying lengths, their use here perhaps to be explained as a show of wealth or prestige at this obviously significant building;⁸⁷ and at the Monumental Altar J (c. 100) in the Sanctuary of Poseidon and Amphitrite on Tenos where the small retaining walls buried in the central foundation fill are constructed from small marble blocks, probably being reused like most of the marble in the superstructure.⁸⁸ Even on Thasos during these periods, marble virtually ceases being used in foundations, gneiss instead taking over its role. A partial use of marble is made at the Classical Temple of Zeus in the agora

⁸³ i. Vallois, 'TopDél', pp.200-201, figs.12, 15 (incorrectly identifying it as the Temple of Anios); ii. AHHD, II.i, pp.9, 15.

⁸⁴ The marble for the Temple of Apollo on Naxos came from the quarries at Melanes around 18 kms. away by modern road: G. Gruben, 'Fundamentierungsprobleme der ersten archaischen Grossbauten', in H. Büsing, F. Hiller (eds.), Bathron: Beiträge zur Architektur und verwandten Künsten, (Saarbrücken, 1988), p.167. The Sangri temple is located only 1 or 2 kms. from marble ground-rock as indicated on the geological map of Naxos (see page 18, note 33). The pinkish-streaked marble of 'Temple GD 68' on Delos is more likely to be Siphnian rather than Parian as Vallois suggested (see page 19, note 42).

⁸⁵ E.g. Temple of Athena (start 5th C.): Ch. Picard, 'Fouilles de Thasos', CRAI, 1912, p.212 (identified as the 'Temple of Apollo') - some blocks are c. 3 m. long; Herakleion, Temple cella (end 6th - start 5th C.): ET, I, p.72; Alikí, North Building (mid 6th C.): ET, IX, pp.16-43 *passim*, figs.17-19.

⁸⁶ Martin, Thasiaca, p.170.

⁸⁷ EAD, V, p.56, figs.75-76; for the *Graphe*, cf. GD, p.146, and Hellmann, InscripDél, p.90.

⁸⁸ See page 41.

where a couple of long marble slabs (c. 1.40 m. x 0.85 m.) are used under the door wall only, and at the Ionic Temple in the Herakleion where only the upper foundation courses of the peristyle (added in the second century) are composed of huge slabs, c. 0.30 m. high and up to 2.50 m. long (Pl.32).⁸⁹ Marble is used 'in rough blocks' throughout the foundations only at the choregic 'Monument II' in the Dionysion (c. 300-250).⁹⁰

An exceptionally idiosyncratic use of marble occurs near the north-east corner of the top foundation course at the Great Temple of Apollo on Delos (c. 475-450), where a single small block of marble (0.60 m. x 0.40 m.) is neatly slotted into a narrow and shallow gap between the very large slabs of gneiss which are otherwise used for the rest of the foundations (Pl.33).⁹¹ Perhaps this was the last part of the foundation to be laid, and the white marble was placed here as a mark of this, although ultimately to be buried; perhaps, more mundanely, it was a left-over piece of stone lying conveniently to hand.

b) Unworked marble

The most usual aspect of marble when it is occasionally found in foundations on the Cyclades is, however, of fairly small, unworked pieces. It is also always found in conjunction with other types of stone (see Table 1). Marble rubble is apparently first used in the late Archaic period both in various amounts and in a variety of building types.⁹² In the Classical age one knows of only two instances of its use: at the Prytaneion (c. 500-450) and the Apsidal Building (c. 480-450) on Delos.⁹³ Marble rubble is mostly found in the Hellenistic period. It is then sometimes used in approximately the same quantities as the other materials in the foundation, as on Delos at the Oikos of the Aphrodision (c. 310-300), the temples at Sarapieion A and

⁸⁹ i. BCH, 74, 1950, Chron., p.336; ii. see pages 51-52.

⁹⁰ P. Bernard, Fr. Salviat, 'Nouvelles découvertes au Dionysion de Thasos', BCH, 83, 1959, p.300.

⁹¹ EAD, XII, pl.3.

⁹² On Delos, it is sporadically used at the Monument of Hexagons (EAD, XXXII, p.14) and adjoining Andrian Oikos (AHHD, II.i, p.13, n.4), both dating to late 6th - early 5th C; it is more freely used at the Poros Temple, c. 525 (EAD, XII, p.208, fig.263); at the Apollo Temple at Koressia on Kea, c. 500, the marble/limestone is used in equal amounts with brown limestone, both found in the immediate vicinity (H. Lauter, 'Bemerkungen zum archaischen Tempel von Koressia', AA, 1979, pp.9-10, figs.2-5).

⁹³ i. personal observation; ii. GD, p.148.

Sarapieion B (c. 220-200), and the Monument of Mithridates (102/1) (Pl.34), as well as on Kea at the third-century Propylon at Karthaia.⁹⁴ At other times the marble occurs in much smaller and often sporadic amounts such as: i. Temple A in the Dioskourion (early Hellenistic), ii. the Monument of Granite (c. 150-100) on Delos; iii. Temple E1 (early III century) on Tenos; iv. the Hestiatorion in the Herakleion (III century), and v. the N.E. Stoa in the agora (probably I century) on Thasos.⁹⁵

That the form of the marble in these 'mixed foundations' is nearly always of unworked rubble suggests that the pieces are either off-cuts from larger marble blocks or parts of older broken blocks being reused. Another possibility is that they are from small outcrops or quarries of marble (of which there are a few near the sanctuary on Delos⁹⁶) which are otherwise unsuitable for the large-scale extraction of 'first-class' marble blocks, and thus exploited for 'rubble'.

POROS

In the Cycladic islands, poros only naturally occurs in pockets on Mykonos, Rheneia and Delos;⁹⁷ it is used for foundations on Delos alone and then only rarely. In the Archaic age, unworked or slightly worked pieces of poros are found in the foundations of the sixth-century 'Oikos II' in the Archegesion, their use probably merely due to the proximity of the building to small poros deposits.⁹⁸

All other instances of poros in foundation construction are as well-squared ashlar blocks. In the Classical period poros is found at the Temple of the Athenians, constructed c. 425-417 (Pl.35), and at 'Building GD 42', c. 360-340.⁹⁹ The use of poros foundations in these two buildings is of significance since it provides further

⁹⁴ All based on personal inspection, although for the Mithridatic Monument *cf.* EAD, XVI, p.19, fig.19; certain small marble blocks at the Sarapieion B temple are quite neatly worked.

⁹⁵ i. personal inspection; ii. EAD, XXIV, pl.23, fig.116; iii. Ténos, p.151; iv. ET, I, pp.80-82; v. personal inspection.

⁹⁶ See page 19, note 36.

⁹⁷ See page 23.

⁹⁸ *Cf.* AHHD, II.i, p.20. Poros, however, is not used in the foundations of the Poros Temple, as listed in the table in Martin, Manuel, p.121; it is used though for the temple's euthynteria - see pages 67-68.

⁹⁹ i. EAD, XII, pp.110-111, fig.121, pl.11; AHHD, II.i, p.19; ii. AHHD, II.i, pp.19-20.

evidence for their Athenian authorship,¹⁰⁰ since this stone is often used in Archaic and Classical foundations in Attica.¹⁰¹ In addition, it is interesting to note that the construction method of their foundations – the ashlar blocks fit tightly together, are laid in a regular plan, and are used as both headers and stretchers – is similar to that which is quite often found on the mainland, and in contrast to normal Cycladic practice.¹⁰²

In the Hellenistic epoch, poros is similarly rare in Cycladic foundations, but half of these monuments now have Macedonian, rather than Athenian, connections. At the Monument of the Bulls (c. 306-290), poros is used mainly under many of the long granite blocks which support the floor of the long gallery,¹⁰³ while at the Stoa of Antigonos (c. 246-239) the foundations of both the walls and the interior columns are composed of rectangular blocks of poros varying in size (some blocks on the eastern side attain 2 m. in length and 0.70 m. in height) (Pl.25).¹⁰⁴ Piles of poros blocks also form part of the 'linked foundations' under the interior columns of the 'Ionic Room' in the West Stoa (c. 180-150), an extension to the Macedonian Stoa of Philip V; unfortunately, the donors of the West Stoa are unknown, although the Ionic capital design has a few Macedonian traits.¹⁰⁵ However, since the prostyle Doric colonnade of the North Building would appear to be a local, probably third-century addition (as

¹⁰⁰ The main evidence is – Temple of the Athenians: actual name (first described by this name in 4th C. inventories, e.g.: IG, II², 818, line 9 [year 354/3]; T. Homolle, 'Inventaires des temples déliens', BCH, 10, 1886, p.465, line 107 [year 364/3]; cf. EAD, XII, pp.220-227); Pentelic marble superstructure; details of design. 'Building GD 42': Pentelic marble superstructure; account ID, 104-24 and service contract ID, 104-4 (providing revealing factors of date, the form of the Ionic order, the mainland architect, and the Athenian origin of the *paradeigma* of the capital; cf. M.-Chr. Hellmann, 'Problèmes d'architecture et d'épigraphie déliens', BCH, 104, 1980, pp.151-159).

¹⁰¹ See page 23, note 61.

¹⁰² E.g. Older Parthenon (c. 488-480): Travlos, PictDict, p.444, fig.567; Temple of Aphaia, Aegina (c. 500-485): A. Furtwängler, *et al.*, Aegina, das Heiligtum von Aphaia, (Munich, 1906), p.22, pl.10.4; Temple of Apollo Delphinios, Athens (mid 5th C.): Travlos, PictDict, p.83, figs.106-108.

At the Temple of the Athenians the foundation blocks are proportionally dimensioned and laid in a predetermined, patterned way – common factors to several Greek temples, cf. R. Ginouvès, 'Notes sur quelques relations numériques dans la construction des fondations de temples grecs', BCH, 80, 1956, pp.104-117; cf. also Martin, Manuel, p.320 + n.4.

¹⁰³ AHHD, II.i, p.24, n.6. The five-door Propylaia of the Monument of the Bulls rests on a long platform of poros: AHHD, II.i, p.24; its date is uncertain (AHHD, I, pp.244-246), although the Ionic capitals attributed to it are 3rd C. (see pages 201-203).

¹⁰⁴ EAD, V, pp.14-15, figs.16-17, plan 1; in the 'isolated foundations' of the interior columns each course is often composed of pairs of poros blocks placed at right-angles to the course below.

¹⁰⁵ EAD, VII.i, pp.80-81, figs.109-110, pls.1, 11; the poros blocks again alternate direction in each course. For 'linked foundations' see pages 40-41, and for the Ionic capital see pages 206-207.

indicated by the smallness of the colonnade, and the unusually slender columns¹⁰⁶), the use of poros blocks in the single course of the 'isolated foundations' probably has to be attributed to Delian design although they could perhaps have been unused blocks left over from the construction of the adjacent Stoa of Antigonos.¹⁰⁷

On Thasos, poros is found in the foundations of a couple of second or first-century buildings: at the aptly named Poros Building in the agora, and also in the individual footings beneath the interior columns of the 'Galerie aux Piliers'.¹⁰⁸

LIMESTONE

The Cycladic islands are composed mostly of metamorphosed limestone, namely marble, but in places – notably on Thera and Kea – one comes across untransformed limestone.¹⁰⁹ Buildings built on areas of this rock naturally make use of it in their foundations as well as superstructures. In contrast to the rest of Greece, in particular the Peloponnese and Sicily, where limestone foundations are often of ashlar, all the known Cycladic instances are composed of small or medium-sized, roughly shaped blocks and rubble, even at the more prestigious or larger monuments such as the third-century distyle *in antis* Temple of Dionysos (6.57 m. x c 10.50 m.), and the Ptolemaic Garrison, c. 275, at ancient Thera.¹¹⁰ A possible reason for such mediocre foundations at Thera may be that the shallowness of the soil covering the rocky hill on which ancient Thera is located did not allow for or require massive foundations.

From the materials and methods used for Cycladic foundations, we now turn to those used for the euthynteriai.

¹⁰⁶ See page 145.

¹⁰⁷ Vallois, 'TopDél', pp.307-308; GD, p.146. Courby believes the poros was reused from the Antigonos Stoa after its destruction, and thus he sees the colonnade of the North Building as Roman: EAD, V, pp.59-60, pl.1.

¹⁰⁸ i. BCH, 74, 1950, Chron., pp.342-343; ii. BCH, 80, 1956, Chron., p.413, fig.19.

¹⁰⁹ See page 21.

¹¹⁰ i. Thera, III, p.107; ii. Thera, p.205.

EUTHYNTERIAI

In Greek monumental architecture a transitional course is very often supplied between the buried foundations and the visible superstructure; this is termed in numerous architectural inscriptions the *euthynteria*.¹¹¹ As well as normally marking the ground-level,¹¹² the euthynteria, as a levelling course, establishes the horizontality of a building and provides the first true platform on which the masons can lay measuring tapes and water-levels. In practice, the euthynteria can rest directly on the rock if there are no subterranean foundations, or it can act as the levelling course between a podium and the walls proper in a type of *euthynteria-toichobate*. At ground-level the euthynteria usually projects only slightly beyond (c. 0.05 m. - 0.10 m.) the steps or wall above.

On buildings outside the Cyclades especially, the euthynteria which is nearly always present on Classical and Hellenistic monumental buildings is more closely related to the superstructure than to the foundations, for it is often composed of a stone which is not only different to that of the foundations but which is sometimes the same as that of the krepis;¹¹³ the blocks of this course are virtually always joined by clamps and dowels.

On the Cyclades, however, the stones used for the euthynteria are often the same as those used in the building's foundations; a change of stone occurs at a few of the most prestigious marble buildings, as well as at many 'non-Cycladic' buildings. Clamps and dowels are usually used only on marble and poros euthynteriai. As in the foundations, there are four main types of stone used for euthynteriai – granite, gneiss, marble and poros (see Table 2) – and we shall examine them in turn.

GRANITE

Granite is found in euthynteriai only on Delos, and then only very occasionally. One can cite five known instances of its use, all spread evenly throughout the Hellenistic period: at the Oikos in the Asklepieion, at the Dodekatheon, at the Theatre Skene, at the façade of the Hypostyle Hall, and at the façade of the Temple in the

¹¹¹ Cf. Martin, *Manuel*, pp.322-323; M.-C. Hellmann, *InscripDél*, pp.145-146.

¹¹² An exception apparently occurs at the North Building on Delos – see page 66, note 128.

¹¹³ E.g. at fifth-century Athens, at Corinth, and at Epidauros; cf. Martin, *Manuel*, pp.324, 326-333.

Sanctuary of the Bastion. In all these cases granite was ^{also} used in the foundations, sometimes mixed with gneiss; granite was also used for the superstructure walls at the Asklepieion Oikos and the Theatre Skene. The most noteworthy occurrence of a granite euthynteria is at the hexastyle amphiprostyle Dodekatheon, *c.* 290 (Pl.36),¹¹⁴ partly because previous, similarly-prestigious marble monuments on the Cyclades have a marble or at least a gneiss euthynteria; its use here may perhaps be explained as part of the renewed use of granite as a major building material at the start of the Delian Independence. It is also interesting to note that the euthynteria is divided into two zones, the buried lower one being left fairly rough, while the visible upper zone is carefully worked to form a small vestigial 'step' which, on the ends of the temple, is decorated with a convex moulding. The superior treatment of the upper half of a euthynteria is not uncommon, but the carving of moulding is extremely unusual.¹¹⁵

The clamping of granite euthynteria blocks occurs only at the Hypostyle Hall (*c.* 220-200). Here the granite slabs, which are only used for the euthynteria of the façade colonnade, are sometimes bound to each other by wooden dove-tail clamps engulfed in lead.¹¹⁶

The general scarcity of granite euthynteriai on Delos is undoubtedly due to the hardness of the stone; there was little point in the mason endeavouring to obtain a flat surface on a granite block when there was an abundant, local source of gneiss which was ideally suited for use as euthynteriai.

GNEISS

Gneiss slabs, with their flat upper and lower surfaces created naturally by cleavage, are ideally suited for use in the euthynteria course. As Table 2 clearly

¹¹⁴ *EAD*, XXII, pp.15-16, 18, fig.3, pl.4.

¹¹⁵ The Hellenistic Temple of Apollo at Delphi also has a moulded euthynteria (Martin, *Manuel*, p.324).

¹¹⁶ *EAD*, II.i, p.12, fig.16, plan 1; *EAD*, II.ii, p.22, figs.42-43. Dove-tail clamps have a slight renaissance on Delos from the mid 3rd C. when they are sometimes used in the lower parts of buildings, *e.g.* also at Stoa of Philip, *c.* 216-200 (on poros euthynteria), West Stoa, *c.* 180-150 (on poros euthynteria), Palaestra of Granite, *c.* 150-125 (on marble thresholds), Gymnasium, interior *c.* 150-100 (on marble thresholds); Mithridatic Monument, *c.* 100, (on wall-blocks); on Tenos they re-appear also at a late date at Building D, *c.* 100 (on gneiss antithema of first step). *Cf.* *AHHD*, II.ii, pp.554-555; *Ténos*, p.154, pl.59.4b.

Although granite blocks in superstructure walls are apparently neither clamped nor dowelled, there is sometimes jointing between the granite krepis antithemata blocks of certain Hellenistic buildings on Delos, *e.g.* the South Stoa (*c.* 270-230), the L-shaped Stoa in the Delian Agora (187-173).

shows, gneiss is by far the most common stone used for the levelling course not just on Delos but on many of the Cyclades during the Classical and Hellenistic periods.¹¹⁷ As with foundations, the gneiss slabs are not given smooth vertical faces with sharp right-angle edges but are just roughly trimmed, thus differing from euthynteriai elsewhere in Greece where the upper part defines a clear rectangle around the base of the building. The gneiss slabs used for the euthynteriai do not attain the huge dimensions seen in many 'Parian-type' foundations, but are usually of a length between 0.50 - 1.50 m.

Gneiss euthynteriai are used not just above gneiss-only foundations but also over most mixed foundations of gneiss and granite, including those of rubble. Even on fairly prestigious marble buildings where one might expect a marble euthynteria there is often one of gneiss. For example, on Delos, one can cite the four early Classical treasuries (Pl.43) (exceptionally, the vertical joint faces of the euthynteria of Treasury IV has elements of *anathyrosis*); the Temple of Asklepios, c. 297; the 3rd Propylaia of the Apollo Sanctuary dedicated by the Athenians shortly after 166 (Pl.37) – even though the former Propylaia had a marble euthynteria; the L-shaped Stoa in the Delian Agora, c. 187-173 (Pl.38); and the Agora of the Italians, c. 110-88 (Pl.27).

Clamping and dowelling is sometimes used upon gneiss euthynteriai although there appears to be no consistency as to when and why it is employed. Examples are known from Delos: on the west side of the Stoa of Philip (c. 216-200), at the L-shaped Stoa in the Delian Agora (c. 187-173), and at the new Temple of Artemis (c. 179-167), where the euthynteriai of all three buildings are dowelled and joined with 'pi-shaped' clamps.¹¹⁸ On Tenos the gneiss euthynteria of the great Stoa L (c. 140-110) possesses only 'lost dowels',¹¹⁹ and on Thasos, where most gneiss euthynteriai are neither clamped nor dowelled, that under the walls of the Hestiatorion in the Herakleion (III century) has dove-tail clamps.¹²⁰

Finally, it is worth noting that at the Stoa of Philip V on Delos (c. 216-200)

¹¹⁷ In the Archaic period there is usually no distinct euthynteria, although when it is used it is nearly always of gneiss on Delos (cf. *AHHD*, II.i, pp.12-14), although the known instances on Paros are of marble - see page 65.

¹¹⁸ Cf. *AHHD*, II.ii, pp.577-580.

¹¹⁹ *Ténos*, p.131, pl.43.

¹²⁰ *ET*, I, pp.77-82.

there is a gneiss euthynteria only on the rear wall (Pl.26); on the façade and sides it is of poros.¹²¹ The suggestion by Vallois that the use of gneiss reflects a desire for a harder stone than poros on the side exposed to the west wind and the sea is attractive,¹²² since the other possible reason – that of financial economy (certainly practised with some marble euthynteria as we shall see immediately below) – can be probably discounted given that large sections of the euthynteria, separating the gneiss/granite foundations from the marble superstructure, are formed from *two* courses of either poros or gneiss.

MARBLE

Marble euthynteriai are also used on the Cyclades although not very frequently; from known examples their period of greatest use is the late sixth to fourth centuries. As we shall see, reasons for the use of marble vary, and it is not even the case that marble foundations are capped by a marble euthynteria.

The use of marble euthynteriai was established in the Archaic period on the Cyclades, for not only does the peripteral Temple of Apollo on Naxos (c. 525) have a marble euthynteria above marble foundations, but even the contemporary 'Town Temple' A on Paros (c. 525) has a marble euthynteria above gneiss foundations, as does the later Temple of Artemis in the Delion on Paros.¹²³ At these prestigious monuments marble was obviously considered to be the most suitable material for the lowest visible part of the building, the external superstructure of which was also marble.

It is thus no surprise to find that in the Classical period the euthynteria of the peripteral Great Temple of Apollo on Delos (c. 475-450) is of marble (Pls.24, 33), as is that of the contemporary Propylaia to the Sanctuary of Apollo, and the large 'Building GD 42' (c. 360-340), all of which have marble superstructures.¹²⁴ Likewise

¹²¹ *EAD*, VII.i, pp.29-30, pls.7-8. See also page 68.

¹²² *Ibid.* However, the architect of the later adjoining West Stoa obviously had no such concerns about using a poros euthynteriai on the sea-facing side: see page 68.

¹²³ i. *AA*, 1968, pp.698, 705-710, figs.9-11; ii. *AA*, 1982, pp.198-200, fig.5; iii. Schuller, *Artemis-Tempel*, pp.9-12, figs.6-7, pls.101-107.

¹²⁴ i. *EAD*, XII, pp.5, 9, figs.9, 12; ii. *AHHD*, II.i, p.17; iii. *AHHD*, II.i, p.35. Of course a marble superstructure does not automatically mean a marble euthynteria, e.g. the early Classical Treasuries on Delos.

on Paros, a piece of marble has been attributed to the euthynteria of the peripteral Temple at Marmara (c. 400-350).¹²⁵ In the Hellenistic period, euthynteriai on Delos composed completely of marble are only found at the prominent – and ‘foreign’ – Stoa of Antigonos (c. 246-239), and, rather surprisingly, at the small marble Temple (7.04 x 4.13 m.) and Oikoi at the Aphrodision (c. 310-300).¹²⁶ Marble euthynteriai on less prestigious buildings are also found on other islands – on Tenos (Building F, c. 200, in the Sanctuary of Poseidon), and on Amorgos (early Hellenistic Temple and gymnasium at Minoa);¹²⁷ in the last case the local marble is used throughout the buildings.

Euthynteriai partially composed of marble are found at three buildings on the Cyclades, all on Delos. At the late fifth or early fourth-century North Building the marble foundations are topped by a marble euthynteria on the most visible sides of the building (the southern façade and most of the western side), while a gneiss euthynteria is used on the less viewed sides (the rear and hidden eastern wall).¹²⁸ At the Monument of the Bulls (c. 306-290) the majority of the euthynteria is of gneiss, but in certain sections it is of marble (Pl.39).¹²⁹ It again appears that marble is used at certain key areas, for it appears along the whole front of the pronaos and then returns for 16.50 m. along the west face – the two sections most visible to a person entering via the temenos’ propylon to the south west of the Monument. There are also two 3 - 4 m. sections of marble euthynteria immediately to the north of the doors on the west and east sides of the northern-most room, the *thalamos*, suggesting that doors may have originally been planned to be over these better quality euthynteriai. It is interesting to note that both the Monument of the Bulls and the Stoa of Antigonos are of Macedonian design and/or construction, and their use of marble euthynteriai may thus be due to a common Macedonian preference. This may also explain the use, albeit very limited, of three marble slabs in the northern part of the western

¹²⁵ AA, 1982, p.266, fig.4.

¹²⁶ i. EAD, V, pp.19, 24-26, figs.20-23, 29-30; ii. personal inspection.

¹²⁷ i. Ténos, p.38, pls.4.2, 67.2; ii. personal inspection.

¹²⁸ EAD, V, p.56. A toichobate comes immediately above the euthynteria, and Courby probably rightly believes the exterior ground-level to have been at the top of the toichobate; however, there is no evidence today for the small rebate at the top of the toichobate presumably marking ground-level as shown in EAD, V, p.57, fig.75.

¹²⁹ Cf. AHHD, II.i, p.22, n.2; CAD, pls.5, 18-19.

euthynteria of gneiss at the Stoa of Philip (c. 216-200);¹³⁰ this marble section perhaps indicates a planned doorway (or indeed an actual doorway not recognised by Vallois), although they could merely be reused marble blocks being 'hidden' at the back of the stoa.

On Thasos, economy of marble is also displayed on some euthynteriai; that of the Paraskenia Building (c. 350-300) is mostly of marble, but for some reason that of the central body's façade (*i.e.* between the two projecting wings) is of gneiss.¹³¹ More understandably, the euthynteriai of both the Hestiatorion in the Herakleion (III century) and the Poros Building in the agora (probably I century) are only of marble on the façades, the other sides being of a less valuable stone.¹³²

Clamps and dowels are only sometimes used on marble euthynteriai. Although they are not present on any of the known Archaic marble euthynteriai on the Cyclades, the Classical and Hellenistic ages present a few cases. For instance, at the Great Temple of Apollo on Delos, lead dove-tail clamps without a reinforcing bar or staple are normally used between the marble euthynteria blocks but at the angles iron 'Double T' clamps are used instead, probably because they were regarded as being stronger.¹³³ In contrast, flat rectangular dowels¹³⁴ are the only type of bonding found on the marble euthynteria of the Monument of the Bulls on Delos.

Thus when marble is occasionally used for euthynteriai, it is normally on the most prestigious monuments such as certain major temples, propylaia and stoas; however, as with foundations, marble is used for the euthynteria of lesser monuments if the marble source is at hand and plentiful, or perhaps the marble is being reused. It is also sometimes limited to just the most visible parts of the euthynteria.

POROS

Poros is only very occasionally used on Delos for the euthynteria course. Of its four known occurrences in this position, the first is at the mid sixth-century 'Poros

¹³⁰ Personal inspection (not mentioned in EAD V).

¹³¹ ET, VI, pp.61-62, pl.17.2.

¹³² i. ET, I, pp.80; ii. BCH, 74, 1950, Chron., pp.343.

¹³³ EAD, XII, p.90, fig.110 *left*; AHHD, II.ii, pp.539, 553, 566. For 'Double T' clamps in general, *cf.* Martin, Manuel, pp.261-273.

¹³⁴ *Cf.* Martin, Manuel, pp.282-283.

Temple' in the Sanctuary of Apollo, where a poros stone resembling that from Akte on the Piraeus peninsula is used.¹³⁵ In the Classical period, the poros euthynteria of the Temple of the Athenians (c. 425-417) is of a 'finer' grade than that used in the foundations below, recalling the use of two types of poros for the foundations and euthynteria respectively of the mid-fifth century Hephaisteion in Athens.¹³⁶ The use of a poros euthynteria was thus presumably a specific requirement at the temple of the Athenians, and one undoubtedly initiated by an architect following recent Athenian constructional techniques. During the Delian Independence, a poros euthynteria is used at the Stoa of Philip V (c. 216-200) on the façade and sides, while at the West Stoa, added to the back of the Stoa of Philip around fifty years later, the whole double euthynteria is of 'local' poros no doubt to harmonise with that of the earlier stoa (Pl.40).¹³⁷ On Thasos, poros euthynteriai are found above foundations of the same material at the second to first-century Poros Building (back and side walls) and at the 'Galerie aux Piliers' (probably I century), both located in the ancient agora.¹³⁸

The Thasian instances of poros euthynteriai are all still covered by superstructures and so do not reveal whether they are clamped or dowelled. However, on the Cyclades, clamps – but not dowels – are used on all the poros euthynteriai apart from the Archaic Poros Temple. 'Double T' clamps of bronze are used at the Temple of the Athenians, while lead dove-tails, reinforced with wooden ties, are used at the Stoa of Philip and the West Stoa.¹³⁹

¹³⁵ EAD, XII, pp.208, 210, fig.269, pl.25.

¹³⁶ EAD, XII, p.111, fig.121; AHHD, II.i, p.19. Hephaisteion: Martin, Manuel, p.119 with further refs.

¹³⁷ Philip Stoa: see pages 64-65; West Stoa: EAD, VII.i, pp.78-80, figs.102-103.

¹³⁸ Personal observations.

¹³⁹ Cf. AHHD, II.ii, pp.554, 567.

CONCLUSIONS

As the preceding detailed examination of foundations and euthynteriai has shown, the main type of stone used on the Cyclades for these structures in the Classical and Hellenistic periods is gneiss; on Delos, many foundations are also of granite, the most abundant rock of the island. Gneiss, apart from being one of the most common stones on the islands, has the distinct advantage that it can be easily and quickly quarried, dressed and assembled due to its cleavage properties; in contrast, granite is especially hard and difficult to cut. On Delos, as we shall discuss below, the decision of which stone to use for the foundations also depended on a number of other factors including the exact location and status of the building under construction, as well as the origin of its architect and/or building-group.

The dramatic decline in the use of granite during the Classical period on Delos is probably to be explained not by the nature of the archaeological record, since the number of known Classical monuments is probably sufficiently large and chronologically widespread to ensure a fair sample, but rather as a direct result of the extensive use of 'Parian-type' foundations of gneiss. This fairly rapid switch to 'Parian-type' foundations occurs at the start of the Classical period and is directly attributable to the contemporary flourish of building activity in the Sanctuary of Apollo when the construction of the Great Temple of Apollo and of the four 'Treasures' began; these monuments adopt this type of foundation, possibly because they were constructed by Parian building-groups. Moreover, the impetus for these building projects was not just the fact that Delos was increasingly becoming a major Greek sanctuary, but also – and probably more significantly – that the island was now the seat and treasury of the Delian League.

Equally striking is the rapid resumption in the use of granite as a major foundation material at the start of the Delian Independence in the late fourth century. How is this to be explained? It is very unlikely to be associated directly with the newly acquired political and administrative independence on Delos, for this almost presupposes the implausible idea that the Athenians had imposed a ban on the use of granite! It is also unlikely that the renewed use of granite is due to the acquisition of tools and/or skills making it easier to shape this hard stone, for not only were no new tools introduced into Greek architectural construction at this time, but also the ability to dress granite to an appropriate standard was available in the late sixth century, as

extant examples show. A possible explanation relates to the growing Greek interest in Egyptian architecture which is characterised by the use of granite;¹⁴⁰ however, even though the Ptolemies controlled the Island Confederacy during the first half of the third century, their architectural influence on Delos and Tenos (also possessing natural supplies of granite) is limited at best.¹⁴¹ The renewed use of granite is probably due simply to the wide-scale resumption of Delian building projects carried out by the locals using traditional constructional methods and materials rather than copying 'Parian-type' foundations or engaging Parian building-groups. Indeed, during the Hellenistic period on Delos it is used in over two-thirds of the foundations listed in Table 1, and is the sole material used in around one-third of them; gneiss, on the other hand is only used by itself in around one-fifth of these foundations, although it is the most common foundation material overall in this period since it is commonly used in conjunction with other materials.

On the other islands gneiss was nearly always the prime material for foundations. On Paros its known employment in the Classical and Hellenistic periods is always as large slabs piled in 'Parian-type' foundations. Tenos, on the other hand, used gneiss in a less massive way, although it utilised 'Parian-type' foundations at the end of the second century for some of the larger monuments in its extensive new building programme, again perhaps as a result of Parian work-groups being engaged. Thasos only started systematically using gneiss as a main foundation material in the second half of the fourth century, and then nearly always as large slabs and blocks, perhaps under the influence of her mother-colony Paros, and perhaps when the economic value of marble, the usual foundation material up to that point, was becoming increasingly clear.

The use of other stones in the foundations of Cycladic monumental buildings is negligible during the Classical and Hellenistic periods. Marble, although an abundant material, is reserved for superstructures presumably because it was regarded

¹⁴⁰ Ancient sources speak of Alexander's personal involvement in the design of Alexandria notable for its unusually wide streets perhaps inspired by the monumental avenues of Pharaonic temple architecture (Diodorus Siculus, XVII, 52). Later on, wide streets became a feature of some Greek cities such as Dura Europas. Egyptian architecture may be reflected in the columns of the Ptolemaic temple to Arsinoe (c. 270) at Point Zephyrium near Alexandria; cf. Lawrence, *GkArch*³, pp.266-267.

¹⁴¹ One can only cite the Delian Sanctuary of Agathe Tyche, to be associated probably with Arsinoe, wife of Ptolemy II. The notable use of clerestories on Hellenistic Delos is possibly more directly influenced by an early Classical example on the island; see page 214.

as too valuable a resource to be used in the majority of subterranean constructions, and certainly not worth the extra cost of transport when other types of stone closer at hand would suffice; the abundance of marble in and around the settlements of Thasos proves the rule. However, when marble is used in these periods it is usually as rubble, suggesting the opportunistic and economical use of off-cuts, reused pieces, or the exploitation of small outcrops of marble near the buildings. Poros is also little used by Cycladic building groups for use in foundations; there is no call for its use when the customarily-used gneisses and granites are adequate and much more widely available. The exceptions are generally buildings built, or likely to have been built, by the Athenians (who usually used poros for foundations) and by the Macedonians (who were heavily influenced by and copied many Athenian and Peloponnesian architectural traits). Limestone is used only where it is sporadically found.

The physical construction of both granite and gneiss foundations (excluding those of 'Parian-type') changes little from the sixth century to the second century; they are composed of two facings, and the blocks used are both summarily and fairly well worked, while smaller pieces of stone fill gaps and level courses (level beds being more important than tight vertical joints). In contrast, 'Parian-type' foundations are constructed much more solidly, consisting of courses of huge slabs of gneiss spanning the width of each foundation. Strictly regular foundations consisting of alternating headers and stretchers, which often occur on the mainland, are hardly ever used on Cycladic buildings; the most consistent example is at the Temple of the Athenians, constructed by the Athenians according to their customary style. When headers are used in native Cycladic foundations, their use is often more a case of convenience and opportunism than that of a predetermined and systematic plan. Indeed, many Cycladic foundations (with the exception of 'Parian-type') give the impression that they are not pre-planned with exactitude but are built '*ad lib*'. This is certainly the case on Delos, when from around the middle of the second century the use of rubble foundations becomes almost universal. This change is undoubtedly related to the Second Athenian Domination of Delos beginning in 166 B.C., which in turn resulted in Delos becoming a free port with the associated huge influx of foreign traders. Construction of buildings went on apace, and either 'foreign' builders or the requirement for fast construction, or both, account for the use of rubble foundations.

The quality of a particular foundation is also related to the status of the

building. 'Premier' status buildings such as major temples, treasuries and stoas (located within the sanctuary of Apollo on Delos) nearly always have neatly constructed foundations of well-shaped blocks and slabs, with 'Parian-type' foundations finding particular favour in the Classical period, while granite ashlar are used especially during the Delian Independence; yet after 166 B.C. on Delos even 'premier' status constructions, like other buildings, are given rubble foundations. On the other hand, 'secondary' status constructions (minor temples, administrative and civic buildings) on Delos usually have what one may term 'second class' (roughly shaped blocks) and, especially after 166, 'third class' (rubble) foundations. On Tenos, however, even buildings in the Sanctuary of Poseidon and Amphitrite that can be regarded as of 'secondary' status have well constructed, neat foundations; conversely, the amphiprostyle Temple of Poseidon (E2) only has 'second class' foundations under the walls.

The actual types of foundations used on the Cyclades – 'continuous' and 'isolated' – were the same as those used elsewhere; however, the technique of 'linked' foundations seems to have had a certain vogue amongst Cycladic builders from the mid third to the mid second century.

As with Cycladic foundations, gneiss is also the most common material used for the euthynteriai on the islands. This stone is especially suited to the role of a levelling course as it naturally splits into flattish slabs. However, the use of gneiss leads to a distinct difference from the mainland in one of the roles played there by the euthynteriai; the absence of smooth faces and sharp edges on the gneiss euthynteriai prevent them from defining a clear plan and shape to the base of the building.

Of the other stones used, marble is the next most common although its use is usually limited to prestigious buildings, particularly those which were 'foreign' dedications; the marble euthynteria becomes almost a symbol of status. Granite was obviously considered as not usually worth the time and effort to shape into flat planes when other available materials were more suitable.

The euthynteriai also differ from the foundations by the fact that they are sometimes clamped and/or dowelled.

Finally, non-Cycladic influences hardly affect the local techniques of foundation and euthynteriai construction, despite Athenian and Macedonian buildings being built on the Delos. Traditional methods and materials are the common feature

of Cycladic foundations and euthynteriai through the Classical and Hellenistic periods. Equally, these particular constructional techniques were not adopted outside the islands, in contrast to several other Cycladic architectural techniques and forms.

In this detailed examination of the methods of Cycladic foundation and euthynteria construction we have seen that it is, to a large extent, the types of available stone that determine their general character, which is often quite distinct from elsewhere in Greece. Political and economic factors are also reflected in the types of foundations employed on the islands, as is the basic conservatism of Cycladic builders. Undoubtedly, Cycladic foundations and euthynteriai display a distinct and strong regional character; this character is also reflected in wall construction, as is examined in the next chapter.

WALL CONSTRUCTION

In Greek architecture walls of stone, unlike those in many earlier and some later civilisations, are often much more than merely the functional, solid sides of a structure. The individual blocks of stone making up the wall often play their own part in the decorative nature and expressiveness of the whole structure. Whether the blocks are polygonal or ashlar, roughly tooled or smooth on their visible surfaces, they lend the wall, and thus the whole structure, a certain mien. Indeed, the nature of a wall and the care bestowed upon it can often indicate the status of the structure to which it belongs, and even occasionally suggest the origin of the wall's designers and/or builders).

Walls built of stone can be divided generally into different types according to their function. Thus, one can distinguish – as indeed the ancient Greeks did – between a supporting or retaining wall (ἀνάλημμα), a surrounding fortification wall (τείχος, τεῖχη), and the walls of a building (τοῖχοι).¹ In this chapter, attention will be focused mostly upon the walls of buildings, although reference will be made to other types by way of comparison and illustration. The free-standing walls of buildings are sometimes constructed more elaborately than other types, with those of prestigious monuments, such as temples, usually being composed of numerous constituent parts: above a small footing (*toichobate*) one usually meets the lower part of the wall or dado consisting of a course or two of large, tall blocks (*orthostates*) recalling the stone socles of earlier mud-brick walls; above this is the 'middle wall' or 'main wall' which forms the basis of the following study; finally, a wall can be capped by a decorative moulding course (*epikranitis*).²

As already stated, the actual shape, size and surface treatment of the stones used in the construction of a wall are a vital part in the overall aspect of the finished structure. The basic division of stones followed here is that commonly employed in Greek architecture; thus, ashlar are large rectangular blocks of a size that cannot be picked up by one person; rubble, on the other hand, consists of stones that can be

¹ Cf. Martin, *Manuel*, pp.374, n.3; 375, n.9; and 388, n.8 for inscription refs.

² Cf. Martin, *Manuel*, pp.358-371; *Dictionnaire*, II, pp.31-35, pl.14.

picked up by one person (near maximum, therefore, c. 0.40 m. x 0.20 m. x 0.20 m.), and they are nearly always undressed or only summarily worked.³ Other terms will be defined when they are introduced.

The specific shaping of a stone (and thus the nature of the wall in which it is employed) is very often directly related to its type. For instance, gneiss is very difficult to cut into right-angled blocks and thus gneiss walls are nearly always composed of small to medium-sized roughly shaped blocks or rubble; marble, on the other hand, can be cut into blocks with sharp precise-angled corners and absolutely level surfaces enabling a wall to be equally as precisely and finely built. Additionally, local building methods also played a part in wall construction; as we shall see, the customary method for gneiss walling on the Cyclades was sometimes applied to marble walling on the islands. Thus, different constructional techniques are applied with walls in Greek architecture according to the stone used, the status of the building, and local customary building methods.

The following examination of Cycladic walling will be divided according to the two main considerations, which are sometimes inter-related, in wall construction; these are: Wall Structure (as exemplified by its transversal cross-section) and Wall-Face Jointing (*i.e.* its external joint-pattern). Within Wall Structure there are divisions according to whether a wall has a full ashlar construction, a full rubble construction, or a mix of both – *i.e.* 'heterogeneously skinned' construction. Wall-Face Jointing is divided into four sections, each dealing with one of the main types of blocks used in Cycladic walling – Ashlars, Trapezoidal blocks, Polygonal blocks and Rubble masonry; within these, the various types of joint patterning is examined. Finally, the chapter ends with a detailed examination of several of the characteristic features found in Cycladic wall construction: stacked jointing, quoining and wall plastering.

³ Cf. Dictionnaire, I, p.55.

WALL STRUCTURE

The 'structure' of a wall in the present context is its composition from front to back, that is its transverse cross-section. The structure of a wall is often related to its function and, especially if it is the wall of a building, the status of that monument. Thus, fortification walls often have a large amount of internal fill between the two faces, while the walls of many monumental buildings are composed of either a single row of ashlar or two rows close together with no fill in between. In contrast, the walls of many vernacular buildings in Greece were formed from two 'skins' of rubble which were bound together with a packing of earth and small stones and, as we shall see, on the Cyclades in particular, one finds a 'monumentalisation' of this technique whereby the walls of many high-status buildings have an exterior skin of ashlar or regularly cut rubble and an interior skin of less well-worked stones, the two bonded with an earth packing.

Thus, in the following study of the walls of buildings, their structure is categorised according to whether they are composed wholly of ashlar ('full ashlar construction'), wholly of rubble ('full rubble construction'), or of two differently composed skins ('heterogeneously skinned construction').

FULL ASHLAR CONSTRUCTION

(See also Table 3a)

At the start of the seventh century on the Greek mainland, large rectangular blocks of stone (ashlar) began to be used, instead of mud-bricks, for the main walls at certain temples.⁴ Depending on the thickness of the wall (which is related to the overall size of the building), either a single row, or a double row of similar-sized ashlar are employed (Fig.1, A.i, ii);⁵ the use of two rows of smaller, more manageable blocks is naturally more economic in labour costs than a single row of very large blocks. When a double row of ashlar forms the wall structure of a building, the rows often have a small gap between them since the invisible backs of the blocks are usually only roughly worked; this gap is normally left empty as the tightness of the

⁴ E.g. Isthmia, Temple of Poseidon, early 7th C.; Corinth, Temple of Apollo, early 7th C.; Delphi, 1st Temple of Athena Pronaia, late 7th C.

⁵ Three rows are used in the main walls of the Hellenistic Didymaion (cf. Martin, *Manuel*, p.406, pl.22.3), and at the Hieron in the Sanctuary of the Great Gods on Samothrace (*Samothrace*, III, pl.103).

blocks on all the other joints, as well as the clamping and dowelling, make any extra 'binding' material superfluous.⁶

On the mainland, in Sicily and South Italy, and in Asia Minor, the main local stones (marble, limestone and poros) all lend themselves well to full ashlar construction because they can be fairly easily cut into precise rectangular blocks. However, on the Cyclades the physical properties of the native granites, gneisses and schists do not readily permit the stones to be shaped with geometrical accuracy, so it is usually only marble and occasionally poros that is used for ashlar walls.⁷

Full ashlar wall construction became the prevailing method for many public buildings in Greece by the end of the Archaic period;⁸ on the Cyclades, however, it was still uncommon at this time, the islanders preferring to use the heterogeneously skinned walls of stone.⁹ One of the earliest buildings on the islands with a full ashlar wall structure may have been the Poros Temple on Delos, and this was very probably built by the Athenian tyrant Peisistratos.¹⁰ In addition, the two Archaic monuments built by Cycladic building-groups and which possess complete ashlar wall structures, have a possible simple explanation for their 'non-traditional' walling: both the Knidian Treasury (mid VI century) and the Athenian Treasury (c. 490) at Delphi were probably designed by non-Cycladic architects.¹¹ On Thasos, however, the full ashlar marble wall structure of the Ionic temple in the Herakleion (c. 500) and of the contemporary Temple of Athena on the acropolis above the city have no specific extraneous explanations, since gneiss was also locally available, other than general influence from the mainland and the East.¹²

⁶ Small stones and off-cuts are, however, more common as a fill in certain ashlar walls in Ionia; cf. Martin, *Manuel*, p.404. See also page 80, note 22.

⁷ The few times that gneiss is carefully squared into ashlar, it is backed with a much less regular skin of rubble on the interior, thus being a heterogeneously skinned wall construction; see page 83.

⁸ Other types of wall are sometimes used: e.g. rubble for the small prostyle temple (mid 5th C.) in the Athena Sanctuary at Sounion; mud-brick for the Tholos in the Athenian Agora (c. 465).

⁹ See pages 79-84.

¹⁰ The poros orthostates are extant (*EAD*, XII, pp.210-212, figs.265-268). For Athenian links, see page 24, note 66.

¹¹ i. Martin, *Manuel*, p.400 + n.1, fig.175; ii. *FD, TrAth*, pp.14-16, pls.F-R. At the Knidian Treasury the pseudo-isodomic wall coursing on the Knidian Treasury is typically Asiatic (see page 91), while the use of Parian marble, the Ionic frieze, island clamp types and the monolithic door frame is typically Cycladic; for the Athenian Treasury, see page 131, note 29.

¹² i. *ET*, I, pp.75-76; ii. C. Picard, 'Fouilles de Thasos', *CRAI*, 1912, p.214.

It is not until the start of the Classical period, and the construction of the peripteral Great Temple of Apollo on Delos, that one can state without reservation that Cycladic architects and masons adopted the full ashlar wall structure. The marble blocks of the main wall courses (varying in length between 0.81 m. - 1.28 m., in height between 0.33 m. - 0.36.8 m., and approximately 0.37 m. in width) are laid in two rows, although the meagre number of extant blocks prevents one from establishing whether there were any 'headers' spanning both rows.¹³ Yet even in adopting full ashlar for the walls of the temple, native Cycladic customs are maintained in the omission of orthostates at the foot of the wall; the three lowest courses are stippled on the exterior so as to present the appearance of a single course of orthostates.¹⁴ Indeed, the frantic building activity on Delos in the first few decades of the Amphictyony did not weaken the grip of heterogeneously skinned walls which were even used for high-status buildings (e.g. the four new Treasuries) in the Sanctuary of Apollo. During the rest of the fifth century only the Temple of the Athenians (c. 425-417) employed full ashlar wall structure, in keeping with major Athenian temples at this time.¹⁵

The increased number, however, of fourth-century Cycladic monuments that possess full ashlar wall structure reveals that by the end of this century this type of wall was fully assimilated into Cycladic constructional practices. Furthermore, the status (known or presumed) of these buildings befits their use of this 'premier' wall structure: thus, on Paros, the Ionic Peristyle Building and the Tholos are perhaps to be identified as the Prytaneion and a Shrine of Hestia;¹⁶ the Temple of Apollo Pythios was a large (hexastyle amphiprostyle), stately sacral building, and the Archilocheion was a heroon to the island's famous poet;¹⁷ and on Delos the 'North Building' in the Sanctuary of Apollo is most likely the *Graphe* – the picture gallery – mentioned in inscriptions.¹⁸

As one can see from Table 3a, the third century shows, if anything, an increase

¹³ *EAD*, XII, pp.63-67, figs.78-87, pl.10.

¹⁴ See page 89, note 53, and Appendix 1 for omission of orthostates in Cycladic architecture.

¹⁵ *EAD*, XII, pp.142-162, figs.168-204, pl.18.

¹⁶ i. *AA*, 1982, pp.641-642, fig.3; ii. *AA*, 1972, pp.421-422, fig.6b. Identification *cf.* *AA*, 1982, pp.648-675.

¹⁷ i. Schuller, *Artemis-Tempel*, p.116. ii. *AA*, 1982, p.282.

¹⁸ *EAD*, V, p.58. For identification *cf.* Hellmann, *InscripDél*, p.90.

in the numbers of full ashlar construction on the Cyclades, especially on Delos. Again it is essentially limited to temples and stoas, the latter now being the customary dedicatory gift of the Macedonian and Pergamene royal lines. Indeed, the Monument of the Bulls, the Stoa of Philip, and the Stoa of Antigonos all possess architectural traits that indicate Macedonian architects, and the full ashlar walls of these buildings are probably directly due to the 'foreign' architects.¹⁹ Economy prevails at the South Stoa on Delos (c. 270-230) for only the side walls of the actual colonnade are in full ashlar masonry (Pl.41); all other walls are of heterogeneously skinned construction.²⁰ However, in the years following the end of Delian Independence in 166 B.C., there is a complete absence of full ashlar wall structure. As discussed more fully below, this is in contrast to, and probably a result of, the huge contemporary increase in rubble wall structure, factors both related to the rapid economic and social development of Delos at this time.

It is unfortunate that the archaeological record of Naxos and Paros during the Hellenistic period is exceedingly poor, but, given the earlier examples on Paros, one can presume that full ashlar walls were constructed on that island at least. The apparent absence of full ashlar structured walls on Tenos is also notable, because from the start of this period the Sanctuary of Poseidon and Amphitrite was flourishing. This may be related to the fact that there is no evidence for the main buildings being the gifts of 'foreign' donors. However, the new amphiprostyle Temple of Poseidon (E2) may well have had full ashlar masonry but there is now no evidence for the main wall structure.

HETEROGENEOUSLY SKINNED CONSTRUCTION (See also Table 3b)

One of the most common forms of wall structure in the Cyclades is that of a 'heterogeneously skinned' construction (Fig.1, B.i, ii).²¹ This type of wall consists of two skins, each constructed differently: the outer skin is always composed of larger, often well-dressed and closer fitting blocks; the inner skin is formed from stones that

¹⁹ See pages 205, note 58; 216-217.

²⁰ See page 93.

²¹ As termed in *Dictionnaire*, II, p.30. Martin, *Manuel*, pp.392-395 has a brief and somewhat inaccurate account of Cycladic and Asiatic heterogeneously skinned walls.

are smaller and less well-cut, if indeed shaped at all. There is considerable use of small stone tablets which are inserted into the vertical and occasionally horizontal joints of the blocks to fill spaces and level courses; as we shall examine later, this can become quite stylised with fairly prominent stacks of tablets assuming a decorative nature within the wall. The two skins are usually bonded together by a fill of earth and small stones which must have been inserted and packed tight as each 'course' was put up.²² Occasionally a stone will stretch between both skins further reinforcing the wall.

Heterogeneously skinned walling on the islands would seem to have developed from the basic rubble wall structure (the first type of stone walling used in post-Mycenean Greece, including the Cyclades), the difference in the new type being that the exterior skin is composed of more regularly cut blocks, thus giving the whole wall a neater, more prestigious appearance.²³ It is used for a variety of buildings whose status merits a more 'monumental' walling. Although the earliest known examples of heterogeneously skinned walls date only to the mid sixth century, from then onwards up to the start of the Classical period many Cycladic monuments have walls of this type.

The external appearance of walls with a heterogeneously skinned structure can show a full and diverse range of types; thus, it is most appropriate to divide this wall structure into two main types on the basis of whether the *exterior* skin of the wall is composed of either A) ashlar masonry or B) rubble masonry; there is also an occasional hybrid type (A/B) between these two divisions.

Type A: Ashlar masonry exterior (Fig.1, B.i)

This type of exterior is used, as one would expect, on the more carefully constructed monuments. In the sixth and early fifth centuries not only are the vast majority of Cycladic buildings heterogeneously-skinned, but also they have ashlar

²² This fill has sometimes been regarded as the central core or '*emplekton*' mentioned by Vitruvius in his description of rubble walls (*De Architectura*, II, 8, 7), but this now seems erroneous: cf. R. A. Tomlinson, '*Emplekton* masonry and "Greek Structura"', *JHS*, 81, 1961, pp.133-140.

²³ Pace Martin (*Manuel*, p.393): '*Le principe et l'origine de cet appareil se laissent clairement reconnaître dans le soubassement des murs de la cella de l'Héraion d'Olympie*' (c. 560); there each orthostate is backed by 4 courses of smaller blocks (on top of which came mud-brick), however this is not directly comparable to - and highly unlikely to be the origin of - full-height heterogeneous walls on the Cyclades where there was no tradition of mud-brick.

masonry on their exterior facing.²⁴ As Table 3b shows, marble is the most commonly used stone for the exterior skin. Approximately half of these monuments also have marble on the inner skin, the other half using gneiss or schist. Regardless of the stone used, the inner facing is usually left fairly rough presumably the better to accept a coating of plaster, patches of which still remain on some buildings.²⁵

Several significant Archaic monuments with this type of wall structure are worth noting: i. the prominent, Ionic hexastyle 'Town Temple A' in Parikia on Paros which is the largest known building where it is used; ii. the Temple of Artemis in the Delion on Paros, which is the first extant example of an orthodox Doric order on the Cyclades; iii. the exquisite Siphnian Treasury at Delphi; and iv. the Temple of Athena at Karthaia on Kea, which presents the best extant example of this type of masonry, the double-skinned walls still standing over 1 m. high (Pl.42).²⁶

Since in the Archaic period ashlar exterior skins are nearly always limited to prestigious buildings, or at least buildings with a religious/cult function, one can reasonably assume that this type of wall structure was considered by Cycladic architects as the prime technique for their important monuments which were built according to local custom and not to the dictates of 'non-Cycladic' commissions; indeed, as has already been noted, there is no known native construction on the islands at this time with walls of a full ashlar structure.

In the Classical period, despite the knowledge of complete ashlar wall structure (as adopted at the Great Temple of Apollo, and presumably 'imposed' at the Temple of the Athenians and 'Building GD 42'),²⁷ heterogeneously skinned walls with ashlar exteriors continued to be built, even for quite highly prestigious monuments. Treasury I and Treasury II (c. 475-450) in the Sanctuary of Apollo on Delos are certainly constructed according to this method (Pl.43),²⁸ while one can also postulate this wall

²⁴ This type of wall structure is predominantly limited to the Cyclades and Thasos; however, there are a few occurrences on the periphery of the archipelago: *e.g.* Samothrace, the Hall of Votive Gifts (c. 540); Rhamnous, Temple of Themis (early 5th C.); Ephesos, Heroon (Hellenistic): *cf.* Martin, *Manuel*, p.394 - also, erroneously, citing the North Stoa at Samos (c.570-560).

²⁵ See page 115.

²⁶ i. *AA*, 1982, pp.205-213, figs.9, 12; ii. Schuller, *Artemis-Tempel*, pp.18-20, figs.20-25, 64, pls.101-102; iii. *FD, TrSiph*, pp.84-116, 141-143, figs.73-82, 139-140, pls.65, 105; iv. Østby, *OpAth*, p.200, figs.12-15.

²⁷ See page 78.

²⁸ *AHHD*, II,i, p.57.

structure for the adjacent Treasuries III and IV, given chronological, topographical and other architectural similarities with the first two treasuries. The façade of the first stage of the 'Temple of the Dioskouroi' in the Samothrakeion is the other Classical instance of this type of walling.²⁹ The relatively few Classical examples of ashlar-faced heterogeneously skinned walls must, of course, be seen in the context of the general paucity of monuments on the Cyclades in the Classical period. However, it is interesting to note that the fifth-century houses in the Hermes' Gate and Silenus' Gate Quarters in Thasos town have exterior wall facings of small marble blocks (0.30 - 0.35 m. high, 0.40 - 0.45 m. long) laid 'in regular courses and with careful jointing' which are backed with an inner skin of gneiss rubble.³⁰

In the Hellenistic age this particular type of wall structure continues to be used on a number of monuments although now found on more islands than previously, and, as Table 3b shows, on more diverse types of building including small temples, stoas, a gymnasium, a hestiatorion and several buildings of an indeterminate function. The Oikos-Hestiatorion in the Asklepieion on Delos (c. 323-302) is notable for having an ashlar exterior skin of granite (Pl.44); granite is rarely fashioned into square-cut ashlar due to the hardness of the stone, and moreover its appearance here signals the resumption in the use of granite in Delian architecture after its absence in the Classical period.³¹ Most buildings still use marble for their exterior ashlar facing, although in addition to the Oikos-Hestiatorion, the Monument of Granite on Delos (c. 150-100) uses not only granite, the blocks of which are c. 0.50 m. high and can attain over 2 m. in length, but also large slabs of gneiss, c. 0.25 m. high and up to 1.50 m. in length, which are sometimes 'sandwiched' between the more massive granite blocks.³² The roughly contemporary House of the Hermes on Delos is equally notable; the exterior skin of its front wall is composed entirely of large granite ashlar and still stands over 2 m. in height (Pl.45).

²⁹ *EAD*, XVI, p.60, fig.79.

³⁰ Martin, *Thasiaca*, p.175; the blocks' size and careful shaping allows them to be termed 'ashlar'.

³¹ *EAD*, XX, p.69. For the resumption in the use of granite in foundations see pages 69-70.

³² *EAD*, XXIV, pp.73-75, pls.23, 61 (107-110), 62 (116); for alternate coursing between granite and gneiss, see pages 93-94.

Type B: Rubble masonry exterior (Fig.1, B.ii)

The second type of heterogeneously skinned walls is where the exterior skin is of rubble masonry. This wall structure is distinguished from 'full rubble masonry' (discussed below³³) by the fact that the outer rubble skin is of a significantly better worked standard, and often of larger individual blocks, than that of the interior skin. The use of gneiss characterises this type of wall structure which is not, in fact, particularly common in either the Archaic, Classical or Hellenistic period.

The single Classical example – the court wall at the Archegeion on Delos (c. 480-475) – represents the best standard of this type of wall, for its exterior skin is composed of gneiss blocks which are so well squared and neatly coursed that one could almost term them 'ashlar masonry' if it were not for their relatively small size (c. 0.30 - 0.40 m. long, c. 0.10 - 0.15 m. high) (Pl.46).³⁴

During the Hellenistic period, heterogeneous walls with rubble exteriors are slightly more numerous than in previous periods. All are found on Delos and occur equally before and after Delian Independence in 166. These walls are used for small temples outside the main sanctuary which are thus of lesser general import: at the 'Chapel' at Fourni, at the temple in Theatre Sanctuary C and at Temple G in the Agora of Theophrastus.³⁵ They are also employed for some fairly major public or utilitarian buildings, for instance: the South Stoa's rear wall, the L-shaped Stoa in the Delian Agora and the Hypostyle Hall.³⁶ These last examples show that in the Hellenistic period, when many important administrative or utilitarian buildings were not of marble, they were still given a fairly regular, neat treatment on their exteriors.

Type A/B: Mixed masonry exterior

As stated above, there are a few heterogeneously skinned walls where the exterior skin is composed of both large-block masonry and rubble. This 'mixed masonry exterior' is the result of the use of 'stacked jointing' between large blocks. A detailed examination of this 'stacked jointing' in both heterogeneously skinned walls

³³ See page 84-86.

³⁴ BCH, 86, 1962, Chron., pp.960-961, fig.1. The gneiss north wall of the 6th C. Letoon on Delos is similarly composed: EAD, XXIV, pp.38-40, pls.5, 51 (53). For definition of rubble, see pages 74-75.

³⁵ i. cf. BCH, 71-72, 1947-1948, Chron., pp.412-414; ii. + iii. personal inspection.

³⁶ i. + ii. cf. AHHD, II.i, p.54; iii. personal inspection (EAD, II.i, pp.19-21 makes no distinction between the skins).

and full rubble walls is found at the end of this chapter.³⁷

The final major type of wall structure that is found on the Cyclades is that of:

FULL RUBBLE CONSTRUCTION

(See also Table 3c)

In this category of wall structure the exterior and interior wall skins are both composed of rubble stones and, significantly, are virtually no different from each other either in the sizes of the stones used or the general mode of construction (Fig.1, C.i, ii; Pls.47-48). During the Dark Ages in Greece, after the collapse of Mycenaean society, rubble construction seems to have been the only practised type of stone walling, although in fact on mainland Greece the main walls of buildings are usually of mud-brick upon protective stone socles. On the Cyclades, however, where finding suitable clay was evidently more of a problem than using the widely available and easily split gneisses and schists, rubble is most often used for complete walling in pre-Achaic times for both houses and shrines (barely distinguishable from each other in form or construction, before the seventh century).³⁸

In all periods rubble walls are essentially of two skins, not just to provide the necessary width of wall (on average 0.50 m. - 0.80 m.)³⁹ while using relatively small and manageable stones, but also to allow the stones of each skin to interlock (their rears are sometimes pyramidal in shape to aid this process), thus lending general stability to the wall. A fill of earth and small stones packed between the skins and occasional large stones spanning the width of the wall provide bonding.⁴⁰ This fill is nearly always present and still visible, although it is not often mentioned in reports and publications. Water and sand may sometimes also have been added to this fill, thus creating a simple mortar, although this is now quite difficult to establish on visible

³⁷ See pages 110-112.

³⁸ E.g. 8th C. buildings at Zagora on Andros (*Zagora*, I, pp.22-23); late Geometric houses (c.750-700) at Kastro on Siphnos (J. K. Brock, 'Excavations on Siphnos', *BSA*, 44, 1949, pp.6-16, pls.4-5; and the buildings at Koukounaries on Paros continuously occupied from late Mycenaean times until the Archaic period, including the 'Temple of Athena' dated to c.700 (*Ergon*, 1989, p.118). Early 'historic' examples of rubble walls outside the Cyclades are found at Geometric buildings on Samos: H. J. Kienast, 'Topographische Studien im Heraion von Samos', *AA*, 1992, p.173, figs.1-2.

³⁹ Cf. *AHHD*, II.i, pp.76-77.

⁴⁰ See page 80, note 22.

evidence alone.⁴¹ There is a single known instance on the Cyclades of a 'lime mortar' used to bond the rubble walls of two '*boutiques*' in the Theatre Quarter.⁴²

As examined in more detail below,⁴³ the actual appearance of rubble walls can vary depending on the care lavished on the shaping and jointing of the individual stones; thus they can be 'coursed', 'irregular' and even 'rough'. The materials used for both skins are generally exactly the same, except that on Tenos there is a distinct local tendency for the exterior skin to be of one type of stone and the interior of another, although the actual size of the stones and the method of construction is exactly the same in both facings (and so not allowing these walls to be classed as 'heterogeneously skinned' in structure).

For a large part of the Archaic period, full rubble construction remains a major method of walling for buildings of high as well as of lowlier status, although by the late Archaic period it appears to be increasingly relegated to both more minor buildings and less visibly important walls, while heterogeneously skinned construction is increasingly employed for some of the more important buildings. The two late Archaic examples of rubble walling are indicative: on Kea it is used at the small, local Temple of Apollo at Koressia, and for just the door wall at the peripteral Temple of Athena at Karthaia.⁴⁴

In the Classical period there are relatively few examples of this type of wall structure and the known instances, all on Delos, again are widely illustrative of the roles that rubble walling was deemed suitable to fill. The Prytaneion and the Palaestra of the Lake are centrally located buildings with administrative and civic functions which cannot have been considered important enough to warrant more visually impressive walling.⁴⁵ In the Samothrakeion sanctuary in the Inopos valley high above the main Apollo sanctuary, the 'Temple of the Dioskouroi' has only its side and back walls built with rubble masonry (the front wall is of a heterogeneously skinned nature

⁴¹ Cf. *Dictionnaire*, I, pp.50-51. An earth/clay *mortar* is stated to have been used at the Palaestra of the Lake (*EAD*, XXV, p.81) and at many houses in the Theatre Quarter (*EAD*, VIII, p.242).

⁴² *Boutique* 51 on *Rue de Theatre* and at Boutique 49 on *Ruelle δ* of *Insula III* (*EAD*, VIII, p.242). For lime mortar, cf. *Dictionnaire*, I, pp.50-51; R. A. Tomlinson, 'Emplekton masonry and "Greek Structura"', *JHS*, 81, 1961, pp.137-139.

⁴³ See pages 103-109.

⁴⁴ i. Lauter, 'Koressia', pp.9-10, figs.4-5; ii. Østby, *OpAth*, p.200.

⁴⁵ i. personal inspection; ii. *EAD*, XXV, pp.80-81.

with an exterior skin of marble ashlar); rubble is used throughout the Sanctuary of Artemis Lochia which is 'hidden' from the main sanctuary on the south-east slopes of Mount Kynthos; and the actual function of the rubble structured 'Temples of Replat', located to the east of the Apollo Sanctuary, is unknown.⁴⁶ In most of these cases granite and gneiss (and marble at the 'Temple of the Dioskouroi') are used in fairly regularly worked blocks together with piles of gneiss levelling courses and filling gaps, in what can be termed 'coursed rubble'; only at the Artemis Lochia sanctuary are the stones unworked and randomly laid in 'rough rubble' walling.

In the Hellenistic period, when construction of both monumental and domestic buildings flourishes generally on the Cyclades, rubble structured walls become extremely common, with almost half of the monumental buildings on the islands having this type of wall – see Table 3c. The great majority of these are on Delos, reflecting the needs of the growing population for both institutions and amenities. The increased wealth brought about by commerce, especially after the granting of 'free port' status after 166, is reflected in the quantity and range of new construction rather than in the actual quality of the wall construction. In this period, not only are the types of buildings with rubble structured walls even more varied than in the Archaic and Classical periods, embracing almost every building type apart from the most prestigious temples and stoas, but also after 166 most of the rubble walls are built with unworked stones in 'rough rubble' construction, further indicating the wish for rapid and economic construction.

⁴⁶ i. EAD, XVI, p.60; ii. AHHD, I, p.76; iii. EAD, XI, p.296.

WALL-FACE JOINTING

The pattern of wall-face jointing, as created by the shape and positioning of each individual wall block, is usually the most visible aspect of any unplastered wall, bestowing upon it and the building as a whole a certain character dependent largely on the orderliness of the joints. As we shall see within each type of wall structure, there are specific and different ways in which the stones are fitted together. The very nature of ashlar wall structure with its use of square-cut blocks immediately ensures a regularity of jointing pattern in its wall-face, while at the other extreme a rubble wall structure composed of rough rubble has no intended pattern, and was often plastered over. The decorative possibilities of wall jointing were well understood by the Greeks and the Cycladic islanders added to the usual repertory of wall decoration by exploiting the natural cleavage properties of gneiss, in particular in the creation of 'stacked joints', and also by sometimes disguising the jointing by hammer-working the entire wall surface.

The following examination of wall-face jointing will deal primarily with the exterior facing as this was the most often viewed face.

One can initially divide all the types of wall facing into four categories depending on the main type of block used: Ashlar masonry; Large-block Trapezoidal masonry; Large-block Polygonal masonry; and Rubble masonry.

The first three categories all involve blocks of sufficiently large size so as to distinguish them immediately from the smaller rubble stones. Additionally, the first three types are examined in this order, in reverse of their generally accepted chronological origins, since ashlar masonry is the most common style for Cycladic monumental buildings, followed by trapezoidal, and then polygonal masonry.

ASHLAR MASONRY

Ashlar masonry, also known as 'rectangular' masonry,⁴⁷ is formed as one would expect from ashlar – large, rectangularly or square-cut stones that are generally too massive to be handled by a single person. The blocks are cut with right-angled corners, the top and bottom beds are horizontal and the side joints are vertical, although the quality of the work varies according to the degree of tooling used; in addition, if the

⁴⁷ Cf. *Dictionnaire*, I, pp.98-99.

wall structure is composed of two skins, it is sometimes only the forward visible joints and angles that are carefully worked and touching. One should note that this masonry does not belong exclusively to walls with a 'full ashlar structure', for it is also used for the exterior skin of many heterogeneously skinned walls.

Ashlar masonry constitutes the most usual type of wall construction for monumental buildings in the Greek world, as well as being employed for a significant number of retaining walls and fortifications. It is also a rapid method of construction once all the blocks have been delivered to the construction site, although any economy that this might achieve is likely to be offset by the time and labour involved in the careful shaping of the blocks by the masons.

Joint patterning within ashlar masonry can be achieved by two means; firstly by occasionally varying the length of a block within a course (normally a natural result of laying a header, running through the thickness of two rows of ashlar, at intervals), and secondly, and more usually, by varying the heights of the individual courses; it is this last treatment that we shall concentrate on in the following examination of wall-face jointing. Ashlar masonry can thus be classified according to whether the courses are: a) Uniform; b) Alternate; c) Varying; or d) Broken. All four categories of ashlar masonry are found on the Cyclades. (Table 4a lists the Cycladic and Thasian monuments with these types of ashlar masonry).

a) Uniform courses

When all the courses above the orthostates are of equal, or apparently equal, height, the masonry can be said to be of 'uniform' courses. This type of coursing is also known as 'isodomic' but since this term can also imply that the blocks are not just of the same height but also of the same length,⁴⁸ and since this complete regularity of block dimensions is hardly ever found on the Cyclades, it seems best here to avoid this term. Uniformly coursed masonry is the most popular ashlar style for temples and other less eminent buildings both on the mainland and in the western colonies from the early sixth century onwards.⁴⁹ However, it is not a usual feature of native Cycladic

⁴⁸ Cf. Lawrence, *GkArch*³, pp.226-227; *Dictionnaire*, I, p.98, n.14 + p.99.

⁴⁹ For examples, cf. Martin, *Manuel*, pp.387-388, figs.170a, 173a, 174, 176, 182a; Orlandos, *Matériaux*, II, pp.140-146, fig.160; *Dictionnaire*, II, pp.33-34, pls.16.1, .3-5, .10, 17.1-2.

architecture until the fourth century and the adoption of a full ashlar wall structure.⁵⁰

Uniform courses are apparently first used by Cycladic building-groups at the Athenian Treasury at Delphi, constructed *c.* 490 (Pl. 84),⁵¹ however, this building is in many ways an Attic design, and so its wall coursing can perhaps be attributed more to Athenian rather than Cycladic taste.⁵² Not long afterwards, though, uniform coursing was being employed on the Cyclades themselves – in no less a building than that of the peripteral Great Temple of Apollo (*c.* 475-450) on Delos.⁵³ Again, Athenian architecture is undoubtedly the primary source of influence for this style of masonry owing to the islands' proximity to the mainland and to the strong Athenian political influence over the archipelago at this time. As one would expect the Athenian Classical monuments on Delos are built with uniform courses. At both the Temple of the Athenians and 'Building GD 42' the marble blocks are of both uniform height and length, their walls thus presenting a true isodomic appearance.⁵⁴ It is not until the fourth century, however, that Cycladic architects are evidently freely designing walls of buildings with uniform courses, as indicated by many of the surviving late Classical and early Hellenistic monuments: i. the Tholos, ii. the Archilocheion, iii. perhaps the Ionic Peristyle Building on Paros; and on Delos, iv. the *thalamos* of the Monument of the Bulls, v. the Dodekatheon, and vi. the Temple of Asklepios.⁵⁵

Two of the best extant Cycladic examples of ashlar masonry with uniform course heights are to be found at the unexcavated and largely unknown Sanctuary of Apollo, now incorporated into the monastery of Kalamiotissa, on the small Cycladic island of Anaphe.⁵⁶ Large marble ashlar, presumably from the temple cella itself, have apparently been carefully reused to build a complete monastic building *c.* 11 m. x 18

⁵⁰ See pages 76-79.

⁵¹ FD, TrAth, pp.14-16, pls.Y-Z.

⁵² See page 131, note 29.

⁵³ EAD, XII, pp.63-64; *cf.* AHHD, II.i, pp.61-62. The first three courses, however, are of visibly different heights (0.449 m., 0.423 m., 0.382 m.), but they are given a stippled surface treatment to make them appear as a single, high course of orthostates. The courses above also decrease in height towards the top of the wall, but so slightly (*c.* 0.005 m. per course) as to be imperceptible.

⁵⁴ i. EAD, XII, pp.57-67, pl.10; ii. M.-Chr. Hellmann, 'Un Problème d'architecture et d'épigraphie déliennes', BCH, 104, 1980, p.158.

⁵⁵ i. AA, 1972, p.422, fig.6; ii. AA, 1982, p.282, fig.2; iii. AA, 1982, pp.641-642, fig. 3; iv. AHHD, II.i, p.65; v. EAD, XXII, pp.66-69, pls.D-G; vi. EAD, XX, pp.78-81, figs 51-53.

⁵⁶ Thera, I, pp.353, figs.3-7.

m., and still standing c. 6 m. high (Pls.49-50); thus, since the vast majority of these ashlar blocks are of uniform height it seems reasonable to suppose that the ancient cella was also in this style. In addition, the extensive remains of the large peribolos wall are of roughly hammered, marble ashlar blocks (1.20 m. long x 0.50 m. high) in uniform courses with plumb-line rebates at the angles (Pl.51); a date of the fourth or third centuries would seem to fit well with the known styles of both the temple and the peribolos wall.

However, there are fewer third and second-century monuments with uniform ashlar masonry, not just because of a total absence of full ashlar wall structure after Delian Independence in 166, but also perhaps as a direct consequence of there being a greater use of alternate course heights.⁵⁷ The monuments with uniform ashlar masonry are the temple in Sarapieion B (on the façade only; end III century), and Temple F in Sarapieion C (c. 200-150) where poros blocks are used in a regular system of headers and stretchers (Pl.52).⁵⁸ It is also likely that the two Ionic distyle Oikoi (c. 281-225) in the Kynthion Sanctuary had walls of uniform ashlar since this style is employed for the marble peribolos wall and the granite terrace walls of the sanctuary. Granite, although relatively hard to work, would of course have been the natural choice of stone for the large supporting walls of the sanctuary as it is the natural rock of Mount Kynthos.⁵⁹ Another notable occurrence of a granite uniformly coursed ashlar wall is, in fact, in a domestic context: the north exterior wall of the second or first-century House of the Hermes on Delos still stands in six uniform courses to over 2 m. high (Pl.45). Finally, it is interesting to note that of the numerous Classical and Hellenistic towers on the Cyclades, most of which are constructed from large-block trapezoidal masonry, a couple are of ashlar masonry with uniform heights – the Cheimarros tower on Naxos (late Classical – early Hellenistic) which is one of the best preserved island towers, its fine marble masonry still standing to a height of 15 metres, and the 'Sto Phlambouro' tower on Siphnos (probably III century) built of

⁵⁷ See pages 91-94.

⁵⁸ i. personal inspection; ii. Roussel, *CED*, p.56, fig.9.

⁵⁹ Oikoi: *EAD*, XI, p.87; *AHHD*, II.i, p.59, n.3. Peribolos + terracing: *EAD*, XI, pp.76-82, figs.8-9, 59-62, pl.3.

limestone and marble.⁶⁰

Thasos offers no example of this masonry style on a monumental building;⁶¹ the preferred style on that island seems to have been for alternate course heights.

Thus, the extant instances suggest that ashlar walls with uniform courses are an integral masonry style on the Cyclades from the start of the Classical period, and have their greatest vogue between 350 and 200 B.C. This walling was obviously regarded as a superior type for it used especially on buildings with considerable status; in fact, nearly all the buildings with uniform ashlar masonry are temples. Thus, this style is also often associated with marble, although even the monuments built with ashlar of granite or poros are of considerable prestige.

b) Alternate courses

In this style of ashlar masonry the courses are of two (occasionally more) markedly different heights which are so placed that they alternate regularly with each other. Alternate course masonry is also known as 'pseudo-isodomic',⁶² but this term is avoided here because a variant meaning of pseudo-isodomic is where *all* the courses are of different heights (thus corresponding to masonry of 'varying courses' as described below⁶³). This style evolved early in the sixth century if not before, perhaps in the Eastern Aegean area as many of the sixth-century examples suggest;⁶⁴ indeed, in the Classical and Hellenistic epochs, alternately coursed ashlar masonry is found primarily in this region to which it thus became closely associated.⁶⁵

This systematic alternation of courses very probably has structural rather than decorative origins, most likely deriving from a course of single header blocks or slabs

⁶⁰ i. Ph. Zaphiropoulou, Naxos, Monuments and Museum, (Krene Guides, Athens, 1988), fig. 18; ii. Ashton, SiphTwrs, pp.86-87.

⁶¹ The Akeratos lighthouse (6th or 4th C.) is uniformly coursed for the majority of its courses: T. Kozelj, M. Wurch-Kozelj, 'Phares de Thasos', BCH, 113, 1989, pp.172-175, figs.12-13.

⁶² Lawrence, GkArch³, p.227; Dictionnaire, I, p.99; Orlandos, Matériaux, II, pp.146-152 (in relation to ashlar masonry only).

⁶³ See pages 94-97.

⁶⁴ E.g. the Knidian Treasury, Delphi (mid 6th C.); Altar of Poseidon at Cape Monodendri (mid 6th C.); Chian Altar of Apollo, Delphi (end 6th C.). The oldest representation of this masonry style is, however, on a building on the 'Olive Tree' pediment (c. 570-560) from the Athenian Acropolis.

⁶⁵ For examples, cf. Martin, Manuel, pp.399-406, figs.166, 170b, 172, 173b, 177-181, 182b-c; Orlandos, Matériaux, II, pp.146-152, figs.165-168; Dictionnaire, II, pp.33-34, pl.16.2, .6-.9

at intervals spanning and linking the two skins of a wall. Early examples of this method occur on full ashlar wall structures, where both skins are of ashlar (as at the Knidian Treasury at Delphi, mid VI century),⁶⁶ and on heterogeneously skinned wall structures where the exterior skin is of ashlar and the interior one is of rubble (as at the 'Town Temple' A in the main town on Paros, c. 525).⁶⁷

'Town Temple' A is, in fact, the only known Archaic building on the Cyclades whose walls have alternate course heights. Nor are there any Classical Cycladic instances of this style. This lack of use on the Cyclades suggests that it was a style not appreciated by the islanders.⁶⁸ Thus, its use at this major Parian Ionic temple, prominently located in Paros and one of the largest buildings (c. 17 m. x 35 m.) in the Cyclades at that time, is perhaps to be seen as a deliberate statement where the usual Cycladic style of 'varying course heights' is abandoned in favour of a more 'cosmopolitan', indeed 'fashionable' appearance. This would entirely be in keeping with the desires of Lygdamis, the tyrant of Naxos and Paros, on whose orders the large peripteral Temple of Apollo on Naxos and this contemporary temple were undoubtedly built.

On Thasos this type masonry occurs on some of the exterior walls of the two small Archaic sanctuaries at Alikí (Pl.53);⁶⁹ yet its use here is merely decorative rather than structural for the low courses are not 'headers' spanning and bonding the inner and outer skins, suggesting that the Thasians were merely copying a style of masonry the structural mechanics of which were not appreciated. The paucity of Classical monuments on Thasos makes it difficult to infer reliably its popularity in this period; the single possible example is at the Paraskenia Building (c. 350-300) in the agora where the numerous extant tall orthostates indicate that they were probably used in two rows throughout the whole wall in conjunction with thin bonders.⁷⁰

The Hellenistic age on the Cyclades is slightly richer in alternately coursed

⁶⁶ W. B. Dinsmoor, 'Studies of the Delphian Treasuries', *BCH*, 37, 1913, pp.24-38, figs.5-6.

⁶⁷ *AA*, 1982, pp.208-209, figs.9, 16.

⁶⁸ Its use on the Cycladic-built Knidian Treasury at Delphi could equally be due to the designs of a local Knidian architect. See also page 77, note 11.

⁶⁹ North wall of the South Building: *ET*, IX, p.65, figs.57-58, 81; less consistently on south wall of the North Building: *ET*, IX, pp.18-22, figs.17, 19.

⁷⁰ *ET*, VI, pp.67-70, plan L. This style is used on some rubble-walled houses, see page 106, n. 124.

ashlar masonry, there being four separate monumental buildings built in this style: i. on Amorgos, the small (7.80 m. x 6.50 m.) distyle Temple of Athena at Minoa dating to early in the period; on Delos, ii. the sides of the South Stoa colonnade (c. 270-230) (Pl.54); iii. the Stoa of Philip V (c. 216-200) together with the later West Stoa extension; and iv. the eastern façade of the Monument of Granite (c. 150-100).⁷¹ In all these cases the walls are two-skinned and the low courses stretch right through the entire wall, thus acting as a positive bonding element; only at the Stoa of Philip and the South Stoa's colonnade wall is the inner skin also of ashlar. It is interesting to note that with the first two of these buildings one could possibly attribute the use of alternate course heights to Asiatic architectural preferences, for the South Stoa may have been partly financed by Pergamene kings, as indicated by the subjects of the statue bases in front of the colonnade (although the rest of its architecture owes little to Pergamon),⁷² while the town of Minoa on Amorgos was founded and settled by the Samians in the Archaic period. Moreover, the use of this style on the Stoa of Philip is undoubtedly due to the designs of the architect who, in this case, was most probably Macedonian as some of the stoa's architectural details reveal⁷³ – alternate course heights appear to be a favourite masonry style with Macedonians from the fourth century onwards, as exemplified on prestigious buildings, fortifications and even represented in relief wall plaster in houses.⁷⁴

However, the most conspicuous use of alternate course heights – probably then as now – is actually not on a building but on the 150 m. long East Peribolos Wall of the Sanctuary of Apollo on Delos (end IV - start III century), standing up to 2 m. high in places, where two-rowed tall orthostates of granite alternate with full-width low slabs of gneiss (Pl.55).⁷⁵ This exact pattern and combination of materials is copied on later walls – on the eastern façade of the Monument of Granite, and on the north wall

⁷¹ i. personal inspection; ii. cf. *AHHD*, II.i, pp.65-66. iii. *EAD*, VII, pp.37-43, fig.47, pl.7. iv. *EAD*, XXIV, pp.74-75, pls.24, 62 (fig.116).

⁷² Cf. *GD*, pp.118.

⁷³ See page 205, note 58.

⁷⁴ E.g. the Hieron (c. 330) and interior of the Rotunda of Arsinoe (c. 289-281) on Samothrace; the fortifications at Gortys (4th C.) and Amphipolis (Hellenistic); and interior plasterwork in a 2nd C. house in Amphipolis. Cf. Ginouvès, *Macedonia*, pp.103, 204, figs.89, 93, 175, 177.

⁷⁵ L. Bizard, 'Fouilles de Délos', *BCH*, 31, 1907, pp.475-477, figs.1-2, pl.14; *AHHD*, II.i, pp.73-74.

of House Block 59A in the *Îlot de Bijoux*.⁷⁶ In all these cases this style of masonry may perhaps be explained as the natural result of the physical properties of the stones used; for the hardness of granite makes it sensible to chisel a few large blocks of the stone rather than many small ones thereby reducing the area of stone required to be cut, while gneiss naturally splits along its laminae to form thin slabs. The alternation and contrast of the colours of the stones (light grey granite and darker brown gneiss) may also have been a desired decorative effect.

On Thasos also, alternate courses are used in a few instances of marble ashlar masonry in the Hellenistic age, all dating to around the third century; the most prestigious instance of which is the large N.W. Stoa in the agora (c. 300-280).⁷⁷

It would thus seem that ashlar masonry of alternate course heights is not a style naturally favoured by Cycladic builders for monumental buildings.⁷⁸ It has its greatest vogue on the Cyclades in the Hellenistic period when this style is common in Asia Minor; indeed, some of the Cycladic instances of its use in this period could well be related to the preferences and/or designs of Asiatic or Macedonian architects. Macedonian influence may also account for many of the Thasian examples of this style.

c) Varying courses

This type of wall-jointing is characterised by all or many of the courses being of different heights, where either the courses systematically decrease in height towards the top of the wall, or differing course heights are randomly arranged within the wall.⁷⁹ This is a relatively economic method of wall construction, for any mistake in the

⁷⁶ i. see page 82; ii. personal inspection.

⁷⁷ *ET*, VI, pp.35-38, plans F, G. Also on the podium of 3rd C. Choregic Monument I in the Dionysion: personal inspection; and possibly on the bastion of the Gate of Zeus and Hera, c. 325-300 (Martin, *Thasiaca*, p.173), although the reason for this belief – that the extant two-rowed orthostates capped and spanned by a low slab repeated itself up the wall – is not necessarily true as shown by the Rotunda of Arsinoe (c. 289-281) and the Propylon of Ptolemy II (c.285-280) on Samothrace.

⁷⁸ *Pace* Martin, *Thasiaca*, p.173.

⁷⁹ This type of ashlar coursing is not recognised as a separate category in the major handbooks. It is sometimes included in the term 'pseudo-isodomic' (Martin, *Manuel*, pp.383-384, 386-7; Delorme, *EAD* XXV, pp.19-20 in relation to the *rubble* walls of the Delian palaestras), and sometimes, together with my 'broken coursed ashlar', is included under the term 'irregular ashlar' (Scranton, *GkWalls*, p.99; Orlandos, *Matériaux*, II, pp.139-140; Martin, *Manuel*, pp.385-386; Winter, *GkFort*, p.80; Dictionnaire, I, p.99).

quarrying or trimming of an ashlar block can be rectified by cutting it down for use in another course.

-- *Decreasing course heights*

Ashlar masonry with decreasing course heights (marked 'a' on Table 4a) is found on many prestigious buildings in the Archaic period on both the Cyclades and Thasos, including the Monument of Hexagons on Delos (c. 500), the Temple of Athena at Karthaia on Kea (c. 500-480) (Pl.42), and the Siphnian Treasury at Delphi (c. 525).⁸⁰ In all these cases the walls are heterogeneously skinned, the interior skin being of rubble. This typically Cycladic wall structure reinforces the view that, at this date at least, walls with decreasing courses are also especially Cycladic and considered worthy enough to be used on these high status, marble monuments.

In contrast to the frequency of this style in the late Archaic age, the Classical and Hellenistic periods witness a reduction in its employment, which begins almost immediately after 480 B.C. with the walls of the Great Temple of Apollo on Delos which decrease in height, but so imperceptibly that they are classed as uniform courses.⁸¹ The only definite use of noticeably decreasing course heights during this time on the Cyclades is at the exedra section of the Fountain-Exedra on Tenos (c. 320-280), a prominently located and architecturally innovative, marble monument in the Sanctuary of Poseidon and Amphitrite (Fig.3).⁸² It is also probable that this type of coursing is used on the North Building on Delos (c. 400-350), for the extant marble blocks which vary in height between 0.21 m. - 0.44 m. do not have a stippled or decorative exterior surface which would point to the other possibility of courses laid in random heights (discussed directly below).⁸³ One can also postulate decreasing wall heights (extant blocks: 0.60 m. - 0.495 m.) for the bottom storey of the '*thalamos*' of the Monument of the Bulls on Delos (c. 306-290), not just for the same reason cited for the North Building, but also because this type of masonry is a more attractive

⁸⁰ i. EAD, XXXII, pp.66-69, plans 8-11; ii. Østby, OpAth, p.200; iii. FD, TrSiph, pp.84-116, pl.105. Also 'Temple GD 68' on Delos: Vallois, 'TopDél', pp.200-201, fig.12; the Ionic Temple in Herakleion on Thasos: ET, I, p.75.

⁸¹ See page 89.

⁸² Ténos, pp.77-78, pls.7b, 9. See also page 217.

⁸³ EAD, V, p.58; cf. AHHD, II.i, p.62.

counterpart to the uniform coursing of the storey above.⁸⁴

On Siphnos, there are also a few Classical and Hellenistic towers that have decreasing course heights of marble and limestone ashlar.⁸⁵ On Melos, parts of the city wall, which may possibly date on historical grounds to the years 426-416, are also in ^{Decreasing courses of} ~~uniform~~ ashlar masonry of trachyte (Pl.21).⁸⁶

-- Random course heights

Courses of many differing heights are also sometimes arranged randomly within an ashlar wall (marked 'b' on Table 4a). This method of ashlar coursing is one of the most economical as it allows blocks of many heights to be used and so reduces the amount of labour spent trimming blocks; yet known occurrences on Cycladic monuments are very few and date *only* to the sixth and early fifth centuries. These include a couple of prominent Doric distyle *in antis* temples – the Temple of Artemis in the Delion on Paros, and the Heraion B on Delos.⁸⁷ It is undoubtedly the irregular appearance of this masonry style that is the main reason for its sparsity in monumental architecture; indeed, that it was not considered suitable for these high-status marble monuments is shown by the fact that their exterior wall-faces are given a decorative stippled surface to disguise the inconsistent jointing.

This style of masonry is also sometimes used in all periods for utilitarian architecture on the Cyclades and Thasos. Instances include parts of the late Archaic Thasian city walls, the fourth-century Evraiokastro 'lighthouse' on Thasos, and the late sixth-century tower at Kambanario on Siphnos which is unusual in being of gneiss, a material that in large blocks is more usually cut as trapezoidals.⁸⁸

⁸⁴ Cf. AHHD, II.i, p.65.

⁸⁵ E.g. 'Stou Kastana' (5th C.) and 'Stou Katergou' (late 4th - early 3rd C.): Ashton, SiphTwrs, pp.58-59, fig.11, and pp.74-75, fig.19.

⁸⁶ R. C. Bosanquet, 'Excavations at Melos - the East Gate', BSA, 2, 1895-96, pp.80-81. Following the Athenian ravaging of Melos in 426 B.C and the Melians subsequent refusal to pay a disproportionate amount of tribute to Athens, one might suspect that during these years they must have prepared some defences for the inevitable Athenian retribution which infamously came in 416.

⁸⁷ i. Schuller, Artemis-Tempel, pp.17-19, 41-51, pl.98; ii. EAD, XI, pp.181-189, fig.153, pl.5 (courses I to III decrease in height). Random course heights may also have been used at the Temple of Demeter at Sangri on Naxos (c. 550).

⁸⁸ i. personal inspection; ii. T. Kozelj, M. Wurch-Kozelj, 'Phares de Thasos', BCH, 113, 1989, p.177, fig.18; iii. Ashton, SiphTwrs, pp.76-77, fig.20a.

Thus, the relatively large number of sixth and early fifth-century examples of wall courses with varying heights – both decreasing and randomly arranged – leads one to believe that this style was accepted as normal for marble ashlar masonry in Cycladic architecture at that time, and used for many prestigious monuments. Thereafter, however, this type of coursing becomes increasingly rare; the few occurrences (definite or probable) are now always with decreasing course heights. This downturn in its use is almost certainly to be linked with the adoption of uniform and alternate courses in the Classical and Hellenistic periods.

d) Broken courses

Walls of broken courses are those where the regularity of their courses are consistently disrupted by tall blocks projecting into the course above, and the use of two or more blocks making up a single course height.⁸⁹ It is undoubtedly the most rapid and economical method of ashlar wall construction as there is no requirement for the supply of blocks to be cut to precise measurements.

Broken coursing is usually associated with trapezoidal masonry, but there are a few examples on the Cyclades of it being used for walls that are largely of ashlar. The only monumental building, however, with this type of masonry is the Monument of Mithridates VI Eupator (102/1 B.C.) on Delos;⁹⁰ this small (4.30 m. x 3.05 m.), Ionic distyle *in antis* edifice is built of marble, and one can suppose that it was deliberately given this type of walling for decorative purposes rather than for purely economical reasons (although the wish for rapid construction cannot be discounted).

Classical and Hellenistic towers provide all the other instances of ashlar masonry with broken courses. At the round tower at Aghios Petros on Andros (III or II century), preserved up to a height of c. 20 m, most of the wall is composed of gneiss ashlar laid in broken courses, although towards the top the wall becomes better coursed (Pl.56).⁹¹

⁸⁹ This type of walling is often known as 'irregularly coursed' masonry, a term avoided here because of the confusion that can arise with masonry with 'varying courses'; see page 94, note 79.

⁹⁰ *EAD*, XVI, pp.22-29, figs.57-59.

⁹¹ T. Sauciuc, *Andros* (Wien, 1914), p.31-32, figs.38-40; cf. A. W. Lawrence, *Greek Aims in Fortification*, (Oxford, 1979), pp.193-194. Other *e.g.*'s include on Siphnos: 'Stou Kadho' (5th C.), 'Stou Ayio Dhimitrio Arkhavou' (5th C.) and 'Stou Katergou' (3rd C.): Ashton, *SiphTwrs*, pp.114-115, fig.39b; pp.90-91, fig.27; pp.74-75, fig.19.

Thus, the extremely limited use of broken coursing for monumental buildings shows that it was obviously regarded as too unrefined and unsuitable for buildings whose physical appearance was as important as their function. This style of masonry though is used for a number of fortifications since it allows a rapid and economic construction.⁹²

(LARGE-BLOCK) TRAPEZOIDAL MASONRY

In trapezoidal masonry, as its name implies, the majority of blocks are trapeziums – quadrilaterals in which the top and base are parallel and one or both ends slant off the vertical. Each block tightly interlocks with its neighbour keying the masonry together against movement. This masonry is more economical than ashlar masonry in terms of both material and labour because blocks do not require as much initial cutting as in ashlar masonry since the strata and faults found in many limestones/marbles and gneisses/schists often result in the quarried blocks having at least one natural sloping side that need not be worked away in trapezoidal masonry. In addition, blocks from the same quarry 'batch' would have similarly angled joint-faces, and by turning alternate blocks 'upside-down' a very close jointing should be achieved. A nearby stockpile of variously shaped trapezoidal blocks, and perhaps also the use of lead templates, would have further added to the speed of construction.⁹³

Large trapezoidal blocks (as opposed to smaller rubble stones of trapezoidal shape) of both marble/limestone and gneiss/schist are often used on the Cyclades, as in the rest of Greece, for fortifications, including the many towers. They are also used, unusually, for several monumental buildings on the Cyclades.

Trapezoidal masonry can be theoretically divided into the same four main categories as ashlar masonry – uniform courses, alternate courses, varying courses and

⁹² Outside the Cyclades this type of masonry is perhaps most notably used at Pergamon for various supporting walls (e.g. the lower back wall of the South Stoa in the Demeter Sanctuary, c. 241-197: *Pergamon*, XIII, pp.22-23, pl.12.4) and often used in conjunction with broken courses of trapezoidal masonry (e.g. back wall of the Upper North Stoa in the Demeter Sanctuary: *ibid.*, p.39, pl.51).

⁹³ Lead templates were used in 'Lesbian' masonry according to Aristotle (*Nichomachean Ethics*, 1137b, 30). Orlandos, *Matériaux*, II, p.135 believes trapezoidal masonry to be quicker to construct than ashlar; Martin, *Manuel*, p.382 disagrees; Scranton, *GkWalls*, pp.70-71 is ambivalent.

broken courses; on the Cyclades only three of these categories are found.⁹⁴ (Table 4b lists the Cycladic and Thasian monuments with these types of trapezoidal masonry).

a) Uniform courses

There is only, to my knowledge, a single example on the Cyclades of large-block trapezoidal masonry with uniform course heights: the *parodos* walls of the third-century Theatre on Delos (Pl.57).⁹⁵ These fine marble walls are formed from courses c. 0.40 m. high, of which six courses are still standing. The use of trapezoidal masonry here is probably related to its employment for the whole of the supporting wall of the cavea, which is visible above and beyond the *parodos* walls; additionally, the exterior surface of the *parodos* walls is lightly picked, giving the wall a more 'substantial', less affected character than if smooth or polished, appropriate for the building's status, and a neat counterpoint to the 'rusticated' walls of the cavea.

b) Varying courses

In this style of trapezoidal masonry, coursing is generally maintained (there may be a few taller blocks breaking the regularity at times) but the heights of the courses differ from each other.⁹⁶ Some walls have courses which decrease in height towards the top; one of the most notable examples being the marble 'Aspros Pirgos' tower (late VI century) on Siphnos, still standing up to 5.50 m. high (Pl.58).⁹⁷ Most of the known examples, however, have courses whose heights are not placed in any order. Of the few extant Archaic walls on the islands built with varying courses of trapezoidal masonry, one can cite the west face of the marble terrace wall to the rear

⁹⁴ Trapezoidal masonry with uniform courses is widespread in other areas of Greece, especially for fortifications from the end of the 5th C., cf. Martin, *Manuel*, p.384; Scranton, *GkWalls*, pp.170-174. However, Orlandos, *Matériaux*, II, p.139 includes in his definition two Cycladic examples that have visibly different course heights. Alternate courses in trapezoidal are virtually non-existent in Greek architecture: Scranton, *GkWalls*, provides no instances; Winter cites the fortifications at Isaura, but the joints there appear almost vertical, cf. Winter, *GkFort*, p.81, fig.60.

⁹⁵ As also listed in Scranton, *GkWalls*, p.173. Orlandos (*Matériaux*, II, p.139) places in this group the interior socle of the Hypostyle Hall and a Theran terrace wall (after Scranton *GkWalls*, pp.78, 174, fig.17), but these are clearly of varying courses.

⁹⁶ This style is more usually termed 'pseudo-isodomic' (thus conflicting with the meaning of 'pseudo-isodomic' as used for ashlar masonry); cf. Scranton, *GkWalls*, pp.73-75, 101, 174; Orlandos, *Matériaux*, II, p.139; Martin, *Manuel*, pp.383-384; Winter, *GkFort*, p.80; and *Dictionnaire*, I, p.98.

⁹⁷ Ashton, *SiphTwrs*, pp.132-134, figs.48a, c.

of the Artemis Temple in the Delion on Paros.⁹⁸

The Classical period offers no instances of this type of masonry, yet from the Hellenistic age one can cite several occurrences on monumental architecture: i. large sections of the marble supporting wall of the cavea of the third-century Delian Theatre (Pl.59); ii. the marble interior socle of the Hypostyle Hall, c. 210-200 (Pl.60); and iii. several limestone socles, presumably of Hellenistic date, on Thera.⁹⁹ It is also used on a number of Cycladic towers.¹⁰⁰

The use of trapezoidal masonry with varying courses appears to be mostly a matter of convenience and economy; for, apart from the general speed and economic benefits of trapezoidal masonry, the use of many different course heights lessens further the pre-determined 'restrictions', and admits greater flexibility in the programme of construction which has attendant benefits. The type of stone used is dependent upon the usual major factor – status. The utilitarian and defensive towers make use of the local stone, be it marble, limestone or schist; cost was undoubtedly the main and probably sole factor in the choice of material. The fact that marble is close at hand on Delos and Paros must have been a bonus for patrons and builders of the higher status monuments listed above; yet, these walls are really only 'secondary' as far as function and location are concerned, and this must be a strong reason for trapezoidal rather than ashlar masonry being considered sufficient.

c) Broken courses

In large-block trapezoidal masonry with broken courses (normally referred to as 'irregular trapezoidal masonry'¹⁰¹) the blocks are of many diverse trapezoidal shapes and sizes, resulting in numerous offsets and projections from the level of the course,

⁹⁸ Schuller, *Artemis-Tempel*, p.84, pl.79.3.

⁹⁹ i. cf. *AHHD*, II.i, p.67; ii. *EAD*, II.i, pp.21-22, fig.30 (some of the blocks in the north wall are small enough as to be classed as 'rubble'). Vallois considers both these walls as being of 'broken courses' (which do occur but only in a few areas of these walls). iii. Scranton, *Gk Walls*, p.78, fig.17, citing this example as isodomic, but the courses vary visibly in height. All these instances have courses of random height.

¹⁰⁰ Siphnos - 'Stou Moustou' (late 4th - early 3rd C.; random courses of limestone), 'Stou Marathiti' (mostly random courses of schist, some limestone): respectively, Ashton, *SiphTwrs*, pp.62-63, fig.13, and pp.94-95, fig.29. Tenos - 'Smovolon' (3rd or 2nd C.; random courses of marble): H. Demoulin, 'Monuments de Ténos', *BCH*, 27, 1903, pp.258-259, fig.3.

¹⁰¹ As in references cited in note 102 below; Vallois (*AHHD*, II.i, pp.66-67) terms it 'structure libre'.

if any one level can be established. A few smaller blocks or piles of tablets often make up the differences in height and an adjoining block may be cut to fit around a projecting block. This style is most common on the mainland in fortifications from the fifth through the fourth century;¹⁰² it is also used on the Cyclades for the Classical and Hellenistic ramparts of certain cities, as well as for many of the 'Island Towers' including the well known square tower of gneiss at Aghia Marina on Kea.¹⁰³

There are also a number of extremely striking uses of broken courses within large-block trapezoidal walling on more prestigious Cycladic buildings. The small Temple of Aphrodite (c. 310-300) in the Aphrodision of Stesilaos on Delos (Pl.61), and the side walls of the Fountain-Exedra (c. 320-280) in the Sanctuary of Poseidon and Amphitrite on Tenos have walls with refined versions of this type of masonry (Fig.3);¹⁰⁴ the walls of both are of blue-white marble blocks that are lightly picked on their visible surfaces and are tightly locked together. Exactly the same marble masonry is found at the Inopos Lower Reservoir (mid III century) on Delos (Pl.62) and the peribolos wall (late II century) of the Poseidon Sanctuary on Tenos.¹⁰⁵ The varied nature of the block joints certainly enliven these walls, and in the case of the Delian examples the juxtaposition of blue-grey and white marble blocks (undoubtedly from the nearby quarries) adds to the overall decorative impression which must have been initially desired or at least deemed acceptable by the patron, even if, as seems most likely, the economical use of marble was the principal motive for the use of this type of masonry. The fact that none of these buildings are of 'first-class' status reinforces this view.

The similarity in both masonry style and date between some of these buildings

¹⁰² For examples, cf. Scranton, *GkWalls*, p.79; Orlandos, *Matériaux*, II, pp.135-139; Martin, *Manuel*, pp.382-383.

¹⁰³ Tenos' city walls (gneiss; 4th C.): P. Graindor, 'Ténos, fouilles et recherches', *Musée Belge*, 14, 1910, pp.236-241, fig.6. Arkesine's city walls on Amorgos (gneiss; Hell.): G. Rougemont, *et al.*, 'Recherches à Amorgos; Le site et le rempart d'Arkésiné' in R. Dalongeville, G. Rougemont, *Recherches dans les Cyclades*, (Lyon, 1993), pp.104-122. Towers – Aghia Marina, Kea: K. Manthou, *Ἀρχαιολογία καὶ Ἱστορία Κέας*, edited and annotated by L. G. Mendoni, (Vourkari, Kea, 1991), pp.79-80, 147, n.470, 149, figs.21-23; Panachrantos, Kea: *ibid.*, pp.78, 146, nn.455-456, pls.24a-b; Aghia Triadha, Amorgos: R. M. Dawkins, A. J. B. Wace, 'Notes from the Sporades', *BSA*, 12, 1905-06, pp.157-158, figs.4-5; on these towers cf. also A. W. Lawrence, *Greek Aims in Fortification*, (Oxford, 1979), pp.192-197, pls.18-19.

¹⁰⁴ i. *AHHD*, II,i, pp.66-67; ii. *Ténos*, p.75, pls.9, 56-3A1.

¹⁰⁵ i. *AHHD*, II,i, p.67; ii. *Ténos*, p.36, pls.56-3A2, 66.3.

on Delos and Tenos may perhaps indicate an architectural contact of some form between the islands, although, as we have seen, the trapezoidal style within large-block masonry (and rubble masonry¹⁰⁶), was common on the islands from Archaic times.

(LARGE-BLOCK) POLYGONAL MASONRY

Polygonal blocks used in this type of masonry generally have more than four joints on their exterior visible surfaces; the joints are generally straight, although if the joints are mostly curved the masonry can be termed 'curvilinear' or 'Lesbian'.¹⁰⁷ Except in the roughest types of polygonal masonry, the blocks are carefully cut so that they fit tightly together with no gaps between them. 'Lesbian' masonry appears in the Greek world in the seventh century and has its greatest vogue in the sixth century, while 'polygonal' is especially common in the fifth century, although both styles are found at later dates. Polygonal and 'Lesbian' walling is most commonly found in Attica, the Peloponnese and in Ionia for ramparts and supporting walls.

On the Cyclades, polygonal masonry is fairly exceptional because of the abundance and widespread use of gneisses and schists which cleave more readily into trapezoidal blocks than polygonal ones. Indeed, most of the instances of polygonal masonry occur on Thera and Melos, islands with volcanic rocks and limestones. On Thera, there are several Archaic examples of 'Lesbian' masonry in the ancient city, while sections of the Melian fortifications of trachyte, possibly of the late fifth century if not earlier, provide the best examples of 'Lesbian' walling on the Cyclades (Pl.21).¹⁰⁸ At the late sixth-century terrace walls at Karthaia on Kea, the majority of blocks are polygonal although a few have curvilinear joints (Pl.63). This mix of styles is seen in contemporary mainland walls perhaps indicating a transitional period between 'Lesbian' and the more developed polygonal masonry.¹⁰⁹ However, these Karthaian walls as a whole are not constructed in true polygonal style but only in 'rough' versions of it,

¹⁰⁶ See below pages 103-108.

¹⁰⁷ Cf. Scranton, *GkWalls*, pp.25-44 (lesbian), 45-69 (polygonal); Martin, *Manuel*, pp.379-380; 380-382; Orlandos, *Matériaux*, II, pp.127-132; 132-134; *Dictionnaire*, I, pp.97-98.

¹⁰⁸ Thera: lower section of a part of the city wall known as 'Platys Toichos' (6th or 5th C. ?): *Thera*, I, pp.195-196; supporting wall of the 6th C. Temple of Apollo Karneios: *ibid.*, pp.279-280. Melos: cf. Scranton, *GkWalls*, p.159; G. Belivanakis, *Milos Island*, (Guide book, Athens, 1987), fig.3.

¹⁰⁹ E.g. parts of the terrace wall of the Apollo Temple at Delphi: *FD, Temple*, fig.185.

since between many of the large marble blocks – especially those with curvilinear joints – there are piles of smaller gneiss slabs. This stacking is normally more frequent on other 'rough polygonal' Cycladic walls, but in these cases the whole wall can no longer really be regarded as polygonal, since the general requirement of interlocking blocks is consistently ignored.

Polygonal masonry is hardly ever used for the free-standing superstructure walls of buildings in Greece,¹¹⁰ and likewise, on the Cyclades, it is only found at the following: on Delos a type of 'Lesbian' walling of granite is used at the sixth-century Oikos II of the Archegesion, and polygonal masonry is employed for the 'front walls' of the Hellenistic 'Kynthion Cave' (Pl.64).¹¹¹ However, the granite walls in Room K of the Delian Gymnasium (c. 150-100), described by Vallois as 'sub-polygonal' are better described as 'irregular rubble' for between the (mostly trapezoidal) blocks are frequent, even if quite small, gaps that show that an interlocking polygonal masonry was obviously never intended.¹¹² In contrast, Thasos furnishes many Archaic examples of 'Lesbian' masonry such as the socles of sixth-century houses and of buildings of unknown function in the agora, and most significantly, the complete walls of the sixth-century 'Polygonal Building' (a temple or more likely a hestiatorion) in the Herakleion.¹¹³ There is also a small section of 'Lesbian' masonry, probably late sixth century in date, in the city rampart to the north of the theatre.¹¹⁴ By the Classical period, however, this style is no longer used on Thasos.

RUBBLE MASONRY

In this type of masonry the whole wall, both exterior and interior skins, is composed of rubble – that is, stones of a size which can be handled by one person.¹¹⁵ The stones, depending on the desired finished aspect of the wall, are either left

¹¹⁰ Instances of its use: e.g. Eleusis, 1st Telesterion (7th C): *Eleusis*, fig.7, pl.2 top; Rhamnous, Temple of Themis (early 5th C.): Orlandos, *Matériaux*, II, p.128, fig.146.

¹¹¹ i. cf. *AHHD*, II.i, pp.72-73; ii. *EAD*, XI, pp.238-241, fig.187.

¹¹² *AHHD*, II.i, pp.72.

¹¹³ Cf. *ET*, XII, pp.369-370, pls.101.1-2, 107.2; also *ET*, I, pp.31-33, pls.4-5. Some of the polygonal blocks are quite small in size and could thus be classed as 'rubble'.

¹¹⁴ *GT*, pp.50, 90; *ET*, XII, p.369.

¹¹⁵ See pages 74-75.

unworked in a 'quarry-state', or shaped with varying degrees of accuracy and neatness (often depending on the type of stone used). Rubble walls only very occasionally attain the exactness of jointing and the smooth surface treatment of the most careful ashlar masonry. Rubble masonry is primarily used throughout the Greek world, on the basis of economy, for utilitarian buildings with no pretensions towards monumentality (including several small 'provincial' temples¹¹⁶) as well as for a number of fortifications.¹¹⁷ On the Cyclades in particular, however, many religious, public and administrative buildings, as well as nearly all the houses,¹¹⁸ are built with this type of masonry.

The stones used for rubble walling are naturally those closest at hand and not especially valuable (e.g. marble). On the Cyclades gneisses and schists are the main stones employed; granite is also sometimes used on Delos where it is abundant but only for the rougher rubble walls on account of the difficulty in shaping this hard stone; marble is normally found as sporadic rough lumps or small 'levelling' tablets (probably being re-used or off-cuts) within a rubble wall that is mainly composed of other stones. Limestone is used on Thera, and, finally, poros rubble is found only on Delos where it is used for rubble interior cross-walls, especially those on upper floors because it is relatively light.

Rubble masonry, on the basis of its appearance, can be categorised thus:

a) Coursed rubble; b) Rubble with 'stacked jointing'; c) Irregular rubble; and d) Rough rubble.

a) Coursed rubble

As the terminology suggests, the main criterion for this type of rubble masonry is the adoption of coursing within the wall. This is easier to achieve, and most often used, with gneiss, since the rubble stones upon quarrying have at least two, often more, naturally flat beds as a result of their cleavage properties. The blocks are laid

¹¹⁶ E.g. small prostyle temple in the Athena Sanctuary at Sounion, mid 5th C (B. Stais, *Τὸ Σοῦνιον*, [Athens, 1920], pp.42-43; A. B. Tataki, *Sounium: the Temple of Poseidon*, [Guide, Athens, 1978], p.63, fig.43); Temple of Apollo at Cape Zoster at Vouliagmeni, end 6th C. (K. Kourouniotis, 'Τὸ ἱερὸν τοῦ Ἀπόλλωνος τοῦ Ζωστήρος', *ADelt.*, 11, 1927-28 [1930], pp.15-17, fig.8).

¹¹⁷ Cf. Martin, *Manuel*, pp.390-391; Orlandos, *Matériaux*, II, pp.158-160 (fortifications).

¹¹⁸ On Thasos, the house walls are generally of mud-brick but the stone socles upon which they stand are unusually tall, c. 1 - 2 m. high: *ET*, XII, p.363.

so that their top and bottom beds are horizontal, the side joints then being either vertical or oblique. The blocks can presumably also be arranged in the wall with their neatest cleavage surfaces facing outwards, so that with no (or just a little) tooling fairly tight exterior joints can be obtained, lending the whole wall a tidy appearance. Courses can vary visibly in height, but never enormously so because of the relatively small size of all rubble blocks.¹¹⁹

The finest Cycladic examples of coursed rubble, all on Delos, rival some types of marble ashlar masonry in their appearance. The gneiss north wall of the Letoon, *c.* 540 (Pl.65),¹²⁰ would have been a continual source of inspiration to the few Classical and Hellenistic examples on the island, namely: i. the court wall of the Archegesion, *c.* 480-470 (Pl.46); ii. the exterior walls of the Palaestra of the Lake [stage I], V - IV century (Pl.66); iii. 'Chapel' at Fourni, *c.* 323-300; and iv. the exterior walls of the Palaestra of Granite, *c.* 150-125 (Pl.67).¹²¹ In all these cases the regularity of their gneiss blocks is striking, nearly every side joint being vertical; only extremely occasionally are a few thin tablets inserted to make up a course height.¹²² Although none of these cases are of the status of the Letoon, two of them nevertheless occur in religious contexts and the two others are large public amenities.

There are a few walls which are only slightly less uniformly coursed since they possess several scattered offsets in the coursing, but which on the whole present a regular coursed appearance; such instances are on Delos: i. the exterior walls of the Hypostyle Hall, *c.* 210-200; ii. Theatre Sanctuary C, *c.* 250-166; and, iii. the rear wall of the L-shaped Stoa in the Delian Agora, *c.* 187-173 (Pl.78).¹²³

This superior type of rubble masonry is not just limited to monumental buildings, as it is used for the exterior walls of several houses on Delos and for many

¹¹⁹ On bonding within rubble walls, see page 84.

¹²⁰ *EAD*, XXIV, pp.38-40, pls.5, 51(ph.53).

¹²¹ i. *BCH*, 86, 1962, Chron., pp.960-961, fig.1; ii. *EAD*, XXV, pp.80-81, fig.82; iii. *BCH*, 71-72, 1947-1948, Chron., p.413; iv. *EAD*, XXV, pp.19-20, fig.37.

¹²² This style of coursed rubble walling has been termed 'pseudo-isodomic' (*EAD*, VIII, p.238; *EAD*, XXV, pp.19-20, 80-82), although given the double meaning that can apply to this term (see page 91), it seems preferable to avoid it.

¹²³ i. *EAD*, II.i, pp.19-21; ii. personal inspection; iii. *cf.* *AHHD*, II.i, p.54 (although Vallois overstates the number of offsets and projections on this stoa as well as the Hypostyle Hall).

house socles on Thasos.¹²⁴

b) Rubble with 'stacked jointing'

Coursing within rubble masonry is sometimes achieved by the additional use of neat stacks of smaller, thinner stone tablets in between the larger rubble blocks. These stacks are well defined and arranged, and are also used in masonry where there is no real coursing because of numerous offsets and projections. This style of rubble masonry is fully discussed on pages 110 - 112 where it is treated in conjunction with the use of stacks in large-block masonry.

Both 'coursed rubble' and 'rubble with stacked jointing' are significant masonry styles on the Cyclades throughout the Classical and Hellenistic periods which are employed on many types of buildings, except those of the highest status which are the preserve of ashlar masonry. Indeed, more Cycladic buildings are constructed from this style of masonry than from any other type of stonework. The majority of coursed rubble walling dates from the time of the Delian Independence, with only one example built during the Second Athenian Domination, for after 166 rubble masonry assumes one of the next two forms.

c) Irregular rubble

In irregular rubble masonry the individual stones are much more summarily shaped. The beds of the blocks are not always flat and the vertical joints are usually fairly rough and oblique; coursing is usually of a very 'loose' nature, effected by the use of two or three smaller slabs, and sometimes irregular piles of smaller stones, inserted between the larger blocks.

The only extant sixth century example of irregular rubble walling in

¹²⁴ E.g. Delos - Theatre Quarter, House III K (2nd-1st C.): EAD, VIII, pl.32a; Thasos - cf. ET, XII, pp.374-375, pls.108.5 [wall type 5b], 109.1 [wall type 6]. Rubble masonry with alternate course heights, a style rarely found, is used on sections of the Thasos city wall and on several house walls dating between c. 500-300: ET, XII, pp.377-379, pls.110.1, .3 [wall type 10]. On Thasos one finds another type of masonry which uses squared rubble blocks in conjunction with larger ashlar, but they are not coursed but placed randomly within the wall, sometimes in a loose 'checkerboard' pattern; this masonry, usually mixing marble and gneiss, is used for parts of the city's fortifications, house walls and even for some monumental buildings, including the early Hellenistic stoa at Evraiokastro: cf. ET, XII, pp.375-376 [wall type 7], 379 [wall type 11], pls.109.2, 110.2; Martin, Thasiaca, pp.175-176, figs.4, 5, 7.

monumental architecture is at the small distyle Temple of Apollo at Koressia on Kea, which is built of local limestones.¹²⁵ The Classical period on the Cyclades is equally sparse in this style of masonry, the only instances being at the two anonymous structures known as the 'Temples of Replat' (the largest one being of a not insignificant size, measuring around 17 m. x 10 m., and possessing a central row of interior columns) which are located under large outcrops of granite that may have provided the stone for their construction.¹²⁶

The Hellenistic period, contrastingly, provides many more examples of irregular rubble masonry, as Table 4c shows. The constructions with this type of masonry include large-scale projects (i. the Gymnasium exterior, c. 300-275; ii. the Stadium, III century; iii. the Agora of the Italians, c. 110-90 (Pl.68), as well as sacred structures – albeit of a modest, though not diminutive, scale and status (iv. Temple A in the Dioskourion, c. 303; and, v. the temple in the Sanctuary of the Bastion, end II century (Pl.69) – all located outside the central Apollo Sanctuary).¹²⁷ Irregular rubble masonry of gneiss was necessarily quicker and cheaper to construct than that of coursed rubble, and this is reflected especially in the majority of uses to which it is put in the Hellenistic period. These include the interior walls of several large monumental buildings (the Palaestra of Granite, c. 150-125 (Pl.70); the Palaestra of the Lake [stage III], c. 150-125; and the Monument of Granite, c. 150-100 – the exteriors of which are all in superior masonry),¹²⁸ and the main walls of the majority of houses on Delos which mostly date between c. 166-69 (Pls.79-80).¹²⁹ Indeed, it is noticeable that on Delos many instances of this style of masonry date to after the granting of 'free port' status in 166, and thus reflect the need, at that time especially, for cheap and rapid construction occasioned by the huge increases in population and commercial activity.

Much the same reasons can be advanced for the use of limestone irregular rubble at ancient Thera where many of the houses and some public buildings, probably

¹²⁵ Lauter, 'Koressia', pp.9-10, figs.4-5.

¹²⁶ Cf. *AHHD*, II.i, p.73.

¹²⁷ i. *EAD*, XXVIII, pp.11-12, pls.4, 10, 13; ii. A. Plassart, 'Fouilles de Délos', *BCH*, 40, 1916, p.149; iii. *EAD*, XIX, pp.37-38, pls.6.1, 12.1; iv. *EAD*, XX, p.14; v. cf. *BCH*, 49, 1925, p.468.

¹²⁸ i. *EAD*, XXV, p.20, figs.39, 43, 69; ii. *ibid.*, p.81, figs.83-84, 90, 92; iii. *EAD*, XXIV, pp.73-75, pls.62 (ph.116), 63 (phs.117-119), 64 (ph.120).

¹²⁹ E.g. *EAD*, VIII, pl.33b.

dating to the Ptolemaic dominance over the island (c. 300-145), are built in this style of masonry.¹³⁰

On Thasos, irregular rubble masonry of gneiss is also quite common from the Archaic period through to the end of the Hellenistic period although its use is primarily limited to the wall socles of houses.¹³¹

d) Rough rubble

Rough rubble masonry differs from irregular rubble in that it is composed of stones that are either wholly unworked, or only very summarily worked; they are placed haphazardly in the wall with no attempt at coursing, the gaps between the larger stones being filled by insertions of smaller pieces. Gneiss, granite and even marble are all used. This is necessarily the cheapest and quickest method of walling. The only known Cycladic monument belonging to the sixth century with this type of walling is the Temple of Apollo Karneios on Thera, and from the Classical period one can only cite the Sanctuary of Artemis Lochia on the south-eastern slopes of Mount Kynthos on Delos, and dating perhaps to the end of the fifth century.¹³²

As in irregular rubble masonry, it is during the Hellenistic period that rough rubble walling becomes especially common on the Cyclades for monumental buildings, most of which are on Delos although there are a few examples from Tenos. The range of buildings where it is employed is quite wide: from i. the interior walls of the third stage of the Palaestra of the Lake (c. 150-125) (Pl.71), and ii. the utilitarian 'shops' added to the Agora of the Italians (c. 110-88) (Pl.68), to iii. 'Hestiatorion Q' in the Sanctuary of Poseidon on Tenos (stage I, c. 320-280), iv. the L-shaped Stoa in the Delian Artemision (c. 110), and v. the South Peristyle in the Asklepieion (mid III century); and from small sanctuaries such as vi. 'the Chapel of Dionysos' (c. 166-88), and vii. the privately founded Sarapieion A and B (both end III century) (Pl.48), up to being used throughout large sanctuaries such as viii. the Sanctuary of the Foreign Gods (c. 113-105), as well as for ix. the prominent distyle *in-antis* Temple of Isis in

¹³⁰ Thera, I, *passim*.

¹³¹ Cf. ET, XII, p.377, pls.109.4 [wall type 8b], 109.5 [type 9], pp.379-380, pl.110.5 [type 12].

¹³² i. Thera, I, pp.280-281; ii. EAD, XI, p.296, fig.243.

Sarapieion C (c. 130) (Pl.86).¹³³

The majority of rough rubble monuments on Delos once again date to the period of the island's 'free port' status, for the reasons mentioned previously. Thus, it is rather surprising to find that rough rubble is not very common in the construction of the Delian houses (which are mostly of 'irregular' rubble), except for some of their interior walls.¹³⁴

On Thasos, rough rubble is used from the seventh century onwards for terrace walls and enclosure walls in the domestic quarters of the city; however, the Thasian builders do not seem to have made frequent use of this type of masonry.¹³⁵

¹³³ i. EAD, XXV, pp.81-82, fig.85; ii. personal inspection; iii. Ténos, p.48, pl.69.4; iv. personal inspection; v. personal inspection; vi. Bruneau, CDH, pp.296-298; vii. Roussel, CED, pp.29, 34-36; viii. EAD, XXXV, p.137 *et passim*; ix. Roussel, CED, p.63. Also Theatre Sanctuary A: personal inspection; on Thasos - 'Galerie aux Piliers' in the agora: BCH, 79, 1955, Chron., p.348, fig.5.

¹³⁴ *E.g.* EAD, VIII, fig. 62 (p.141) + pl.34b (House of the Trident, courtyard south wall).

¹³⁵ *Cf.* ET, XII, p.380, pls.110.6, 111.1 [wall type 13].

CYCLADIC WALLS: SPECIFIC FEATURES

STACKED JOINTING

A distinctive and almost idiosyncratic style of masonry that is commonly employed on the Cyclades is that where stacks of smaller stones are placed regularly between larger blocks. This 'stacked jointing'¹³⁶ occurs in both 'large-block' and rubble masonry. Economy of stone and time appear to be the original motives – most obvious in large-block masonry – behind this style. Since the larger blocks (often of hard granite) are not actually contiguous they do not have to be regularly shaped or undergo a careful preparation of joints, while the smaller tablets (usually of easily-split gneiss), can be more easily and rapidly trimmed to fit into the gaps between the larger blocks. In addition, many of these tablets were undoubtedly off-cuts and may well have been prepared and stock-piled in advance of construction.

The earliest known Cycladic examples of stacked jointing involve large-block masonry and date from the seventh century.¹³⁷ Other notable examples of stacked jointing in large-block masonry include: i. parts of the sixth-century terrace walls at the Athena Sanctuary at Karthaia on Kea (Pl.63); ii. parts of the fifth-century fortification wall of ancient Tenos; iii. the socle of the 'Thesmophorion' on Delos (c. 480-450) (Pl.72); iv. the eastern part of the north wall of the Delian Ekklesiasterion (IV or early III century) (Pl.73); v. parts of the supporting wall of the Delian Stadium (III century); and, vi. the north wall of the second or first-century House of the Masks on Delos (Pl.74).¹³⁸

While economic motives were undoubtedly still behind many of these Classical and Hellenistic instances of stacked jointing, there are several examples where the neatness of the piles is so striking that it appears to indicate that the decorative quality of the stonework was an equally – if not more – important factor at these particular buildings; this would of course mean that the walls were not plastered over. This

¹³⁶ Dictionnaire, I, p.97.

¹³⁷ E.g. Delos - supporting wall of Heraion A, early 7th C. (cf. Roussel, CED, p.49); Naxian Oikos, c. 650-600 (EAD, XXXIII, pp.18-24, pls.37, 39; Arhegesion Oikoi, mid 6th C. (AHHD, II.i, pp.70, 72; EAD, XXXIII, pl.38 [fig.5.6]).

¹³⁸ i. + ii. personal inspection; iii. Vallois, 'TopDél', p.252, fig.31; iv. *ibid*, p.285, fig.41; v. A. Plassart, 'Fouilles de Délos', BCH, 40, 1916, p.149; vi. J. Chamonard, 'Fouilles de Délos', BCH, 57, 1933, pp.100-101.

decorative quality is especially apparent, for the first time, on the socle of the 'Thesmophorion' where, between the vertical joints of the large blocks of gneiss (up to 2 m. long), there are extremely uniform stacks of up to 21 thin (c. 0.02 m.) tablets which, furthermore, are not of the usual gneiss but of grey-blue marble (Pl.72). The Ekklesiasterion north wall is also interesting since of the larger blocks, nine are of marble, two of granite, and one of poros (Pl.73).

Stacked jointing also occurs in rubble masonry where, by definition, the main blocks (and usually the 'stacking' tablets also) are of a smaller size than in 'large-block' masonry. Although there are numerous examples in rubble masonry (which can even be quite well coursed) of two or three smaller stones occasionally piled up to the level of a taller block,¹³⁹ the 'stacked jointing' of this category requires a more regular and distinct stacking. Within this type of rubble masonry a number of sub-types can be distinguished on the basis of their coursing. The most 'regular' walling is at the Oikoi of the Aphrodision (c. 323-302) on Delos, where the gneiss stacks are placed between virtually every marble block, nearly all of which are the same height and are quite regularly cut (Pl.75). In fact, it is perhaps the case here that this masonry is being employed for its decorative nature.¹⁴⁰ A semblance of coursing, despite several offsets and projections, is found at a number of buildings in the Sanctuary of Poseidon and Amphitrite on Tenos: on the inner skins of the exterior walls of Hestiatorion Q (stage I, c. 320-280) (Pl.76) and Building B (c. 320-280) (Pl.77), and on the exteriors of Building M (c. 250-200).¹⁴¹ It is interesting to note also that the blocks and the stacks of these particular walls are entirely of marble, which in the case of buildings Q and B, where the outer skins are either wholly (Bldg. B) or partially (Hest. Q) of gneiss, would seem to indicate that the marble inner skins were regarded as especially significant and were probably not plastered over. However, the stacking in these cases may still have been used for economic reasons rather than for purely decorative ones.

¹³⁹ Tenos - Fountain-Exedra, basin A': Ténos, pp.15-16, pl.63.1. Thasos - Evraiokastro Stoa: C. Rolley, 'Dieux Patrôoi et Thesmophorion de Thasos', BCH, 89, 1965, p.480, figs.39-41. Delos - Oblique Stoa: AHHD, II.i, p.54; Palaestra of the Lake, stage II (the apse): EAD, XXV, pp.108-109, fig.118; South Stoa, rear wall: AHHD, II.i, p.54; Theatre skene: J. Chamonard, 'Théâtre de Délos', BCH, 20, 1896, p.281, pl.22; AHHD, II.i, p.72; Agora of Theophrastus, socle of the Poseidon Tmp.: personal inspection.

¹⁴⁰ AHHD, II.i, p.72; Vallois termed this highly regular alternation '*appareil alternatif*' - also known as 'checkerboard masonry', cf. Dictionnaire, I, p.97.

¹⁴¹ i. Ténos, p.48, pl.56.1 int.; ii. *ibid.*, p.19, pl.56.2 int.; iii. *ibid.*, pp.57-58, pls.56.3B1, 70.3.

This is surely the case at House III G in the Theatre Quarter on Delos where this masonry is very unusually used in domestic architecture.¹⁴²

There are also a few instances of well-defined stacked jointing in rubble masonry, which is otherwise 'irregular' in construction with no coursing being adhered to, for example: the late Archaic exterior walls of the Temple of Apollo at Karthaia on Kea, the gneiss exterior of Building B, and the marble and gneiss exterior of Hestiatorion Q on Tenos.¹⁴³ Here, economic motives would seem to be the prime reason for this style of masonry.

From the monuments mentioned above, one can see that stacked jointing is used on walls and buildings of diverse function and status; from terrace walls and fortifications to the walls of house and temples. Its usage also changes according to time – the majority of the stacking in 'large-block' masonry is Archaic or Classical, while in rubble masonry it occurs especially in the Hellenistic period. In this latter period its use in rubble masonry naturally means that it is not found on the most prestigious buildings, but after the example of the Oikoi in the Delian Aphrodision, one can see that in certain cases it was probably regarded as a decorative style of masonry.

Examples of notable stacked jointing outside the Cyclades are not very common, and even these are mostly on the periphery of the Aegean: one can cite, for instance, the 1st dipteral Heraion on Samos (c. 560-550), several houses at Eretria, and certain walls at Arkampolis (near modern Karystos) on Euboia.¹⁴⁴ It is interesting to note that there are no distinctive stacked joints on Thasos.

¹⁴² EAD, VIII, pl.33a.

¹⁴³ i. personal inspection; ii. Ténos, p.19, pl.56.2 ext.; iii. *ibid.*, p.48, pl.56.1 ext.

¹⁴⁴ i. Reuter, Hera Tempel, Z.12; ii. Dictionnaire, I, pls.21.1-2; iii. personal communication. Also an occurrence of stacking in the socle of an Athenian house wall: H. A. Thompson, R. E. Wycherley, The Athenian Agora, XIV: The Agora of Athens, (Princeton, 1972), p.179.

QUOINING

Corners can be a weak point in a wall. To counteract this, the angles of several rubble – and a few ashlar – walls on the Cyclades are composed of larger, dressed blocks. These quoins are placed in a 'saw-tooth' arrangement alternately projecting into each wall face, strongly interlocking the walls. On Delos, where this reinforcement is particularly careful, the quoins are often of a harder type of stone than that used in the rest of the wall which is usually of gneiss. The quoins are normally of marble or granite.

Marble quoins

Marble quoining, where found, is normally used on rubble walls of gneiss. Its first known use on Delos is in the sixth century at two prominent buildings: the Letoon (Pl.65) and the Minoe Fountain.¹⁴⁵ In the Classical period marble corners appear on the exterior coursed rubble walls of the Prytaneion (c. 500-450) and the Palaestra of the Lake (stage I, V-IV century).¹⁴⁶ In all these cases the white marble stands out from the rest of the darker stone walls, and this colour contrast must also have been regarded as an attractive decorative feature. Decorative reasons rather than structural ones must be the main factor at the early Hellenistic Oikos-Hestiatorion in the Asklepieion (c. 323-302) where marble corner blocks are used on walls that are built from similar-sized ashlar of hard granite (Pl.44).¹⁴⁷ There are only two other Hellenistic instances of marble quoining on Delian monumental architecture: on the shared gneiss/granite wall of the peribolos and Temple A (c. 303) in the Dioskourion; and at the south-east angle of the L-shaped Stoa in the Delian Agora (c. 187-173) (Pl.78).¹⁴⁸ A few houses on Delos (mostly built c. 166-88) are also beneficiaries of marble quoins, perhaps specified by the rich owners as a visible display of wealth and status (Pl.79).¹⁴⁹

¹⁴⁵ i. *EAD*, XXIV, pp.38, 40, pls.5-6, 49-50; ii. *EAD*, V, p.106.

¹⁴⁶ i. *AHHD*, II.i, p.55; ii. *EAD*, XXV, p.79, n.3; p.87, n.2; p.148; pl.13, fig.88.

¹⁴⁷ *EAD*, XX, p.69.

¹⁴⁸ i. *EAD*, XX, p.9; ii. *AHHD*, II.i, p.55.

¹⁴⁹ 2 exterior corners in *Rue* 6, and corner in vestibule of House 6A, in the Theatre Quarter (*EAD*, VIII, p.240, pl.37b); north-west exterior corner of House B on *Rue à Colonnes* (L. Bizard, 'Fouilles de Délos', *BCH*, 31, 1907, p.480, fig.6).

Granite quoins

Granite quoining only starts to be used in the Hellenistic period, when it is used to reinforce rubble walls of gneiss. Known instances not only occur on Delian monumental buildings, all of which date to after 166 (*e.g.* the Palaestra of Granite, the Ionic Stoa to N.E. of the Artemision),¹⁵⁰ but also on the second or first-century houses on Delos (Pl.80).¹⁵¹ The granite blocks are usually of greater dimensions than the marble quoins, often reaching over 1 m. in length (and even attaining 2.70 m. at Boutique 49 on *Ruelle* δ in the Theatre Quarter), so forming a visibly solid 'saw-tooth' joint with both walls.

Apart from Delos, the only other Cycladic island with instances of quoining is Thera.¹⁵² In the main city, the corners of a number of Hellenistic and Roman houses are built of large limestone ashlar, strengthening the walls of irregular limestone rubble. In many instances, though, the blocks do not have such a regular 'saw-tooth' arrangement as on Delos, and the ashlar can extend quite far into the rubble wall.¹⁵³ It is somewhat surprising to find that there are no known examples of quoining on Tenos, where there are numerous and diverse buildings with rubble masonry.

The relative infrequency of this technique points to an eclectic approach to its use. If the extra cost of cutting and transporting the larger blocks of marble, granite and limestone could be afforded, their use – in addition to strengthening a potential weak point in the wall – could in many cases decoratively enhance the exterior of a building, as well as advertise the wealth and status of the client/owner.

¹⁵⁰ i. *EAD*, XXV, pp.20-21, pls.2-3; ii. personal inspection.

¹⁵¹ House of the Lake: *EAD*, VIII, p.240, fig.4; House of Dionysos: *EAD*, VIII, p.240; Theatre Quarter House IIb: *EAD*, VIII, p.240, pl.37A.

¹⁵² Quoining is not so common in the rest of the Greek world primarily because it is usually used in conjunction with rubble masonry which itself is fairly uncommon; *e.g.* Hellenistic houses at Dura-Europus (W. Hoepfner, E.-L. Schwandner, *Haus und Stadt*, [Munich, 1994], p.284, figs.276-277). In the Roman period it becomes common in Asia Minor (J. B. Ward-Perkins, *Roman Imperial Architecture*, [London, 1981], p.273).

¹⁵³ *E.g.* Thera, III, figs.55, 133, 199.

WALL PLASTERING

The wall plaster¹⁵⁴ used on Cycladic buildings falls broadly into two types based on composition and thickness; these two types also apparently differ in date.

'Lime Plaster'

Several sixth and early fifth-century buildings on the Cyclades, whose walls are of a heterogeneously skinned structure, have a fairly thin plaster applied to their inner wall-faces, be they of gneiss or marble.¹⁵⁵ When noted, it is of a red colour (painted on the grey plaster at the Monument of Hexagons; termed 'red-coloured plaster' at Sangri and the Hestiatorion in the Parian Delion). There is no detailed account of the plaster's composition other than it once being called 'lime plaster' (Sangri), but at 'Building D' at Karthaia one can see that the brownish-red rendering, around 1.0 cms. deep, has a rough, grainy texture caused by the use of crushed stone and/or sand; the marks of smoothing implements are also visible (Pl.81). The use of this fairly thin plaster (not to be confused with thin stucco - see below) is not specifically mentioned in either Martin or Orlandos in their examination of wall rendering.¹⁵⁶

It is thus probable that the inner faces of other heterogeneously skinned walls – a type of wall structure that is particularly common on Cycladic monuments of the Archaic and early Classical periods – were originally plastered in this way, especially where the inner faces have a roughened surface so as to better accept a plastering.¹⁵⁷

It would be interesting to know the thickness and nature of the plaster that covers the back rubble wall of the small stoa (probably late IV century) in the agora at Palaioiopolis on Andros, as this might provide the only Classical or Hellenistic instance on the Cyclades of this type of plaster.¹⁵⁸

¹⁵⁴ Here used in the general sense of 'wall covering/rendering', and not implying (as in French) that it is composed of gypsum 'plaster'; cf. *Dictionnaire*, I, pp.45, 138.

¹⁵⁵ Naxos, Temple of Demeter at Sangri (c. 550): *PAE*, 1976, p.302; *PAE*, 1978, pp.217-218; Delos, Monument of Hexagons (c. 500): *EAD*, XXXII, p.23, pl.4, figs.18-19; Paros, Hestiatorion ('South Building') in the Delion (late Archaic): Schuller, *Artemis-Tempel*, pp.65, 86; also cf. O. Rubenshon, *Das Delion von Paros*, (Wiesbaden, 1962), p.34; Kea, 'Building D' at Karthaia (probably a tetrastyle temple, late Archaic: personal inspection.

¹⁵⁶ Martin, *Manuel*, pp.422-441; Orlandos, *Matériaux*, I, pp.135-153.

¹⁵⁷ As postulated at 'Town Temple A' and the Temple of Artemis in the Delion on Paros, at Heraion B on Delos, and at the Temple of Athena at Karthaia on Kea. However, the Siphnian Treasury at Delphi, c. 525, had panelling, presumably wooden, on its inner walls: *FD*, *TrSiph*, p.146, fig.139.

¹⁵⁸ *BCH*, 81, 1957, Chron., p.610; N. M. Kontoleon, 'Ἀνασκαφαί', *AE*, 1964, p.3.

'Thick Stucco'¹⁵⁹

The second type of wall plastering found on the Cyclades is that where a thick coat of stucco (lime mortar mixed with marble powder), around 4.0 - 8.0 cms. deep, is used both on the interior and the exterior wall-faces of Hellenistic buildings, including houses; it is used only on walls of irregular and rough rubble masonry (Pls.3, 79). The plaster is composed of several layers, each finer in texture than the one below: the bottom layer is often of a reddish *opus signinum* (mortar with crushed terracotta) while the topmost layer, in the interior of houses especially, is very smooth and often incised and/or painted.¹⁶⁰ Nearly all the Delian monuments and houses which have evidence of stucco date to the second and first centuries,¹⁶¹ although there may have been earlier occurrences as thick stucco is found on the interior of the most prestigious houses at Olynthos (c. 432-348); it is also found on the interior house walls at Priene, generally built c. 350-200, although the plaster could date from much later applications, as is the case of the painted examples at ancient Thera.¹⁶²

The stucco on the lower parts of the exterior house walls on Delos was often water-proofed by the addition of volcanic dust, presumably from Thera or Melos, which created a true 'hydraulic mortar' as used in the cisterns on Delos. The stucco used on the Thera buildings generally, was of this type.¹⁶³

In general, the houses on Thasos were not plastered; however, there are a few instances of this thick type of stucco, the earliest example dating to the fourth or third century.¹⁶⁴

Both types of plaster are different from the very thin (a few millimetres), smooth stucco covering used on many poros and shelly limestone monuments to cover over the imperfections in the stone. This is found on buildings from the seventh

¹⁵⁹ Cf. Martin, *Manuel*, pp.425-428; Orlandos, *Matériaux*, I, pp.136-140.

¹⁶⁰ *EAD*, VIII, pp.358, 388-390.

¹⁶¹ E.g. on Delos – Hypostyle Hall (*EAD*, II.i, p.21); Sarapieion C, Temple F (Roussel, *CED*, p.56, fig.9); Palaestra of Granite (*EAD*, XXV, pp.23-24); Monument of Granite (*EAD*, XXIV, pp.84-85); Gymnasium, stage II (*EAD*, pp.13-14); Palaestra of the Lake, stage III (*EAD*, XXV, pp.99-104); Agora of the Italians (*EAD*, p.38); Sanctuary of the Bastion, Sarapieion A: personal inspection.

¹⁶² i. D. M. Robinson, J. W. Graham, *Excavations at Olynthus*, VIII: *The Hellenic House*, (Baltimore, 1938), p.292; ii. *Priene*, pp.310-319, fig.364; iii. *Thera*, III, pp.142, 162, 165, 169-170, figs. 124, 154.

¹⁶³ *EAD*, VIII, p.87; *Thera*, IV, p.116.

¹⁶⁴ *ET*, XII, pp.386-387, pls.31.3, 93.3, 118.2.

century onwards both on Mainland Greece and in Sicily and South Italy.¹⁶⁵ There are only very rare extant examples of thin stucco on the Cyclades where, in any case, poros and limestone monuments were not very common;¹⁶⁶ however, Delian inscriptions record a plastering of the columns – thus presumably in thin stucco – in the 'Palaestra' (where they are known to be of poros) and the Kynthion.¹⁶⁷

Thus, from the available evidence, it appears that by the Hellenistic period the use of a fairly thin covering of lime plaster over interior walls (as used on the Cyclades in the Archaic age) had given way to thick stucco wall renderings. Perhaps the thicker application was longer lasting (as possibly shown by the numbers of extant examples of each type of plaster); the smoother finish was certainly more suitable for decorative painting. This thick stucco was also used for many of the exterior walls built of irregular and rough rubble masonry.

¹⁶⁵ *E.g.* 7th C. – Isthmia, Temple of Poseidon; Delphi, 1st Temple of Athena Pronaia. In the 5th and 4th C. stucco is especially common on Peloponnesian monuments; *cf.* Martin, *Manuel*, pp.429-431, Orlandos, *Matériaux*, I, pp.140-141.

¹⁶⁶ *E.g.* columns of the late Archaic Temple of Athena at Karthaia on Kea (Østby, *OpAth*, p.198).

¹⁶⁷ *IG*, XI 2, 199, A, l.108; *ID*, 443, Bb, ll.165-166. *Cf.* Hellmann, *InscripDél*, pp.37-42 (discussion and refs. of all the types of varnishing and rendering. Vallois notes (*AHHD*, I, p.48, n.1) the use of 'stucco of sand and crushed marble' on the exterior of the Archaic Temple of Artemis (E) on Delos, but its thickness is not given, and it could date to any time up to the temple's replacement in the second century.

CONCLUSIONS

Wall construction on the Cyclades was an ever-changing and evolving procedure which responded to, and reflected, not only local materials and preferred techniques, but also many external influences – political and economic as well as architectural – which affected the islands. These traditions and influences determined the type of wall structure employed as well as the various types of masonry and their associated styles of jointing.

It is quite obvious that there were some significant and – while acknowledging the possible vicissitudes in the archaeological record – very real changes in the basic structure of Cycladic walls from the sixth to the first centuries B.C. Firstly, one can see that 'full ashlar' wall structure, owing to the powerful hold of the customary 'heterogeneously skinned' walling, was adopted on the Cyclades much later than in the rest of Greece. Even at the Great Temple of Apollo on Delos, its first known use on the islands, Cycladic practice prevails at the base of the wall where orthostates are omitted although their appearance is faked. Full ashlar walling seems only to have been fully adopted by Cycladic architects and masons in the fourth century. Given the proximity of the islands to the mainland, the Cycladic involvement in the construction of the Treasury of the Athenians at Delphi and the presence of the Poros Temple and the Temple of the Athenians on Delos, the main influence for this type of wall structure must have come from Athens, along with numerous other constructional techniques and architectural forms. In the Classical and Hellenistic periods full ashlar wall construction was used for the majority of the most important buildings on the Cyclades, such as the large temples and stoas, whose high status was bestowed either by function or location. However, it should be remembered that a good number of these monuments were, or probably were, foreign dedications and that their architecture may thus have been determined by non-Cycladic architects.

Heterogeneously skinned walling was the most common type of Cycladic wall structure used in monumental architecture in the sixth and early fifth centuries, even being 'exported' to the mainland for the Siphnian Treasury at Delphi. It was employed for nearly all the highest-status buildings. However, by the fourth and third centuries it was no longer the only type of wall construction used for the premier monuments, as full ashlar wall construction also fulfilled this role. Indeed, faced by

'competition' from this latter wall structure, the continued use of heterogeneously skinned construction in the Hellenistic age – albeit reduced and no longer limited to the most prestigious monuments – is a testament to its popularity and tradition in Cycladic architecture. Of the two types of heterogeneously skinned walls, that with exterior ashlar (Type 1) is the premier method, both in terms of style and frequency of use. Indeed, this particular type is a distinct class between 'full ashlar' and 'full rubble' construction. Type 2 – composed of better worked rubble on the exterior than on the interior – is merely a slightly more sophisticated version of basic 'full rubble' wall structure.

The huge increase in the use of full rubble construction for monumental buildings on Delos in the Hellenistic period is unanticipated and undoubtedly the result of the growth in population and commercial activity in this period, particularly after 166. Indeed, in this final period the rubble masonry becomes 'rough' in appearance indicating the wish for more rapid construction.

In a general way, the preference of architects and builders for one type of wall structure over another, was in no small measure dependent on the contemporary political fortunes of the Cyclades, for the political situation can determine types and quality of building, not only directly (*e.g.* the monumental, politically inspired dedications) but also more subtly, via economic and social policy, as happens on Delos and to a lesser extent on Tenos in the Hellenistic age (*e.g.* in the quick construction of houses and public amenities). Material is also important in determining the wall structure, for the abundant gneiss provides suitable stones for the easy construction of heterogeneously skinned and rubble wall structure, while both gneiss and granite are more difficult to shape neatly into squared ashlar than is marble. Additionally, the status of a building played a major role in determining the type of wall structure used – to exemplify the two extremes: important temples were carefully built of full ashlar construction while houses employed the more rapid and cheaper full rubble wall structure.

As for the actual masonry styles, ashlar, whether as part of 'full ashlar' or 'heterogeneously skinned' construction, was almost always used from the Archaic period onwards for the large and important temples on the Cyclades as elsewhere in the Greek world. It was also often employed for a number of civic buildings, such as treasuries, hestiatoria and stoas. Marble was the stone primarily used in ashlar

masonry, reflecting this style's pre-eminent status. Gneiss ashlar were surprisingly little used in monumental architecture; their use at a few of the island towers, presumably indicates the owners' wishes for a 'superior' masonry style while using the local stone that often happened to be gneiss. Courses of ashlar with uniform heights – the main style of ashlar masonry on the mainland – although used at Athenian monuments on Delos, were only adopted by island architects and masons in the fourth century; prior to this, ashlar with varying course heights were favoured for Cycladic monumental architecture. Buildings with alternate course heights were even less common, and many of these have certain or possible Asiatic or Macedonian links, two areas with a preference for this style of masonry. Broken coursing within ashlar masonry was rarely employed for Cycladic monumental buildings, although it was occasionally used for the island towers which were, in fact, more usually the preserve of trapezoidal masonry.

Large-block trapezoidal masonry was apparently first used for Cycladic monumental buildings from the early Hellenistic period, despite having been commonly used in the Archaic period for supporting walls and island towers. This early Hellenistic 'renaissance' thus corresponds to the regaining of Delian Independence from Athens, but although it is perhaps tempting to see an artistic expression of 'freedom' in the reversion to 'ethnic' masonry after the ashlar dominance of Athens, it is much more likely that the motives for the use of trapezoidal were mainly economic – in terms of material and possibly speed of construction – even if marble was used in some instances. Rapidity of construction would indeed have been a priority for fortifications and utilitarian walls, as indeed perhaps for the more 'prestigious' Hellenistic marble walls, although in these cases the fact that the marble had carefully tooled surfaces which were not to be plastered over, would indicate that the decorative qualities of trapezoidal masonry, although probably not primary reasons for its use, were undoubtedly appreciated. Thus, uniform course heights – a fairly labour-intensive style – is exceptional in trapezoidal masonry. Furthermore, the distinction between 'varying courses' and 'broken courses' is often one of degree and it would be a mistake to extrapolate too much from the use of one type or the other, except to point out the obvious: trapezoidal with varying courses is merely a more carefully planned and constructed version of broken coursed masonry. Indeed, sometimes these two styles are used in the same wall and merge

into one another.

Polygonal masonry is the least common of all the types of masonry found on the Cyclades. On city ramparts (rather than buildings) where one might expect it to be used, trapezoidal and ashlar are preferred. Its one significant use – at fifth-century Melos – may be a result of the use of trachyte which may have split in such a way as to prompt this style; or the Dorian inhabitants of the island may have preferred this style which was certainly more 'mainland' than Cycladic in tradition and origin.

The Cycladic islands certainly, and most strikingly, differed from other areas of Greece in their extensive use of rubble masonry for monumental buildings in the Classical and Hellenistic periods. Furthermore, rubble masonry was employed for nearly every type of building with the exception of the most important, centrally located temples which were the preserve of ashlar masonry. Coursed rubble masonry accounts for about half of all monumental rubble constructions, with examples of its use commonly occurring from the sixth to the second centuries. The best examples of this type of rubble construction rival many uniformly coursed walls of ashlar, and it is unlikely that these walls were plastered. However, many, if not all, 'irregular' and 'rough' rubble walls were given a rendering on both their exteriors and interiors. In the Classical period there are only a few monuments built in either irregular or rough rubble, but in the Hellenistic period these types are used for many religious, administrative and civic buildings. The most prestigious of these were given either a façade wall of marble ashlar (the temple in Sarapieion B) or a columnar façade (*e.g.* Agora of the Italians, the Temple of Isis in Sarapieion C), and thus also conforming to the general Cycladic emphasis on the façade. In these buildings, as in those entirely built of rubble, economy and rapidity of construction must have been the overriding factors in the choice of masonry. The rise in the number of irregular and rough rubble monumental constructions in the Hellenistic period on Delos must almost certainly be directly related to the huge increase in the population which would have been particularly acute after the granting of free port status in 166 (attested to by the large numbers of contemporary houses on the island). The inhabitants required amenities for religious, commercial and leisure purposes, and the use of rubble masonry allowed these buildings to be rapidly and economically constructed. Indeed some buildings were built from privately gathered funds (*e.g.* Agora of the Italians, Sanctuary of the Foreign Gods) where economy would have

been a priority, while major temples, for instance, which were state-funded continued to be built from the more expensive ashlar masonry.

Gneisses and schists are the stones most associated with rubble masonry, but on Delos granite is also a major material in irregular and rough rubble walls. Marble, however, is only occasionally found in these types of walls on the Cyclades, the pieces probably being either reused or off-cuts, except perhaps on Tenos where there is a significant and deliberate use made of this stone in stacked jointing. This type of masonry, where distinctive individual piles of smaller stones are placed to the sides of larger blocks (which are only roughly shaped, if shaped at all), is one that is common on the islands and employed from the Archaic through to the Hellenistic period. While economy of time and material was undoubtedly the original motive for this method, in the Classical and Hellenistic periods careful and methodical instances of its use indicate that its decorative effect was deliberately being sought.

Certain Teniot walls would appear to employ decorative stacked jointing, adding to the evidence that rubble walls on Tenos are much more diverse in nature and appearance than on other Cycladic islands. The skins of the rubble walls can sometimes be regarded as 'reversible', in that the care lavished on the interior skin is as great as that on the exterior; not only are neat stacks of tablets used but also the inner skin is sometimes of marble while the exterior is of gneiss.

Extant Teniot walls also differ from those on Delos by their lack of quoining. The distinctive use of quoins on Delian rubble walls, particularly when they are of marble, is certainly suggestive of a decorative role in addition to – or perhaps, in some cases, even prior to – a structural one.

Despite the minor differences between certain islands, which reflect the particular constructional techniques and preferences of the local building-groups, the overall impression of wall construction on the Cyclades is one of homogeneity. The widespread use of rubble (rather than mud-brick or even ashlar) and of heterogeneously skinned walling (essentially 'upgraded' rubble construction) is particularly striking; both methods were products of the materials available to the Cycladic builders – the easily split and widespread gneisses and schists. Both methods were sufficiently well established techniques by the Classical period, that they remained major methods of wall construction throughout the Classical and

Hellenistic periods on the Cyclades. This strong, continual influence of 'traditional' walling techniques and styles, the majority of which were not established practices outside the archipelago, is another element in the significant and individualistic regional architecture of the Cyclades.

DORIC COLUMN PROPORTIONS (HEIGHTS and SPACING)

with specific reference to the proportions:

Column Height / Lower Column Diameter

Interaxial / Lower Column Diameter

Column Height / Interaxial

Refer throughout to:

Tables 7-9 which list the values of the above three ratios for over 120 Greek monuments for the period 570 - 69 B.C.

Graphs 1-3 which plot the same values against the same period, colour-coding monuments according to their geographical location.

In the text, monuments are followed by their Identification Number [# ...] as used on all Graphs.

INTRODUCTION

Analysis of the proportional relationships between various elements within Doric colonnades and entablatures can establish that certain general chronological trends occur in Greek architectural design, although within these trends fluctuations can and do occur. One of the easiest proportions to appreciate visibly is the slenderness of the column (Fig.3), the relevant proportion in this case being that of column height, including capital, in relation to the lower column diameter (CH/D). This proportion is of particular interest in regard to the Doric columns on the Cyclades, for it appears that their CH/D ratios are often higher than those of contemporary 'non-Cycladic' architecture, or if not, then they are certainly among the highest in the Greek world. Since this aspect of Cycladic architecture has never been given the full treatment that it deserves – certainly not in relation to the Classical and Hellenistic periods – I shall briefly outline the main, well-known developments of column slenderness in Greek architecture as well as certain peculiarities that the proportion presents, before fully analysing the Cycladic treatment of this proportion (CH/D) along with the related ratios of Interaxial / Lower Column Diameter (I/D) and Column Height / Interaxial (CH/I).

Some of the earliest stone shafts in Greek monumental Doric architecture are

more slender than sixth and indeed fifth-century columns (*e.g.* the late seventh-century Temple of Athena Pronaia at Delphi where the column height equals 6.5 lower column diameters as measured on the arrises and henceforth known merely as diameters) which is, in fact, a complete reversal of the subsequent general trend of increasing column slenderness that is apparent from the sixth to the second century. These early slender columns, rather than being direct imitations of earlier wooden supports as has been suggested,¹ could have been influenced more so by the extremely slender Ionic shafts of stone from Ionia and the Cycladic islands.² The squatter Doric columns of the early and mid sixth-century temples with heights of just 4 - 5 diameters perhaps resulted from structural concerns (albeit unfounded) or indeed aesthetic preferences given the overall larger scale of these buildings. From this time on, throughout the Classical and Hellenistic periods, the Doric columns of monumental buildings progressively become more slender, with the ratio rising to an upper limit of between 7.5 and 8 diameters. However, the general upward progression of values is by no means smooth or completely continuous but is sometimes rather in discrete groups,³ and indeed there is seemingly a limited 'Neo-Classical' movement in the second century when the proportions and rhythms of the columns and entablature on several buildings return to fourth-century ideals.⁴

This increasing slenderness of columns (together with the lightening of entablature proportions) is a result, presumably, of changing architectural tastes and perhaps, just as importantly, of economic reasons since less stone would be required, thus reducing the costs of quarrying and transport. It is less likely that it resulted from the application of a standard proportional rule, now lost, since the rise in the proportion is broad in its range and not continuous. Moreover, in many cases, perhaps the majority, column slenderness (CH/D) does not appear to have been either the initial or the most significant proportion in the design of a colonnade; instead, the

¹ Dinsmoor, *AAG*, p.73; Lawrence, *GkArch*³, p.128. Moreover, actual wooden predecessors are often rectangular posts – *e.g.* Apsidal 'Heroon' at Lefkandi (*c.* 975-950), Perachora model (*c.* 750-725), Samos, South Stoa (late 7th C.).

² As indicated by slightly later examples: *e.g.* interior columns of the Naxian Oikos on Delos, *c.* 575 (13.32 diameters high: *EAD*, XXXIII, p.55, n.5); Naxian Sphinx column at Delphi, *c.* 570-560 (10.7 diameters high excluding plinth: *FD, Colonne*, pp.5-14).

³ As with Doric capitals; *cf.* J. J. Coulton, 'Doric Capitals: A Proportional Analysis', *BSA*, 74, 1979, pp.81-153.

⁴ See page 147, note 89.

interaxial to lower column diameter (I/D) proportion or that of the interaxial rectangle (CH/I) – the two other essential and related ratios involved in the design of a colonnade – may have played equal or greater parts in the planning process. This can be deduced by the fact that the CH/D ratios often work out into complex fractions, while usually the CH/I and I/D ratios result in simpler, more 'user-friendly' fractions (*e.g.* with 1 as numerator and low denominators; and as eighths and sixteenths so reflecting the division of the Greek foot into 16 dactyls) or even whole numbers.⁵ In the case of both the CH/I and I/D ratios being the main determining proportions in the colonnade design, the slenderness of the column would simply have been a 'by-product', yet its effect must have been foreseen and accepted. Its validity as a significant ratio informative of architectural taste is therefore not affected.

A peculiarity of the CH/D ratio is that the scale of a building⁶ sometimes seems to affect the slenderness of its columns: certain small-scale buildings (such as treasuries) sometimes have more slender columns than larger, contemporary buildings even within the same architectural area. This certainly holds true for the late Archaic and early Classical periods when some of the treasuries at Olympia and Delphi allow one to draw sufficient comparisons.⁷ In such cases this proportional variation was probably intended not only to give upward lift and vibrancy to a relatively small, possibly unimposing and somewhat squat-looking façade but also, more practically, to provide for larger intercolumniations for ease of access, as well as being more structurally viable.⁸ However, this is by no means always the case at later dates when

⁵ However, one must also allow for discrepancies in the present ratios since they may be several steps removed from the original intended proportion: for an architect wanting to obtain a measurement from a proportion would probably use a simple fractional proportion, but if this worked out to a complicated fractional measurement in feet and dactyls, he would undoubtedly round out to a convenient measurement (at least to the nearest $\frac{1}{4}$ dactyl), so that when one comes to work out the proportion today from these measurements one can expect divergences from basic fractional proportions. *Cf.* Coulton, *BSA*, 1973, pp.84-85; Coulton, *BSA*, 1975, pp.83-84, 93, 99.

⁶ The often used division between 'small-scale' and 'large-scale' buildings is of course purely arbitrary and based on general dimensions.

⁷ Large-scale: Delphi, 2nd Apollo Temple [#14], *c.*514-506 CH = 4.50 - 4.56 D
 Olympia, Zeus Temple [#38], *c.*468-460 CH = 4.66 D
 Small-scale: Olympia, Megarian Treasury [#16], *c.*500 CH = 4.94 D
 Delphi, Athenian Treasury [#28], *c.*490-480 CH = 5.47 D
 Delphi, Marmaria Treasury [#31], *c.*480-475 CH = 5.42 D
 Olympia, Sikyonian Treasury[#32], *c.*480-460 CH = *c.* 5.1 D

For possible Cycladic influence in this ratio at the Athenian Treasury at Delphi, see pages 131-132.

⁸ Coulton, *Architects*, pp.88-90.

the difference in proportions between contemporary columns of varying size and within the same architectural area seems too slight to argue justifiably that there was a conscious effort to make smaller columns more slender. There is no known rule which always provides small colonnades with more slender columns, even if this appears to be the case at times – see Appendix 2.

It should also be mentioned that despite the prescription of Vitruvius that stoa columns should be 7.5 diameters in height rather than 7 diameters high as for temples,⁹ (as can be deduced from Table 7 and Graph 1) there is in fact no major difference in column proportions between these two types of building.¹⁰

A final, general feature of column proportioning that is worth highlighting is that the pronaos columns of Doric peripteral temples usually have lighter proportions than their associated pteron columns, a subtlety noted and advised by Vitruvius.¹¹

ANALYSIS: THE CYCLADIC ROLE

The following analysis will show that the Cycladic tendency for unusually slender columns is not primarily the result of the colonnades being relatively small in scale, a reason that might be proffered, but is rather due to a distinct regional preference for extremely slender columns, of which there is a long tradition on the Cyclades.

Although the development of architectural proportions, like the architectural forms themselves, is a continuous one that disregards the subsequently imposed chronological divisions, the following large body of material has been sectioned into the usual main periods of Greek history and art simply for ease of reference. Since the proportions of Classical and Hellenistic columns on the Cyclades are so influenced by those of the Archaic period, it is to this crucial period that we turn first.

⁹ Vitruvius, *De Architectura*, V, 9, 3.

¹⁰ Cf. also Coulton, *Stoas*, pp.108-109.

¹¹ Vitruvius, *De Architectura*, IV, 4, 2. This differentiation is proven in many temples including the Temple of Zeus at Olympia, the Parthenon, the Temple of Apollo at Bassai, the Great Temple of Apollo at Delos, but apparently not at the Temple of Athena at Tegea: cf. J. J. Coulton, 'The Second Temple of Hera at Paestum and the Pronaos Problem', *JHS*, 95, 1975, pp.22-24. See page 135, note 46.

LATE ARCHAIC PERIOD (c. 550-480)

Before examining the relevant column proportions, it is necessary to note that on the Cyclades in the last half of the sixth century and early fifth century there is a common and distinct series of column shafts and associated Doric capitals which differ in several significant ways from those elsewhere in the Greek world. The 'Cycladic-type' Doric capitals are characterised primarily by their diminutive size, and, among other traits, they have smooth necks with no flutes and no annulets.¹² The column shafts have small upper and lower diameters, are rarely fluted, are either monolithic or composed of only a few drums, and sometimes stand on tall cylindrical or conical bases (Pl.82).¹³ These 'Cycladic' or 'Island-type' Doric columns are unusually slender being 6.5 - 8 diameters high;¹⁴ these are significantly greater values than those of many contemporary, non-Cycladic Doric columns which have heights of 4 - 5 diameters (Fig.3). Moreover, the columns are widely spaced apart having interaxial dimensions (I) of c. 4 lower column diameters (in contrast to a figure of 2 - 2.5 diameters in the rest of Greece at this time¹⁵). These wide column spacings on Cycladic buildings are perhaps, initially at least, not so much the result of a desire for large intercolumniations but are due rather to the association of unusually thin columns with triglyphs and metopes of typical dimensions and proportions for a normal Doric building of similar size.¹⁶

Of all the Archaic 'Cycladic-type' columns associated with monumental buildings, those of the distyle *in-antis* Heraion B on Delos [#17] can be restored with

¹² There are, in fact, two variants of this 'Cycladic-type' capital: some have a flat, widely projecting, phiale-like echinus and a smooth neck with no annulets, and others possess a tauter, steeper echinus with a perpendicular 'lip' in place of annulets, and are also not fluted on the neck. Examples are known from Delos, Naxos, Paros, Despotiko and Cape Sounion. Cf. Schuller, *JdI*, pp.319-398 *passim*.

¹³ The smoothness of the shafts renders them suitable for carrying Doric or Ionic capitals; interestingly, at the Temple of Demeter at Sangri on Naxos (c. 550) a Doric-looking Ionic 'leaf-wreath' capital is placed on this type of shaft: cf. *AA*, 1982, p.215, n.39.

¹⁴ Cf. *AHHD*, II.i, pp.99-106 (the Delian series); Schuller, *JdI*, pp.321-389 *passim* (Cycladic and Thasian examples).

¹⁵ An exception is the Temple of Athena at Alipheira in the Peloponnese where $I/D = 3.01$.

¹⁶ E.g.:

	Trig. width (Tw)	D	Interaxial (I)	Intercolumniation(Ic)
Delos, Heraion B	c. 43 cms.	52.5 cms.	2.075 m.	1.55 m.
Despotiko, 'Doric Building'	39.5 cms.	c. 52-54 cms.	1.98-2.02 m.	1.46-1.48 m.
Olympia, Sikyonian Treasury	41.0 cms.	c. 75 cms.	1.97 m.	1.22 m.
Olympia, Megarian Treasury	40.2 cms.	70.8 cms.	1.928 m.	1.22 m.

In all four cases $I = c.5 Tw$, but in the Cycladic cases $Ic = c.3D$, and in the last two $Ic = c.1.7D$.

the most certainty since the shafts survive (3.885 m. or 7.4 D high), and the heights of the lost capitals can be estimated to have been around 0.35 - 0.45 m. high on the basis of other 'Cycladic-type' capitals – which that of the Heraion must almost certainly have been, given the temple's smooth, narrow column shaft. Thus, the complete column can be reasonably assumed to have been approximately 4.20 m. or 8 diameters high (Fig.3, Pl.83).¹⁷ That this estimation may not be far off the mark seems to be suggested by the fact that the resulting height of the central interaxial rectangle (*i.e.* CH/I) is that of 2 interaxials (actually 2.02); the use of these whole number ratios, if correct, would almost certainly be deliberate.

There are several other sixth-century Cycladic monuments where comparably slender columns can be envisaged, despite the shafts being incomplete or absent, on the basis of relatively small lower column diameters (sometimes marked on the stylobate), large I/D proportions and their association with 'Cycladic-type' capitals'.¹⁸ However, these are omitted from Table 7 and Graph 1 owing to the high incidence of hypothetical reasoning. It is important to acknowledge, though, that even if one cannot fix the column height without using circular arguments involving comparative CH/D proportions, in some cases one can establish a height which the column must have exceeded by using 'less' circular arguments. For instance, at Treasury V on Delos [#4], *c.* 550-525, the known lower column diameter is 0.42 m.; the contemporary 'normal' CH/D proportion outside the Cyclades is 4.7 (see Graph 1), thus leading to a CH of 1.97 m., and this in turn gives a CH/I ratio of only 1.26 which is unparalleled in Greek monumental architecture (with the exception of the utilitarian mid sixth-century Minoe Fountain-House on Delos – see directly below). Thus, in all likelihood its column slenderness must have been above the non-Cycladic average. In a similar fashion the extant, though broken, lower part of the column shaft of the South Building at Aliko on Thasos [#18], dated *c.* 500, allows one to establish that the columns would have been *at least* 6.1 - 6.3 diameters high, again more slender than

¹⁷ EAD, XI, pp.190-192, figs.158-159; AHHD, II.i, p.104; *cf.* Schuller, JdI, pp.340-347.

¹⁸ Delos - Treasury V (*cf.* AHHD, II.i, pp.107-106, 283; Schuller, JdI, pp.348-349). Kea - Temple of Apollo at Karthaia (*cf.* Schuller, JdI, pp.368-371) and Temple of Apollo at Koressia (*cf.* Schuller, JdI, pp.361-367). Despotiko - 'Doric Building' (*cf.* Schuller, Artemis-Tempel, p.96, fig.40).

contemporary columns elsewhere in Greece other than on the Cyclades.¹⁹

The known height of the columns of the Minoe Fountain-House on Delos [#5], c. 550-525, is another above-average 6.2 diameters (Pl.82). The interesting feature of these monolithic columns is their small height (2.09 m. including base) which reaches just above head-height and their extremely small lower column diameters (0.34 - 0.35 m.); this colonnade is the first of a series of 'diminutive' colonnades on the islands. These factors, together with the wide intercolumniations, concur with Archaic Cycladic architectural practice as noted above, but small utilitarian constructions like the Minoe Fountain would appear to be less a result of considered architectural design with regard to monumentality and proportion, than a result of convenience and extreme economy, and thus their effect upon contemporary architecture of larger scale should perhaps not be over-estimated.²⁰

As one can see from Table 7 and Graph 1 there are several late Archaic buildings where the columns have relatively slender heights of 5 - 6 diameters, which thus lie between the contemporary stocky Doric columns of the Greek mainland and of the western colonies, and the extremely slender Doric columns of the Cyclades. Certain explanations can be proffered for these:

-- Assos, Temple of Athena [#6], c. 540: CH = 5.22 D.²¹ The columns of this 6 x 13 peripteral temple – the only notable Doric building in the eastern Aegean during both the Archaic and Classical periods – are most probably the product (like those on the Cyclades) of direct Ionic influence reflecting its location on the Asiatic coast.²²

¹⁹ Height of remaining shaft = 3.12 m.; D = 0.60 m. Since one can reasonably assume that the shaft height rose to 3.40 *at least*, and with the addition of a capital (c. 0.30 - 0.40 m.), minimum CH = 3.70 - 4.80 m. or 6.1 - 6.3 diameters. Servais bases his CH (3.50 - 4.50 m, or c. 7 D) on analogy of the columns of Heraion B on Delos: cf. *ET*, IX, p.53; Schuller, *JdI*, pp.358-359.

²⁰ The I of 2.20 m. is not excessively wide, but the I/D ratio of 6.3 is high due to the small D.: cf. *EAD*, V, p.107, figs.140-141; *AHHD*, II.i, p.104; Schuller, *JdI*, pp.347-348. The capitals (*EAD*, V, p.107, fig.141), despite Courby's belief that they were of the late Hellenistic to Roman period (*ibid.* pp.117-118), are now accepted as 'Cycladic-type' (*GD*, p.142). Other colonnades with small stone columns but even greater spans are found at Stoa C at Selinous (I = 3.70 m.; D = 0.43 m.), the Athenian Stoa at Delphi (I = 3.58 m.; D = 0.39 m.) and a stoa at Stratos (I = 2.95 m.; D = 0.42 m.): cf. Coulton, *Stoas*, p.78. However, these non-Cycladic colonnades probably had wooden entablatures; a stone entablature cannot be ruled out at the Minoe Fountain, despite a complete lack of evidence, given the Cycladic preference for complete stone architecture.

²¹ *Assos*, pp.145, 164, 168.

²² Other architectural forms in the temple reveal Ionian influence: e.g. relief sculpture on architrave (as at the 6th C. Didymaion), and the absence of anta returns: cf. Dinsmoor, *AAG*, p.88, fig.33.

-- Aigina, Temple of Apollo [#12], c. 520-510: CH = 5.65 D;²³ and Temple of Aphaia [#24], c. 500-485: CH = 5.23 D.²⁴ Despite both peripteral temples possessing many canonical Doric forms and non-Cycladic constructional techniques, the slenderness of their columns – especially those of the Apollo Temple – may have been influenced by Cycladic proportions, given the proximity of Aigina to the archipelago and the close contact between them. Indeed, the later Temple of Aphaia possesses some striking 'Cycladic-Ionic' architectural forms and techniques indicating Cycladic and/or eastern Aegean influence, as well as evidence of the likely use of Cycladic sculptors and building-groups for the carving and laying the architectural elements (metopes, simas, pediments and akroteria) of Parian marble.²⁵ However, it is also important to note that in the Aphaia Temple the columnar proportion of primary importance is the interaxial rectangle for the proportion CH/I = 2 (CH = 18 Ionic feet; I = 9 Ionic feet).²⁶

-- Delphi, Treasury of the Athenians [#28], c. 490: CH = 5.47 D.²⁷ Although the unusually slender columns may perhaps be attributed to the building's small scale (6.78 x 9.84 m. on lowest step; Pl.84),²⁸ another reason – by no means mutually exclusive of the former – could relate to the Cycladic involvement in the treasury's construction which was certainly more than merely the use of Parian marble.²⁹ It is indeed possible

²³ W. Wurster, *Alt Ägina, I, 1: Der Apollontempel*, (Mainz am Rhein, 1974), p.119.

²⁴ *Aphaia*, pp.150-151, tables 9-10.

²⁵ *E.g.* capitals with narrow necks in relation to abacus width, the abacus also being unusually flat; anta capitals with flat abaci and an astragal below the Doric hawksbeak; slenderly proportioned triglyphs; painted Ionicising anthemias; Ionic volute akroteria of Parian design and execution (Ohnesorg, *InsMarmDäch*, pp.28-29). The Ionic foot (29.42 cms), commonly used on the Cyclades in 6th C., is employed; the feeble entasis of the columns is a feature associated with Cycladic and later Ionic columns; and the newly proved curvature of the stylobate follows the example of some Cycladic monuments (Demeter Temple at Sangri on Naxos, c. 530; the Siphnian Treasury at Delphi, c. 525) given that this refinement on the mid 6th C. Temple of Apollo at Corinth is not sufficiently proved. *Cf.* *Aphaia*, pp.170-171 and *passim*. The use of a characteristically Cycladic type of dove-tail clamp on the Parian marble suggests an island building-group: *Aphaia*, p.145 + n.383. For the date of the Aphaia Temple, see page 179, note 7.

²⁶ Bankel has demonstrated that two key 'modules' are used in the temple's design: one of 30 dactyls for the major widths, and one of 11 dactyls (20.229 cms; 1 dactyl = 1.839 cms) for the colonnade and elevation: *e.g.* CH = 26 modules; I = 13 modules; D = 5 modules *etc.* *Aphaia*, pp.117-121, 146-151.

See pages 151-162

²⁷ *FD, TrAth*, pp.18-20.

²⁸ See pages 126-127.

²⁹ As indicated by the following Cycladic forms and techniques: reduction of architrave weight by hollowing out the backs of the blocks; lack of joint concordance in the main wall; reduced 'vestigial' (continued...)

that the Cycladic propensity for wide interaxials and slender columns affected – if not prompted – the redesign of the façade which occurred after construction of the building had begun, when we know at least that the planned interaxial was widened.³⁰ It is not inconceivable that enlargement of the interaxial was just one part of a more widespread redesign which also provided more slender columns by increasing their planned height (and perhaps reducing their planned lower diameters).³¹ As it is, the interaxials are wider ($I/D = 2.90 D$)³² and the columns are more slender than those of earlier or contemporary non-Cycladic monuments of similar size. Both these features are typical of Archaic Cycladic architecture and may be due in some measure to their known involvement at this treasury.

-- Selinous, Temple FS [#11], c.525: CH = 5.09 D.³³ In contrast, at this elongated temple (24.37 x c.61.88 m.) the lightly proportioned columns, the most slender in Sicily or South Italy until the mid fourth century, form just one part of the temple's many peculiarities in design – a design which was in many respects a unique experiment that was never attempted again in the course of Western Greek architecture.³⁴ Its light and airy proportioning appears neither to have been influenced

²⁹(...continued)

steps around the building. In addition, the use of certain Ionic mouldings (a beaded astragal crowning the abacus of the anta capital, and below its hawkbeak an uncarved astragal) also points to an Aegean influence. Other oddities in the treasury's design indicate general hesitations in the use and continuing development of Doric architecture. See Appendix 1 for references and fuller elaboration on Cycladic constructional traits. However, more fundamental aspects of the design reveal the hand of a mainland, possibly Athenian, architect: single-skin wall construction; multi-block door-frame with wooden sheathing; use of edge dowels and lever holes; and the retreat of the main wall above orthostates.

³⁰ As indicated by the actual setting of the columns which, unusually, are misaligned with the centre of the stylobate blocks and the frieze elements. Planned $I = 2.02$ m.; actual $I = 2.184$ m. This widening does not seem to have been born of a desire to produce a mathematically or proportionally more pleasing interaxial rectangle since the planned $CH/I = 2.10$, the actual $CH/I = 1.89$.

³¹ The heightening of the columns would also require a heightening of the walls; thus one can speculate on the hypothetical older column height by reducing the current wall height by one course (c. 0.38 m.) which gives $CH = c. 3.748$ m. or $4.97 D$, a ratio in line with those of the similar-sized and contemporary Megarian Treasury ($4.94 D$) and Sikyonian Treasury (c. $5.1 D$) at Olympia.

³² *I.e.* relative to contemporary colonnades on the mainland and in the western colonies, although it is still below usual Cycladic ratios.

³³ Dinsmoor, *AAG*, p.337.

³⁴ Extremism is found also in the unusually wide pteromata, the closeness of the cella to the inner colonnade, and the flank interaxials being wider than those on the short sides; other oddities of design include screens between the lower part of the columns, and mutules with four rows of guttae instead of the usual three: Koldewey-Puchstein, pp.117-121, pl.16; Dinsmoor, *AAG*, pp.98-99; H. Berve, G. Gruben, *Greek Temples, Theatres and Shrines*, (London, 1963), pp.426-427.

by, nor in turn to have influenced, any other Greek monuments.

And on the Cyclades themselves:

-- Paros, Temple of Artemis in the Delion [#29], c. 490-480: CH = 5.59 D.³⁵ The slenderness of the columns, in spite of the small scale (5.82 x 9.29 m.) of this distyle *in-antis* monument, must probably be attributed to the lingering and pervasive influence of traditional 'Cycladic-Doric' architecture, elements of which are mingled in this temple which outwardly conforms to the Doric order of the mainland. Indeed, the Artemis Temple is extremely important for illustrating the development of orthodox Doricism on the Cyclades. The temple's general plan and architectural style at first sight seem quite orthodox but, in fact, not only are there certain hesitations in the application of Doric forms (such as the omission of taenia on the triglyphs and of guttae on the mutules) on the temple, but there are also found the following peculiarly Cycladic constructional techniques: 'heterogeneously-skinned' walls; absence of joint concordance; hammered wall surfaces; a strong inclination of the walls; a variation in wall thickness within the same building; the probable use of mud-plaster to cover interior walls; use of 'island-type' dove-tail clamps; the unusual anta construction; the hollowing-out of the back of certain architectural members to reduce weight; the probable use of a monolithic door-frame; and a reduced step construction on the back and side walls, all of which are referenced and/or more fully elaborated upon in Appendix 1.

It is also interesting to note that the interaxial rectangle (CH/I = 2.27) is also significantly more slender than contemporary mainland instances (although matched at the two earlier temples at Paestum); the intended ratio may have been exactly $2\frac{1}{4}$.³⁶

Finally, one should note that there is a single example of a Cycladic building with a CH/D ratio that is among the mainland ratios. On Kea the hexastyle peripteral Temple of Athena at Karthaia [#25], c. 500-480, has an estimated column height ranging from 4.4 - 5 diameters,³⁷ the average thus being 4.7 D. This unusually squat Cycladic colonnade is perhaps a result of its having been designed by a

³⁵ Estimated CH = 3.952 m., directly following from the reasonable estimation of the wall height: Schuller, Artemis-Tempel, pp.41-48.

³⁶ This interaxial rectangle ratio was copied exactly at the little later Great Temple of Apollo on Delos (see page 135). The I/D ratio = 2.47 D conforms to mainland values.

³⁷ Cf. Østby, OpAth, p.199 (CH = 4.00 - 4.50 m.); p.196 (D = 0.84 - 0.90 m.).

Peloponnesian-trained architect. This is postulated by Østby on the basis of the temple's employment of double angle-contraction (citing the Heraion at Olympia as a forerunner) and of naos-alignment (as earlier at the Olympian Heraion and the Temple of Apollo at Corinth), as well as possessing certain links in the forms and proportions of the columns with the Temple of Athena at Alipheira.³⁸ In contrast to the colonnade, the krepis and cella are constructed in a typically Cycladic manner, the former being constructed economically with no joint concordance and a reduced number of steps (only 2), the latter being constructed from 'heterogeneously-skinned' walls of marble (exterior) and gneiss (interior), presumably by local workmen (Pl.42).³⁹

Thus, in both these last two Cycladic temples, one can see the growing influence of mainland architecture upon Cycladic buildings in the final decades of the Archaic period. They form a very real transition to the Cycladic architecture of the Classical period to follow.

EARLIER CLASSICAL PERIOD (c. 480 – 400)

With the formation of the Delian League in 477 B.C. with its headquarters on Delos, Athenian political and artistic influence within the Cyclades could only increase. Yet, as we shall see, one Cycladic architectural trait that was never completely extinguished was the preference for slender columns, since throughout the Classical and Hellenistic periods the figures for the relevant ratio (CH/D) are often higher on the Cyclades – albeit sometimes only slightly – than elsewhere in Greece.

The first truly Classical monument on the Cyclades to be built according to the precepts of orthodox Doric architecture was the Great Temple of Apollo on Delos [#37], the only peripteral temple (6 x 13 columns) on the sacred isle, largely constructed c. 475-450. Like the afore-mentioned Temple of Artemis on Paros, the Delian temple also exhibited a few features owing something to traditional Cycladic architectural practices;⁴⁰ one such marked feature is the slenderness of the peristasis

³⁸ Cf. Østby, *OpAth*, pp.218-223 + n.136. Moreover, the estimated interaxial rectangle (CH/I = 1.78 - 2.01) and the ratio I/D (c. 2.59) are similar to those of contemporary Peloponnesian buildings.

³⁹ Østby, *OpAth*, pp.192-196 (krepis), 200-202 (walls); see also page 81.

⁴⁰ Lack of orthostates, use of dove-tail clamp even at this relatively late date, lack of joint concordance on walls: see Appendix 1 for further elaboration and references.

columns which have heights of 5.50 diameters.⁴¹ This ratio is significantly higher than those of previous or contemporary peripteral temples or stoas on the mainland or in South Italy and Sicily. For instance, the Temple of Zeus at Olympia [#38], dating between 468-460, has column heights of only 4.66 diameters,⁴² although the large discrepancies in the ratio values between the two temples could possibly be due to the difference in their scale;⁴³ however, at the South Stoa at the Argive Heraion [#43], c. 460-450, where the columns have similar lower diameters and interaxials as the Great Temple of Apollo, the heights are still estimated at only 4.7 diameters.⁴⁴

The round CH/D figure of 5.50 at the Great Temple of Apollo seems to indicate that it was, somewhat unusually, one of the main determining proportions in the design of the colonnade. This possibility is strengthened by the use of a simple ratio 9:4 (*i.e.* $2\frac{1}{4}$, although actually 2.24) for the related interaxial rectangle (CH/I).⁴⁵ A final observation about the Apollo Temple is that the pronaos columns are also more slender than those of non-Cycladic temples.⁴⁶

The early Classical period probably also continued the use of the extremely slender 'Cycladic-type' columns that were prevalent in the Archaic period. Indeed it would be odd if such traditional forms suddenly stopped being used. These types of columns can be presumed, with some certainty, to have been used on two, if not all four, of the Classical Treasuries (I - IV) on Delos since, although none of the shafts remain, the narrow width of the stylobates and the marks on one of them indicate that the columns had small lower diameters and were placed widely apart. At the distyle *in-antis* Treasury I the lower column diameter = 0.54 m. and the two columns are

⁴¹ EAD, XII, pp.16-18.

⁴² From Aphaia, tables 9 + 10.

⁴³ Apollo Temple: 12.47 x c.28.53 m.; CH = c.5.20 m.; D = 0.945 m.
Zeus Temple: 27.68 x 64.12 m.; CH = 10.52 m.; D = 2.256 m. See pages 126-127.

⁴⁴ Coulton, BSA, 1973, pp.75-77.

⁴⁵ The temple's I/D ratio = 2.44; this sits in the middle of the range of I/D values for Sicilian/South Italian and Peloponnesian monuments – the former group having values roughly 2 - 2.5 and the latter 2.5 - 3. The I/D ratios of the slightly later Periklean buildings range from 2.3 - 2.7.

⁴⁶ *E.g.* Delos, Apollo Tmp: pronaos CH = 6.14 D (peristasis CH = 5.50 D) EAD, XII, pp.44-46.
Aigina, Aphaia Tmp: " CH = 5.47 D (peristasis CH = 5.23 D)
Olympia, Zeus Tmp: " CH = 5.44 D (peristasis CH = 4.66 D)

As one can also see, these pronaos columns are more slender than those of their encircling colonnade. See page 127. The I/D proportion for the pronaos columns of the Great Temple of Apollo = 3.59; this high figure is accounted for by the fact that there are three ~~triglyphs~~ ^{triglyphs} rather than the usual two placed over the central intercolumniation of the pronaos. ~~metopes~~

placed relatively far apart ($I/D = 4.6 D$); at Treasury III, also distyle *in-antis*, it is likely that the lower column diameter was equal to or less than the stylobate width of 0.56 m., and the central interaxial was widened to 3.18 m. so as to accommodate the three-metope central span in the frieze above (thus $I/D \leq c.5.7$).⁴⁷ Further evidence for the column slenderness of all four treasuries may come with the possible attribution to them of two types of narrow-necked capitals (lower diameters = 0.378 m. and 0.438 m.) found nearby.⁴⁸ Given the Cycladic location of these monuments, their use of traditional 'heterogeneously-skinned' walling, and their similar size to the late Archaic Heraion B, their combination of columns with small diameters and wide interaxials seems reasonable evidence to suppose that the columns were also slender (although not necessarily as slender as those of the Heraion), granted that one cannot discount the possibility of the treasuries having unusually squat columnar façades.

The Doric 4 x 4 peristyle of the contemporary 'Thesmophorion' [#36] on Delos also reflects Cycladic tendencies since its fluted columns are certainly more slender than other non-Cycladic colonnades. The peristyle's columns have a height of 6.07 diameters and are also widely spaced ($I/D = 3.45$).⁴⁹ The hesitancy which attends the comparison of this fairly small (*c.* 7.75 x 7.60 m.) internal colonnade with other visually more significant exterior colonnades, is somewhat dispelled when one notices that there is in fact a certain amount of proportional planning within the 'Thesmophorion' peristyle, for the ratio of the interaxial rectangle (CH/I) is $1\frac{3}{4}$ (actually 1.76).

On Thasos the preference for slender columns, as found at the South Building at Alikí in the Archaic period, continues in the early Classical period, for at the North Building at Alikí the new Doric tetrastyle *in-antis* colonnade [#33], which replaced the old Ionic one, also has unusually slender columns. From the sections of extant fluted

⁴⁷ Treasuries I + III: *AHHD*, II.i, p.284; Schuller, *JdI*, pp.350-352.

⁴⁸ *AHHD*, II.i, p.133; Schuller, *JdI*, p.352. The Doric capitals, unlike Archaic 'Cycladic-type' capitals have fluted necks. If one, for instance, attributes the narrower capital to Treasury I the upper and lower diameter of its columns almost match those of Heraion B; if one then supposes the same column-shaft inclination (3.99%) as the Heraion B, the Treasury's CH/D ratio (8.05 D) also closely matches that of the Heraion B (*c.* 8 D).

⁴⁹ Vallois, 'TopDél', pp.254-257. The architrave seemingly correctly attributed to the peristyle provides for a 2-metope system with unusually wide metopes of around 2.4 times, and even up to 3 times, as wide as the triglyphs which themselves are comparatively thin (*c.* 0.30 m.) in relation to the lower column diameter (*c.* 0.66 m.).

shafts (one now in the Louvre) it is possible to estimate, on the basis of the known column taper, lower column diameter and contemporary analogies, that the columns would have attained a height of 5.50 - 6.06 m. or 6.7 - 7.3 diameters.⁵⁰ Moreover, the wide interaxial spacings ($I/D = 3.39 I$) also conform to Cycladic practice.

At this point it is appropriate to break off from the examination of Cycladic columns to mention those of Periklean Doric architecture. As one can easily see from Graph 1, these Attic buildings of the final half of the fifth century have a tight group of CH/D ratios ranging from 5.4 - 5.8 diameters, which are above previous and contemporary Peloponnesian, South Italian and Sicilian ratios, although still below certain earlier Cycladic ratios. In fact, and most importantly, it seems that the Doric architecture of Periklean Athens, which itself was so very influential in later Greek (and indeed Western) architecture, had itself been strongly influenced by certain Cycladic constructional techniques and 'Island-Ionic' and 'Island-Doric' architectural forms. These are, principally, the use of the Ionic frieze; of Ionic monolithic door-frames; the employment of stone ceiling beams and stone coffers instead of wooden ones; perhaps the common use of the prostyle plan; the use of Ionic mouldings in the Doric order; and the adoption of more slender Doric columns.⁵¹

Returning to the Cyclades, the next major monument to be erected on the islands was the Temple of the Athenians on Delos [#54], built c. 425-417 to an Attic design, even the marble coming from Mount Pentelikon. The plan, and many architectural forms and constructional techniques of this hexastyle amphiprostyle temple (c. 9.69 x c. 17.01 m.) follow the innovative prescriptions of 'Periklean Doric' architecture; ^{see pp. 163-4 + notes 50-51} thus, the columns have a relatively slender proportioning with a height of 5.74 diameters,⁵² a figure that closely matches those of earlier Periklean columns.

⁵⁰ Remaining height of shaft = 2.49 m.; $D = 0.825$ m.; the upper column diameter can be estimated to be between $0.776 D$ (as at the Parthenon, one of the highest 5th C. ratios) and $0.752 D$ (average of the contemporary Athenian Treasury and the Doric Marmaria Treasury at Delphi, the columns of which have similar diameters to Aliko North Building); the scale drawing of the shaft (ET, VI, p.36, fig.43) enables one to continue the shaft taper to the estimated upper column diameter, so giving the estimated shaft height, to which is added the approx. height (c. 0.40 m.) of a similar-sized Doric capital.

⁵¹ See pages 32, n.117 (stone beams), 161 (Ionic frieze), 164, n.50 (prostyle plan) and Appendix 1 (Ionic door-frame and mouldings). Cf. Gruben, MüJb, pp.16-31; Schuller, Artemis-Tempel, pp.113-114.

⁵² EAD, XII, pp.114-116.

Again, a more critical proportion in the design process of this Delian temple would appear to be that of the column spacing (I/D) for it happens to be a neat fraction, $2\frac{1}{4}$ (as at the Parthenon, where it is more often expressed as 9:4, a ratio that is repeated in several key proportions on the renowned temple).

LATER CLASSICAL PERIOD (c. 400 – 323)

In the fourth century building projects on Paros, after having come to a halt almost a century before, presumably as a result of the subjugation of the island by Themistokles following the Battle of Salamis in 480 B.C., resume with the construction of two large Doric temples which exemplify the excellence of Parian stonemasonry. One is located in the Pythion on the outskirts of the modern main town of Parikia, the other on the opposite side of the island at Marmara. The former was the Temple of Apollo Pythios [#59], c. 400-350, which most probably had a hexastyle amphiprostyle plan, thus resembling the Temple of the Athenians on Delos although broader (estimated width c. 13.50 m.) and also possessing an inner Doric order. Along with other Cycladic constructional techniques and forms used on the temple is that of slender column proportioning, the columns being 6.51 diameters high.⁵³ This high figure for the CH/D proportion is virtually a whole column diameter higher than those of other contemporary temples in Greece many of which match the Apollo Pythios in the scale of either column height (c. 5.53 m.) or lower column diameter (c. 0.85 m.).⁵⁴ Moreover, the columns are widely spaced for an otherwise largely canonical Doric building, the I/D ratio of 2.86 being higher than for other two-metope systems on comparable temples where 2.2 - 2.6 is the norm as ^{Table 8 + 2}Graph 8 shows.

Yet, perhaps within a decade, the columns of the Temple of Apollo Pythios are surpassed in their slenderness by those of the peripteral Temple at Marmara [#60] on the same island. The many surviving column drums – albeit still with their protective mantle – indicate that the column height was c. 6.67 m. or 6.88 diameters.⁵⁵ This ratio contrasts strikingly not only with those of the little later and somewhat larger peripteral temples of Athena Alea at Tegea (6.09 D, and designed by Skopas of Paros)

⁵³ AA, 1982, p.256. For the other typically Cycladic features found on the temple see Appendix 1.

⁵⁴ See Table 7.

⁵⁵ AA, 1982, p.268. The shaft height given in the text (c. 6.15 m.) is obviously incorrect given the prescription of its calculation in n.7 and the reconstruction, fig.4.

and Zeus at Nemea (6.34 D), but also with the ratios of similarly-scaled buildings such as the prostyle 3rd Temple of Athena Pronaia at Delphi (5.91 D).⁵⁶ Interestingly, all three main columnar proportions could have played key parts in the design process. The CH/D ratio is very close to the fraction $6\frac{7}{8}$ which, despite looking complicated, is an easy division of the Greek foot comprising 16 dactyls; the I/D proportion also seems to be a determining one for its value is $2\frac{1}{2}$ (actually 2.495); and the interaxial rectangle (CH/I) may have been a prominent factor in the design process, its estimated proportional value being approximately $2\frac{3}{4}$ (actually 2.756) which, moreover, is unusually slender (excluding the tholoi) as Graph 3 illustrates.

Also on Thasos the Cycladic tendency for column slenderness was maintained: the winged Paraskenia Building [#78], c. 350-300, located in the city's agora has columns which can be restored to a height of c. 6.58 diameters.⁵⁷ Although the relatively small scale of the Paraskenia Building (18.25 x 8.60 m.; CH = c. 4.95 m.; D = 0.745 m.) perhaps flaws direct comparisons with the larger mainland temples (which have slightly squatter columns), if one compares it to contemporary Ionian stoas, whose lower column diameters are similar, the Thasian building still emerges as having the most lightly proportioned columns.⁵⁸ The column spacing is worth noting also, for it is the first time since Treasury III on Delos (c. 480-450) that a three-metope span – albeit probably only on the middle interaxial of the recessed central body of the Paraskenia Building – has been used on the Cyclades or Thasos.⁵⁹

In this late Classical and early Hellenistic transitional period, however, it is worth noting that there are a number of non-Cycladic monuments – none of which are 'temples' in the accepted sense – that also possess exceptionally slender columns, rivalling and sometimes surpassing those Cycladic monuments presented above. One

⁵⁶ Temple	Width x Length	D	CH
Paros, Marmara, c.400-350	c.13 x ? m.	c. 0.97 m.	c. 6.50 m.
Delphi, 3rd Athena Pronaia, c.365-360	11.01 x 21.25 m.	0.89 m.	5.282 m.
Tegea, Athena Alea, c.350	19.19 x 47.55 m.	1.555 m.	9.474 m.
Nemea, Zeus, c.340	20.09 x 42.55 m.	1.63 m.	10.33 m.

For the slender CH/D ratio of the Tholos at Epidauros see page 140.

⁵⁷ ET, VI, pp.70-71. The measurements on the restored elevation (plan M) do not agree with those presented in the text, the latter here being used.

⁵⁸ *E.g.* Priene, Agora, Pi-shaped Stoa: CH = 6.23 D; Miletos, Harbour Stoa: CH = 6.28 D. The only roughly contemporary stoa on the mainland whose column height can be restored is at Oropos; see page 141.

⁵⁹ I/D of 3-metope central interaxial = 3.91; I/D of 2-metope interaxials = 2.59. ET, VI, pp.75-80.

can proffer reasons, other than the general development of column slenderness, for many of them:

-- The Tholos at Delphi [#65], c. 370 B.C., and the Tholos at Epidauros [#80], c. 340: CH = 6.83 D and 6.89 D respectively.⁶⁰ The excessive column slenderness at these monuments seems to be a specific aesthetic measure offsetting several visual ill-effects created by a circular colonnade; it counteracts the otherwise squat appearance of the building which results from the visual bunching of the columns at the curved, receding edges of the building, as well as countering the relatively closer spacing of the columns that was effected to lessen the span of the outward curving entablature.⁶¹ Moreover, the interaxial rectangles of both tholoi, also extremely slender for similar reasons, have CH/I ratios of almost exactly 3 and were thus perhaps the salient proportion in the planning of the column spacing and height.

-- Delphi, Treasury of Kyrene [# 87], c. 334-321: estimated CH = c. 6.95 D.⁶² Following Bousquet's restoration and theories which present this small distyle *in-antis* treasury as an embodiment of higher mathematical theory where ratios of both simple and 'irrational' numbers are extensively employed, the very slender columns are accounted for by the fact that their CH/D ratio, expressed in the sub-divisions of the Ionic foot, is governed by the roots of 9:

$$i.e. \text{ CH : D } = 208 : 30 \text{ dactyls, } = 100\sqrt{9} : 10\sqrt[3]{9}.$$

However, even if one discounts this particular irrational ratio as too complex to be deliberate, or if in fact one regards parts of Bousquet's restoration as suspect,⁶³ the extreme column slenderness remains almost a certainty. In fact, it is not beyond

⁶⁰ Delphi: P. Amandry, J. Bousquet, 'La Colonne dorique de la tholos de Marmaria', BCH, 64/65, 1940/1941, pp.121-126. Epidauros: Roux, Argolide, pp.138, 140; the measurements cited (CH = 6.880 m., D = 0.998 m.) result in CH/D = 6.89 D, used here, not in Roux's 6.92 D.

⁶¹ Roux, Argolide, pp.320-323. Roux also believes that at Delphi the slender columns of the Tholos counteract not only the 'oppressive' background of the large supporting wall but also the relatively heavily proportioned roof outline: G. Roux, 'La Tholos d'Athens Pronaia dans son sanctuaire de Delphes', CRAI, 1988, pp.295-296.

⁶² The CH (c. 3.87 m.) used here is the average of those given by Bousquet (3.864 m.: FD, TrCyr, p.48) and Dinsmoor (3.878 m.: W. B. Dinsmoor, *review of FD, TrCyr*, in AJA, 61, 1957, pp.402-411), both basing CH on the fairly securely fixed wall height. Both give D = 0.557 m.

⁶³ Dinsmoor, *ibid.*, shows that some of the dimensions of the building as given by Bousquet are suspect; that a Doric foot of 0.326 / 0.3272 m. may have been used rather than Bousquet's Ionic foot of 0.297 m.; and that many of the proportional relationships held to involve irrationals can be explained in simpler terms. However, J.-F. Bommelaer, Guide de Delphes, (Paris, 1991), pp.155-158 [including previous bibliography] still largely sides with Bousquet's restoration.

possibility that the architect of the Treasury was influenced by Cycladic architecture in general as several features in the treasury may well indicate.⁶⁴

-- Samothrace, Sanctuary of the Great Gods, the planned porch of the Hieron [#88], *c.* 330, and the Hexastyle Building [#93], *c.* 323-316: CH = 6.63 D at both buildings.⁶⁵ The light column proportions of both monuments are not, in fact, 'decidedly advanced'⁶⁶ but rather in line with largely Cycladic fourth-century CH/D proportions. Indeed, certain features of the Hexastyle Building hint at Cycladic or Thasian design carried out by Cycladic workmen possibly using Parian marble.⁶⁷

-- Oropos, Stoa at the Amphiaraion [#69], built probably *c.* 360: estimated CH = *c.* 7.06 D.⁶⁸ If this ratio is correct, the stoa's extreme column slenderness cannot be attributed to any cause other than aesthetic desire and the almost certain influence of the slightly earlier Delphian Tholos if not the Parian temples. However, the CH/D ratio may well be somewhat lower than the stated figure, since the average height of the 4 column drums per shaft is open to error given that it is based on only 14 of the original 156 drums. For instance, if one assumes that the column height was equal to four of the shortest drums of the main group (ranging from 1.05 m. - 1.15 m. high), the CH/D ratio would be 6.78 D, a figure in line with, and of course perhaps still influenced by, the temple at Marmara on Paros and the Tholos at Delphi.

⁶⁴ *E.g.* the use of Parian marble, the novel use of Ionic mouldings (*e.g.* kyma reversa crowning abacus; cavetto crown on metopes), the Ionic door-frame, the use of a widened central interaxial with a 3-metope system (although these last two could have been copied from the Erechtheion and the Athenian Propylaea respectively), and the possible use of the Ionic foot [0.297 m.]. See Appendix 1.

⁶⁵ Hieron: *Samothrace*, III, pp.96-98, 212, where the ratio is given as 6.99, but this is based on the D (0.901 m.) measured in the flutes and not from arris to arris (*c.* 0.95 m.) as is usual. The I/D ratio would have been 2½ (2.52) and was probably a determining one in the plan. Hexastyle Building: J. R. McCredie, 'Samothrace: Preliminary Report on the Campaign of 1965-1967', *Hesperia*, 37, 1968, p.225.

⁶⁶ *Samothrace*, III, p.213. The 4th C. buildings on Paros were unknown to Lehmann.

⁶⁷ McCredie noted that not only was the material ('Parian or Pentelic' instead of the usual Thasian marble), but also details of construction were outside the Samothracian tradition, and that the architect and masons were different from those employed on the other sanctuary buildings: *ibid.*, p.223. Many of the architectural forms of the Hexastyle Building have direct similarities with those of the Paraskenia Building on Thasos as well as possibly being derived from the Peloponnese or Cyclades (*e.g.* kyma reversa end-stop moulding on drafted margins of steps; lack of triglyph ear; kyma reversa of cornice crown; kyma reversa raking sima). Some point directly to the Cyclades or the Paraskenia Building – the slenderness of columns, the sole use of 'Double T' clamps at this late date, and perhaps the prostyle form and the emphasis on the façade (to which the marble is restricted).

⁶⁸ Coulton, *BSA*, 1968, p.157. The CH/D figure is incorrectly given as *c.* 6.9 D – it should be *c.* 7.4 D using, as Coulton does, a D of 0.626 m. in the flutes; however, a D of *c.* 0.656 m. measured on the arrises – as is more usual – is used here, resulting in CH/D = *c.* 7.06 D.

Despite the use of orthodox Doric on the Cyclades in the fourth century, the older forms are not neglected. At the Samothrakeion on Delos, the so-called 'Temple of the Dioskouroi' [#77], c. 350-300, has a 'diminutive' tetrastyle colonnade where the columns have all the characteristics of Archaic 'Cycladic-type' columns. They not only possess cylindrical bases and archaizing 'Cycladic-type A' Doric capitals, but are also monolithic and very short – only c. 2.60 m. high. Moreover, they are typically very slender having heights of c. 6.9 diameters, while the interaxials are exceptionally wide ($I/D = 4.78$).⁶⁹

EARLIER HELLENISTIC PERIOD (c. 323 – 200)

The Hellenistic period sees this trend of ever more slender column proportioning (CH/D) largely continue. In addition, this period sees the widespread adoption of three-metope interaxials (probably due to the desire for relatively larger intercolumniations, *i.e.* free space between columns, rather than due to the straightforward desire for three metopes per span instead of two), a system primarily found on stoas and small temples.⁷⁰ This period is also characterised by a significant fall in the number of new temples being erected on the mainland, although stoas and other public buildings continue to be built in the Doric Order. Furthermore, it is no longer possible to establish column proportions for many mainland buildings, in contrast to monuments on the Cyclades and especially in the Eastern Aegean and Asia Minor; thus, the disparity of numbers of buildings within each region is further exacerbated.

The period opens on the Cyclades with the construction of the Archilocheion [#90] on Paros, which possesses the most slender columns since those of the Delian Treasuries and of Heraion B dating some 150 years previously: the column height is

⁶⁹ The columns, however, are fluted; see page 128. Vallois gives the I/D proportion as 5.33 D presumably taking an average of the lower diameters of the shafts rather than the diameters of the bases as the requisite figure. Cf. *EAD*, XVI, pp.63-67; *AHHD*, II.i, pp.102, 285.

⁷⁰ The 3-metope system is given by Vitruvius (*De Architectura*, V, 9, 3) as the one suitable for stoas although he admits both 2- and 3-metope systems for temples (*ibid.*, IV, 3, 4 and IV, 3, 7-8). A few stoas retain a 2-metope system but they are generally of a larger scale than usual, the intercolumniations thereby being wide in reality even if the I/D ratio remains relatively low: *e.g.* South Stoa, Thermon (c. 275-216 ?) where $D = c. 0.85$ m. and $I/D = 2.48 D$; Middle Stoa, Athens (begun c. 180) where $D = 0.784$ m. and $I/D = c. 2.55 D$. Cf. Coulton, *Stoas*, pp.116-117.

equal to 7.4 diameters.⁷¹ Admittedly, the prostyle Archilocheion and its columns are of relatively small dimensions (7.10 x *over* 8 m.; CH = *c.* 4.04 m.; D = 0.54 m.) but in comparison to buildings of a similar scale there is no doubt that the architect was here deliberately seeking extremely slender column proportions.

Even the larger, more prestigious Cycladic/Thasian monuments pushed the norms of column proportion forwards and literally upwards at the turn of the fourth to the third century, as Graph 1 makes plain. Several buildings have average or indeed slightly above average CH/D ratios for their period – the Dodekatheon [#119] on Delos = 6.70 D; the N.W. Stoa [#112] in the Thasian agora = 6.92 D.⁷² However, on Delos the prostyle colonnades of both the Monument of the Bulls [#103], *c.* 306-290, and the Temple of Asklepios [#118], *c.* 297, have remarkably slender columns; their heights = 7.27 D and *c.* 7.70 D respectively. Such slender proportions had only been exceeded previously by certain Archaic monuments on the Cyclades.⁷³ Despite the Temple of Asklepios being a small-scale building, its ratio soars above all other contemporary buildings, large and small; the slightly larger prostyle colonnade of the Monument of the Bulls also has a higher CH/D ratio than similar-sized colonnades.⁷⁴

Nor are these columns isolated exceptions in the Cyclades because later in the third century the South Stoa on Delos [#124], *c.* 270-230, and a stoa on Paros [#129], *c.* 220-200, have column heights of 7.58 and 7.59 diameters respectively.⁷⁵ No other third-century monument outside the archipelago has such slender columns with the

⁷¹ AA, 1982, pp.276-278. It is interesting to note that the I/D ratio is almost exactly 4 D (actually 3.98); this almost undoubtedly planned ratio is identical to that of the Heraion B on Delos, although at the latter there are only 2 metopes per span whereas in this early Hellenistic building a 3-metope system is used according to the prevailing fashion.

⁷² i. EAD, XXII, p.150; ii. ET, VI, p.46.

⁷³ Monument of the Bulls: AHHD, II.i, pp.114, 286. I/D = 2.37 D which 'conforms to Attic tradition' with a 2-metope system. Asklepios Temple: EAD, XX, pp.81-82. I/D = 2.77 D reflecting the widened, central intercolumniation; there was a 2-metope system, although the metopes were slightly wider than normal (Tw : Mw = 1 : 1.63, rather than the canonical 1 : 1.5).

⁷⁴ *E.g.*

<u>Building</u>	<u>Width x Length</u>	<u>D</u>	<u>CH</u>	<u>CH/D</u>
Delos, Monument of Bulls (<i>c.</i> 306-290):	10.37 x 69.40 m.	0.721 m.	5.243 m.	7.27
Delos, Asklepios Tmp. (<i>c.</i> 297):	5.44 x <i>c.</i> 10.85 m.	0.60 m.	4.62 m.	<i>c.</i> 7.70
Troy, Athena Tmp. (<i>c.</i> 300-281):	<i>c.</i> 15.0 x 32.30 m.	1.25 m.	<i>c.</i> 8.00 m.	<i>c.</i> 6.4
Epidauros, Artemis Tmp. (<i>c.</i> 300-280):	9.52 x 13.38 m.	<i>c.</i> 0.56 m.	<i>c.</i> 4.00-4.15 m.	<i>c.</i> 7.0
Pergamon Athena Tmp. (<i>c.</i> 290-275):	12.27 x 21.77 m.	0.754 m.	5.26 m.	6.98

⁷⁵ South Stoa: AHHD, II.i, p.109 (shaft ht. = 4.69 m.), p.134 (capital ht. = 0.277 m.). Vallois never states the lower column diameter (D), but gives CH/D ratio as *c.* 7.5 D (AHHD, II.i, p.114); my own measurement of the D = *c.* 0.655 m., thus CH/D = *c.* 7.58 D. Paros stoa: AA, 1982, p.377.

exception of the North-East Stoa at Epidauros [#116], c. 300-250, the columns of which have a height of c. 8.27 diameters, a ratio never surpassed on the Greek mainland in any known temple or stoa.⁷⁶ One should also note that the Parian stoa was probably designed with lesser regard to the CH/D ratio than to the other two main columnar proportions: the interaxial rectangle (CH/I) ratio has the significant value of 2 (actually 2.03;), while its I/D ratio is c. $3\frac{3}{4}$. In addition, the South Stoa (whose CH/I ratio = 1.86, the fractional equivalent $1\frac{7}{8}$ of which indicates that this too was probably a planned proportion) is also notable for being one of the first large colonnades to have an interaxial span of over 4 lower column diameters (I/D = 4.09 D); it was perhaps influenced by the large interaxial ratios of the smaller, 'diminutive' colonnades on Delos. It was rapidly followed by the Stoa of Antigonos [#126], c. 246-239, where the I/D ratio of the stoa's central body (4.14 D) was also large,⁷⁷ and the Hypostyle Hall [#131], c. 210-200, where the I/D ratio = 4.83 D was accompanied for the first time on the Cyclades by a four-metope system.⁷⁸ Unfortunately, the column heights of both the Stoa of Antigonos and the Hypostyle Hall are unknown, although their upper and lower column diameters are extant.

Between 330 and 200 B.C. there is a series of colonnades on Delos which possess small-scale columns, the forms, dimensions and interaxial proportions of which are reminiscent of traditional 'Cycladic-type' columns:

-- The tetrastyle *in-antis* porch of the Prytaneion [#102] on Delos, remodelled probably between 314-290, has very slender monolithic columns for the period, CH = 6.96 D (2.80 m.); in addition, the lower column diameters are very small (0.402 m.) and the interaxials are unusually wide (I/D = 5.26 D).⁷⁹

-- The Oblique Stoa in the Delian Agora [#115], c. 300-250, has very similar dimensions and ratios, with the complete monolithic shaft still standing on the stylobate but lacking its capital (Pl.85); the CH/D ratio can thus be reliably restored

⁷⁶ Roux, *Argolide*, pp.294-295, fig.89. Surprisingly the columns are not very widely spaced (I/D = 3.7 D), and although a wooden entablature has been suggested, a stone entablature with a 3-metope system would be perfectly feasible: cf. Coulton, *Stoas*, p.144.

⁷⁷ However, the stoa effectively only has a 2-metope system so as to allow a bull protome to be placed in centre of each span, with the metopes on either side being greatly widened. *EAD*, V, pp.22-24, pl.3.

⁷⁸ *EAD*, II.i, p.17, fig.18. The nearest non-Cycladic parallel for the I/D ratios of these Delian colonnades is the Lower Stoa at Kos (I/D = 4.12 D), although its date, c. 300-250?, is uncertain.

⁷⁹ H. Lauter, 'Struktur statt Typus', *AA*, 1982, pp.711-713; cf. *AHHD*, II.i, pp.104-105.

to between 6.8 - 7.1 diameters, while the I/D ratio = *c.* 5.01 D.⁸⁰

-- The colonnade added to the North Building [#108] on Delos sometime in the third century has low columns with even smaller bottom diameters ($D = 0.35$ m.; CH probably = *c.* 2.855 m.); not only are the columns very widely spaced ($I/D = 6.73$ D) but they are also extremely slender with a probable CH/D ratio of *c.* 8.16 D.⁸¹ That they are unfluted adds to the impression that they are directly derived from 'Cycladic-type' columns.

Finally, on Thasos the small stoa at Evraïokastro, located just outside the city wall, has five *in-antis* columns which are evidently of small diameter and widely spaced, although no column height can be restored.⁸²

In all of these 'diminutive' colonnades, except the Prytaneion, the entablatures are missing.

LATER HELLENISTIC PERIOD (c. 200 – 69)

As Graph 1 illustrates, by the start of the second century the continual rise in the CH/D proportion begins to tail off, with many of the CH/D ratios of Eastern Aegean and Asiatic columns 'catching up' with Cycladic ones, their columns becoming equally slender, and in a few cases even more slender than those on the archipelago. The majority of CH/D ratios lie between 6.5 - 8.0 diameters, thus making it seem that, for many architects, the Doric columns of monumental buildings had reached an aesthetic maximum when their CH/D ratio was around 8 diameters. Slighter proportioned Doric columns assume a rather 'stick-like' appearance reminiscent of Ionic columns, an aspect obviously regarded as being too enervated for a traditionally more substantial column.

However, several Delian monumental colonnades still remain at the top end of this band: the socio-religious building known as the Complex of the Poseidoniasts of Berytos [#141], *c.* 200-150, has columns – admittedly of an internal peristyle – which

⁸⁰ The height of the missing capital (0.20 - 0.30 m.) is restored on the basis of similar sized Cycladic columns and capitals. $D = c.$ 0.387 m.; CH = 2.64-2.74 m. Cf. F. Dürrbach, 'Fouilles de Délos', *BCH*, 26, 1902, p.501; *AHHD*, II.i, p.106.

⁸¹ The extant shaft ht. = 1.715 m. but a capital found nearby fits on the shaft if it is carried up to a height of *c.* 2.65 m. Cf. *AHHD*, II.i, p.105; *EAD*, V, pp.59-60; Vallois, 'TopDél', pp.307-308.

⁸² $D = 0.35?$ m.; $I = 1.88?$ m.; $I/D = 5.37$. Cf. C. Rolley, 'Dieux Patröoi et Thesmophorion de Thasos', *BCH*, 89, 1965, pp.480-482.

have a height of *c.* 7.75 diameters.⁸³ The small distyle *in-antis* Temple of Isis [#163], *c.* 130, has column heights of around 7.5 diameters (Pl.86), and the Propylon to the Kynthion Sanctuary [#164], *c.* 125-100, has column heights also of around 7.5 diameters.⁸⁴

It is also worth noting several of the Doric columns of the Delian house peristyles (none of which are represented on Graph 1). Dating to the second and first centuries, some houses have columns of extraordinary slenderness (Pl.87); for instance, at the House of Dionysos the columns in 'room VI I' have a CH/D ratio = 9.12 D, while at the House of Cleopatra the columns in 'room II B' have a CH/D ratio = 9.39 D.⁸⁵ Nor are these columns of a 'diminutive' scale but of an average height – 5.60 m. and 4.65 m. respectively. The excessive slenderness of these domestic columns is thus primarily achieved by relatively smaller lower column diameters (0.615 m. and 0.495 m.). Although the slenderness of these columns may have been directly influenced by that of the monumental colonnades on the island, it would also be a useful device for the restricted space of house peristyles since the relatively smaller lower column diameters also result in fairly wide intercolumniations, thus improving access. The possible aesthetic disharmonies of such slender Doric columns would of course neither be so apparent in the internal peristyles as on external colonnades, nor so important to the occupants.

Finally, however, it should be noted that a few Cycladic buildings during the Classical and Hellenistic periods do not follow the general Cycladic pattern of unusually slender columns; instead, their columns are usually within the 'normal' range of values. Notable are the Fountain-Exedra [#101] on Tenos, *c.* 320-280, which has an estimated CH/D ratio of *c.* 6.21 D,⁸⁶ the Stoa of Philip V [#130] on Delos, *c.* 216-

⁸³ *EAD*, VI, pp.91-92. The interaxial distances vary from 2.35 - 2.55 m., thus the other main columnar ratios are: I/D = *c.* 3.67 - 3.98 D; CH/I = *c.* 1.95 - 2.11 I.

⁸⁴ i. Unpublished; ratio based on photographs of the fully re-erected original columns; ii. *EAD*, XI, p.98, fig.73. At the L-shaped Stoa in the Delian Agora [#144, not shown on Graph 1], erected between 187-173, the CH/D ratio is given variously without explanation by Vallois as 7 - 7.5 D (*AHHD*, II.i, p.114), 7.88 D or 7.42 D (*AHHD*, II.i, p.156, implied from cited CH / Capital ht. ratios). The taper on the surviving lower drums is too small to have been maintained all the way up the shaft as this would produce (given the known upper and lower column diameters) a CH = 8.515 m. or 16 D!: *cf.* R. Vallois, 'Attiques déliens' *CRAI*, 1912, p.107; 156.

⁸⁵ *EAD*, VIII, pl. 27.

⁸⁶ *Ténos*, pp.80-81 + n.124.

210, with column heights of 6.53 diameters, perhaps reflecting the preference of the non-Cycladic (probably Macedonian) architect;⁸⁷ and, at the end of the period, the Agora of the Italians ^{# 5} [164], c. 110-88, which also has less slender columns than usually found on the Cyclades, its CH/D ratio = 6.65 D.⁸⁸ Vallois suggests that this low ratio was so as to give the lower order a more squat, solid appearance thereby lessening the 'top-heavy' feel conveyed by the relatively tall upper storey, but in fact the reverse would seem to be true.⁸⁹ Whatever the reason for the relatively squat columns, their main measurements were fixed in round numbers of Ionic feet: CH = 13 feet (albeit less $\frac{4}{5}$ dactyl), and D = 2 feet (less $\frac{1}{2}$ dactyl).

CONCLUSIONS

As Table 7 and Graph 1 unequivocally show, from the mid sixth century to the mid second century Doric columns on the Cyclades are noticeably and almost continually more slender than contemporaries on similar-sized buildings elsewhere in the Greek world. However, the greatest difference between the Cyclades and the rest of Greece in this CH/D proportion occurs in the late Archaic and early Classical periods when the majority of Doric columns on these islands follow the proportions, if not the exact form, of 'Cycladic' or 'Island-type' columns, characterised by their extremely small lower diameters, their wide interaxial spacings in relation to their lower diameters, their comparatively short height, and their column slenderness, as well as occasionally standing on bases and rarely being fluted. These Cycladic-type columns most probably influenced the proportions of the first 'orthodox' Doric columns on the Cyclades seen around the start of the Classical period; while the

⁸⁷ EAD, VII.i, pp.14-18; on the Macedonian connections see page 205, note 58.

⁸⁸ EAD, XIX, pp.14-17.

⁸⁹ In general it seems that the presence of an upper order does not affect the construction or proportions of the lower order: Coulton, Stoas, p.124. In addition, the Agora's architect would seem uninfluenced by the apparent mid 2nd C. revival of late Classical proportions on several buildings in Greece (cf. Samothrace, III, pp.221-223), which at the porch of the Hieron on Samothrace [#151] include the CH/D ratio (5.96 D), because the Agora's I/D ratio (3.64 I and 3.72 I) is average for contemporary 3-metope spans. (The hexastyle Temple of Asklepios at Kos [#148] is sometimes included among the monuments with 'neo-Classical' proportions, but its fairly large size [D = 1.27 m.] could account for the use of the 2-metope system and attendant small interaxial ratios).

columns may now have been fluted and spaced in accordance with the frieze, they nevertheless possessed a much greater slenderness than other Doric columns elsewhere. This marked characteristic perpetuated itself up to the end of the third century, after which it appears, albeit with evidence restricted to the Cyclades and Asia Minor, that this 'superiority' of slenderness is no longer as evident, even though a few Cycladic buildings still possessed exceptionally slender columns. Thus, by this period it seems that the Doric columns of monumental colonnades had attained an aesthetic limit to their slenderness.

The continual increase in column slenderness that one witnesses during the Classical and Hellenistic periods is, of course, not merely a phenomenon of Cycladic architecture but is one that is present in all areas of the Greek world. However, although Cycladic columns are nearly always (up to the start of the second century at least) more slender than contemporary non-Cycladic columns, it would be rash to suggest that the islands were therefore the main source of influence for the increase in column proportions outside the archipelago; this architectural process appears to have been fundamental to all Greek architecture. Nevertheless, given the evidence that a number of key 'Island-Ionic' architectural features were adopted by fifth-century Athenian architecture, it is reasonable to infer the influence of Cycladic Doric column proportioning in this instance, and since Periklean architecture in its turn proved extremely influential, so the Cycladic influence was indirectly continued.

In addition to these slender yet canonical Doric columns, there still occasionally occurred on the Cyclades (mostly at the end of the fourth century and throughout the third) 'Island-type' columns or columns with many of the characteristics of these essentially Archaic Cycladic columns. A feature of these columns, other than their slenderness, was their wide column spacing in relation to their lower column diameter; this trait was largely eradicated with the introduction of the orthodox Doric order in monumental architecture, for the interaxials had to be carefully tied into the rhythm of the triglyph frieze. However, on the 'diminutive' colonnades one finds on Delos, not only are 'Island-type' columns present but so are the unusually wide interaxials, and occasionally as we have seen some larger-scale Cycladic colonnades possess greater than usual I/D values, perhaps in conscious or unconscious imitation of traditional Archaic Cycladic colonnades.

Thus, the evidence shows that during the Classical period and for a large part of the Hellenistic age slender columns, and to a certain extent, wide interaxials (relative to lower column diameter) are typical features of Cycladic architecture. Here then, as in many other fields of this craft, the Cyclades show themselves to be an independent, influential and sometimes conservative architectural force.

DORIC ENTABLATURE PROPORTIONS

The chronological trend in Doric architecture towards a discernible lightening of a building's elevation derives from changes, not just in the proportions relating to the columns (*i.e.* column slenderness, shape of the interaxial rectangle *etc.*), but also in the proportions linking the columns and the entablature and within the entablature itself – notably between the height of the architrave and the height of the frieze. This 'evolution' of entablature proportions has long been recognised;¹ indeed, one only has to compare the façade of a sixth-century temple with that of a second-century temple to see immediately the extreme differences. However, no extended analysis of this general development exists and so it is necessary here to present and discuss various entablature proportions for the main architectural areas of the Greek world in order to compare and contrast their values with those of Cycladic monuments.

The following chapter examines the progressive development of these main proportions with particular reference to the Cycladic examples. Firstly, and with most emphasis, the ratio between the height of the architrave (A) and the height of the frieze (F) is studied. This is followed by a more cursory examination of the proportions between the combined height of the architrave and frieze (A+F) and other major elements of the colonnade – interaxial (I), column height (CH), and lower column diameter (D).

¹ *E.g.* A. Choisy, Histoire de l'architecture, I, (Paris, 1904), pp.319, 397; A. Marquand, Greek Architecture, (New York, 1909), pp.131, 137-138.

ARCHITRAVE HEIGHT / FRIEZE HEIGHT

Refer throughout to:

Table 10 which lists this ratio for over 120 Greek monuments for the period 550 - 69 B.C.

Graph 4 which plots this ratio against the same period, colour-coding monuments according to their geographical location.

In the text, monuments are followed by their graph Identification Number [# ...] as used on the Graph.

INTRODUCTION

As a cursory inspection of Graph 4 will reveal, the proportion of architrave height over frieze height (A/F) within a Doric entablature shows a distinct tendency to decrease over time: in the sixth century the architrave is usually higher than the frieze (e.g. $A/F = 1.05 - 1.15$); in the fifth century they are both usually around the same height (c. 1.0); and from the fourth century onwards the architrave is virtually always smaller than the frieze above it (0.95 - 0.70). This in itself is no novel observation,² but the situation after 300 B.C. has been variously interpreted; Roux, who currently gives the fullest commentary on the trend of this ratio states that it '*remonte au début du III^e, et s'abaisse à nouveau*'.³ However, the use in this thesis of many more buildings and their proportions than Roux includes, refines his conclusions; thus, while early in the third century certain A/F proportions surprisingly increase (quickly reaching a high of c. 0.9), the decrease of the ratio in other buildings occurs *concurrently* (rapidly attaining a low of c. 0.7). Thereafter, nearly all other A/F ratios lie within the band encompassed between these highest and lowest values.

Before analysing the Cycladic role in the development of the A/F proportion, it is appropriate to elucidate first the significance of this ratio in the actual design processes of an architect and his commission. The Doric order as practised by the ancient Greeks would appear not to be a 'modular' system as Vitruvius claims⁴ but

² In addition to the brief remarks in the works cited in the previous note, cf. A. Schober, 'Der neue Tempel von Samothrake', *JOAI*, 29, 1935, p.5 + nn.2-6; Roux, *Argolide*, pp.326-328, 412-413.

³ Roux, *Argolide*, p.326.

⁴ Vitruvius, *De Architectura*, IV, 3, 3-10.

rather a 'successive proportion' system.⁵ Thus one might expect the frieze height to be directly derived from the architrave height (as occurs in the Vitruvian successive system for the Ionic order⁶), but the wide random spread of A/F ratios of any given time indicates that the frieze height was not derived from the architrave height – for if it was so derived, one would expect the ratios to be more closely grouped around values such as 0.900, 0.875 or 0.750 which are, in the fractional system as used by ancient Greek architects, respectively $\frac{9}{10}$, $\frac{7}{8}$ and $\frac{3}{4}$.⁷ It seems then that the majority of A/F ratios are derived from another source, and that they are a 'by-product' of another determining ratio or dimension; in other words, the frieze height and the architrave height were separately derived from other parts of the building and related to each other only indirectly.⁸ Yet, this does not invalidate or make as coincidence the fall in the A/F ratios over time, for an architect would have been aware of the resulting relationship between the architrave and frieze heights, even if this ratio was not directly planned in easy and convenient fractions. The derivative A/F ratio would still have had to satisfy the architect.

Moreover, it is also necessary to point out that there are a number of general

⁵ Coulton, *BSA*, 1975, pp.68-71, 98.
⁶ Vitruvius, *De Architectura*, III, 5, 1-15.
⁷ Even allowing for discrepancies arising from the present ratios being several steps removed from the original intended proportion; see page 126, note 5.
⁸ J. J. Coulton proposes that the architrave height (A) of the South Stoa at the Argive Heraion and of the Temple of Zeus at Olympia is derived from their column heights (CH); to these can be added some further examples where A is within 1 cm. (c. $\frac{1}{2}$ dactyl) of the exact A/CH fraction:

	A/CH (decimal)		A/CH (fraction)	Discrepancy
Artemis Temple, Paros, c.490-480	0.144	=	$\frac{1}{7}$	+ 0.39 cms
Zeus Temple, Olympia, c. 468-460	0.169	=	$\frac{1}{6}$	+ 0.35 cms
Argive Heraion, S. Stoa, c. 460-450	0.171	=	$\frac{1}{6}$	+ 0.28 cms
Athena Pronaia T., Delphi, 365-360	0.109	=	$\frac{1}{9}$	- 1.06 cms
Asklepios Temple, Delos, c. 297	0.090	=	$\frac{1}{11}$	- 0.46 cms
Athens, Stoa of Attalos II, c. 150	0.083	=	$\frac{1}{12}$	- 0.04 cms

Moreover, Coulton proposes that the frieze height (F) of the South Stoa was obtained from the interaxial (I), for F has to be roughly related to I (whether of 2-metope spans or more) if the shapes of the triglyphs and metopes are not to deviate from the norm; thus, for the buildings above:

	F/I (decimal)		F/I (fraction)	Discrepancy
Artemis Temple, Paros, c.490-480	0.341	=	$\frac{1}{3}$	+ 0.48 cms
Zeus Temple, Olympia, c. 468-460	0.332	=	$\frac{1}{3}$	- 0.17 cms
Argive Heraion, S. Stoa, c. 460-450	0.334	=	$\frac{1}{3}$	+ 0.01 cms
Athena Pronaia T., Delphi, 365-360	0.314	=	$\frac{3}{10}$	+ 1.97 cms
Asklepios Temple, Delos, c. 297	0.298	=	$\frac{3}{10}$	- 0.10 cms
Athens, Stoa of Attalos II, c. 150	0.219	=	$\frac{2}{9}$	+ 0.16 cms

Cf. Coulton, *BSA*, 1973, p.81; also Coulton, *BSA*, 1975, pp.69-70.

factors – structural, aesthetic and geographical – that can affect the relative and absolute heights of the architrave and frieze. Firstly, the actual type of building can sometimes influence proportions: temples, for instance, generally have proportionately lower architraves in relation to their friezes than those of stoas.⁹ The architrave of a temple is not required to be as relatively massive as that of a stoa since a temple's entablature does not usually carry as much weight as that of a stoa; the reason for this lies in the fact that in a temple the span (with the accumulative weight of ceiling beams and roof structure) between the entablature and the cella wall is generally less than the span between the entablature and the wall or internal supports of a stoa. Indeed, amongst stoas, a variation in the A/F proportion can occur due to the size of the internal spans: thus the Stoa of Philip on Delos [#130], c. 216-200, which despite its large depth lacks an axial colonnade, has an A/F proportion of 0.871, while the somewhat earlier Stoa of Antigonos [#126], c. 246-239, which is deeper again, has a central colonnade for extra support and thus has a relatively lower architrave, its A/F ratio being 0.835.¹⁰

Another major structural factor concerning weight upon the entablature would appear to be the number of storeys given to a colonnade. Buildings with two external orders placed one above the other are not very common in the Greek world (see Graph 4a, where a two-storey colonnade is indicated by the monument symbol within a box), and of the known examples,¹¹ there are only 11 monuments whose A/F proportions for their Doric lower storeys are known. Their A/F ratios fall into two groups: those values that are among the highest of their time, and those with 'average' values (especially low at the Lower Agora at Pergamon). It is interesting to note that these two groups also broadly follow a chronological pattern, the first group mainly belonging to an earlier period than the second.

Within the first group (*i.e.* 'higher than average A/F ratios') are: the East Stoa in the Asklepieion at Athens [#83], the first definite example of a two-storeyed stoa,¹²

⁹ Roux, *Argolide*, p.327.

¹⁰ Stoa of Philip: depth = 10.71 m.; Stoa of Antigonos: total depth of main portico = 13.40 m., depth of front aisle = c. 6.50 m.

¹¹ Coulton (*Stoas*, p.124, nn.2-4) lists 14 two-storey stoas and 12 other buildings including houses and Macedonian tombs (see page 166, note 61). To this add the colonnade (c. 314-290) of the Prytaneion on Delos.

¹² Coulton, *Stoas*, p.89; both storeys have a Doric outer order.

built c. 340, and with an A/F ratio of 0.899; the Stoa by the Harbour at Perachora [#92], c. 325-300, A/F = 0.852; the N.E. Stoa in the Athena Sanctuary at Pergamon, [#143], c. 190-180, A/F = 0.922; and the Pergamene-type Stoa at Athens [#138], second century or later, A/F = 0.894.¹³

In the second group (*i.e.* 'average or low A/F ratios'), broadly following on in date from the first group, are six second-century stoas: the L-shaped Stoa in the Delian Agora [#144], c. 187-173, A/F = 0.821; the Lower Agora at Pergamon [#146], c. 175-150, A/F = 0.684; the Stoa of Attalos II at Athens [#154], c. 150, A/F = 0.820; the North Stoa at Assos [#153], mid second century, A/F = 0.794; the N.W. Stoa at Aigai [#157], c. 150-125, A/F = 0.821; and the Agora of the Italians on Delos [#164], c. 110-88, A/F = 0.767.¹⁴

Thus, it would seem that until the second century the architects of these large, two-storey buildings provided first-storey entablatures where the architraves were among the highest in relation to their friezes for their time; a desire for extra strength – actual or perhaps even visual – would appear to be the motive. Only after nearly two centuries are two-storeyed stoas given relatively lighter architraves, their A/F ratios falling in line with the average ratios for single-storeyed buildings, with the noted exception of the Lower Agora at Pergamon which, in fact, has the lowest A/F ratio on Table 10 and Graph 4.

Thus, scale^{ca} affects A/F proportions. Scale is also probably the major consideration in the use of three- (or more) metope spans: two-metope spans are generally restricted to large-scale buildings, mainly peripteral temples and large stoas, while three or more metope spans are found mostly on smaller temples and the majority of stoas to allow for relatively wider intercolumniations and better access. However, it appears that the number of metopes per span does not normally affect the A/F ratio of a colonnade, as one can see from Graph 4a where colonnades with different numbers of metopes per span are scattered randomly about the band of A/F

¹³ The two-storey Gate of Zeus and Hera on Thasos [91], c. 325-300, has an extremely low A/F ratio of 0.809. However, this is perhaps due to the Gate being only a façade, the entablature not having to support ceiling beams nor a full roof. See also pages 166-167.

¹⁴ In addition, the façade of the South Stoa at Assos, c. 150, can perhaps be reconstructed as a full Doric order where the A/F = 0.699. Cf. Coulton, *Stoas*, pp.70-71.

ratios.¹⁵ That no attempt was normally made to increase the height of the architrave (or frieze) to compensate for the increasing number of metopes per span (stoas normally being the usual recipients of three and four-metope spans), may indicate that the architects understood one very good structural reason for resisting increasing architrave heights: the smaller scale of the orders used in colonnades of three or more metope spans enabled proportionately even slighter beams to be used than in a larger scale building.¹⁶ This is highlighted by the stoa in the Sanctuary of Artemis at Brauron; this stoa, the first known example of a continuous three-metope colonnade, has – perhaps contrary to expectations – an extremely low A/F ratio (0.927) for its time (c. 420). The architect has, in fact, appropriately decreased the architrave height instead of increasing it – as one might have expected.¹⁷

However, following on from the stoa at Brauron, the first series of three-metope colonnades, built during the first three-quarters of the fourth century, have A/F proportions that are among the most conservative, *i.e.* high, of their time; it is not until the Harbour Stoa at Miletos (late IV century) that three-metope spans again have some of the lowest A/F ratios. It would seem that one is here seeing the understandable hesitations in the use of 'pioneering' entablature proportions.

Two final structural considerations that may have affected the choice of A/F proportion are whether the architrave and frieze are two separate elements or part of a single block of stone, and the type of material used for the entablature. Regarding the first issue, the vast majority of monumental architecture, due to its scale, has separate courses making up the architrave and frieze. Yet one can cite 7 monumental examples where the architrave and the frieze of the lower Doric order are formed from the same block; all date from the fourth century or later and all but one (the Temple

¹⁵ The height of an entablature is generally related to its lower column diameter, and as will be seen later (pages 173-174), the ratios of A+F/D do not greatly differ between 2- or 3-metope colonnades.

¹⁶ The issue of reduction of scale, mass and load is put succinctly by J. J. Coulton: 'For if a whole building is reduced in size uniformly by a linear factor of 2, the weight of the material, and so the load on the beams, will be reduced by a factor of 8, while the strength of the beams, dependent on their cross-section rather than their volume, will decrease only by a factor of 4.' Coulton, *Stoas*, pp.118-119 + p.119, n.1.

¹⁷ See page 163, note 48.

of Asklepios at Corinth) relate to stoas.¹⁸ The smallest in height is that of the Lower Agora at Pergamon ($A+F = 0.64$ m.), but there are other entablatures even smaller in height and still composed of separate architrave and frieze courses.¹⁹ The division into architrave and frieze is thus not an issue structurally but entirely dependent upon the wishes of the architect or perhaps the stonemasons. 5 of these 7 examples have published measurements from which their A/F ratios can be determined, and of these 3 lie within the 'normal' band of contemporary values; however, the Stoa of Attalos I at Delphi, c. 241-223, has a noticeably high ratio of 0.903 (probably due to a local Pergamene tendency for high A/F ratios as described further below), while the Lower Agora at Pergamon, c. 175-150, has the lowest ratio of all the buildings listed in Table 10 with a figure of 0.684; perhaps this very low ratio was meant to emphasise the actual smallness of the entablature which had a height ($A+F$) of only 0.64 m.

The type of stone used may also have had some bearing on the height of the entablature in general as well as the individual heights of the architrave and frieze. The extremely low A/F ratios of some Archaic buildings on the Cyclades and Thasos may perhaps be accounted for by their use of marble, a much harder stone better able to resist the bending forces of the spanning entablature than the limestone and poros limestone habitually used for contemporary mainland monuments (although by the Hellenistic period limestone entablatures also achieve these light proportions). However, if an architect was concerned about the strength of his material and compensated for this by providing an abnormally high A/F ratio, these personal reasons can now no longer be distinguished from other structural or aesthetic factors.²⁰

Aesthetics may occasionally account for the choice of certain A/F proportions. The entablature proportions of an existing monument sometimes seem to influence a

¹⁸ Stoa of Apollo Maleatas at Epidauros; Stoa at Perachora; Temple of Asklepios at Corinth; N.W. Stoa at Corinth; Stoa of Attalos I at Delphi; Pergamon, Lower Agora; Lower North Stoa in the Sanctuary of Demeter at Pergamon: Roux, *Argolide*, p.327; Coulton, *Stoas*, p.145. There are undoubtedly many more belonging to minor monuments, tombs, house peristyles *etc.*

¹⁹ *E.g.* the Theatre Proskenion at Delos: $A+F = 0.425$ m.

²⁰ In fact, any such concern would have been dealt with probably by employing one of several methods known to have been used for relieving stress on the architrave: using a frieze of lighter material (*e.g.* poros frieze on marble architrave at Stoa of Zeus in Athens, c. 425-410); forming the frieze from blocks which cantilever out from over the centre of the column, which thus takes most of the strain; and, as on some Hellenistic stoas, placing the main cross-beams of the roof over each outer column so that the entablature has to support only half the roof area between the outermost purlin and the eaves. *Cf.* Coulton, *Stoas*, pp.145-146.

new building. At Epidauros, the relatively high A/F figure of 0.863 at the Temple of Artemis [#113], c. 300-280, could well have been suggested by the similarly high proportion of 0.891 from the adjacent and highly imposing Tholos [#80] built around fifty years earlier;²¹ furthermore, the North Stoa in Priene's agora [#156], dating to c. 150-125, has a high A/F ratio of 0.879 and is almost certainly closely copying the entablature proportions ($A/F = 0.865$) of the Pi-shaped stoa [#100] on the opposite side of the agora built during the late fourth or third century. Other anomalies have even more straight-forward explanations: the unusually high proportion between architrave and frieze (1.018) on Philo's fourth-century Telesterion Porch [#89] at Eleusis is necessary to match the existing entablature on the walls of the earlier hall behind;²² similarly, the outdated A/F ratio of the Hieron's second-century porch on Samothrace relates to the ratio of the fourth-century hall to which it is adjoined.

Finally, regional tastes may also account for the adoption of certain A/F ratios. For instance, many of the Attic monuments built during the Periklean period not only have similar architectural plans and features, but also similar proportions including that of A/F.²³ There may also have been a minor tendency in Pergamene architecture for higher A/F proportions than usual elsewhere, for not only do two 'Pergamene-type' stoas (the N.E. Stoa in the Athena Sanctuary at Pergamon [#143], and the so-called 'Pergamene-type' Stoa at Athens [#138]) have extremely high ratios (0.992 and 0.894) in comparison to contemporary monuments but so do the Stoa of Attalos I at Delphi [#127] (0.903) and the Temple of Athena in Pergamon [#120] (0.900). Another possible local grouping occurs in the area of Corinth around the third century. The similar A/F ratios are striking: Perachora, Stoa by the Harbour [#92], c. 325-300, $A/F = 0.852$; Corinth, South Stoa [#110], built in the early third century, $A/F = 0.852$; and Corinth, N.W. Stoa [#104], c. 300, $A/F = 0.849$.²⁴

Thus, as we have seen, the architrave to frieze ratio is subject to numerous factors that are both structural, aesthetic and even geographic. Bearing this in mind,

²¹ Roux, *Argolide*, p.327.

²² See page 166.

²³ See pages 161-162.

²⁴ J. J. Coulton, 'The Stoa by the Harbour at Perachora', *BSA*, 59, 1964, p.125.

as well as that the overall general decrease in the ratio is only a tendency, albeit very distinct, and not a mathematical inevitability, it will now be shown that for a long period the Cycladic monuments are a significant driving force behind the ratio decrease, and that the Cycladic A/F ratios form a prominent and enduring local grouping.

ANALYSIS: THE CYCLADIC ROLE

LATE ARCHAIC PERIOD (c. 550 – 480)

As noted at the start of the chapter the majority of Doric colonnades in the late Archaic period have A/F ratios higher than 1.0 – *i.e.* their architraves are taller than the friezes above them. There are noticeable regional groupings: the Sicilian and South Italian ratios form a group of proportions that surpass all others with their high values (1.05 - 1.15), while the Peloponnesian ratios lie very close together between 1.00 - 1.03. However, the ratios of Cycladic and Thasian monuments are distinctive for being below 1.0, usually considerably so.

The most anomalous A/F proportion (0.441) is that of the South Building at Alikí [#18] on the island of Thasos, built c. 500.²⁵ Such extremely low architraves are reminiscent of those on eighth-century terracotta models of buildings (possibly temples), such as the one found at the Heraion at Argos,²⁶ as well as those depicted on Archaic vases.²⁷ Yet while these artistic depictions may represent artistic licence or vernacular architecture, the South Building in its material and forms must be classed as monumental, even if certain elements of the Doric order do not match the established mainland style. The South Building's low architrave is to be explained perhaps not so much by the uncertainty in the use of the Doric order (of which this

²⁵ This proportion is almost certainly correct since parts of the architrave and frieze are extant to their whole original height; the architrave was not supplemented in height by another beam since it has on its upper and lower sides the marks of the triglyphs and the abaci respectively. *ET*, IX, pp.56-64, fig.64.

²⁶ Cf. Lawrence, *GkArch*³, fig.80.

²⁷ *E.g.* the François Vase, c. 550-525: cf. J. Boardman, *Athenian Black Figure Vases*, (London, 1974), figs. 46.1 + 46.5; fountain-house scenes on vases by the Priam Painter, c. 530-510: *ibid*, fig.224.

is the first known example on the island²⁸) but rather in terms of the influence of Cycladic architecture on Thasos in the Archaic period. To this area we now turn.

On Kea, another unusually low architrave is found in the entablature probably to be assigned to Building D at Karthaia [#26] where the A/F proportion is 0.771.²⁹ While one could possibly ascribe this to the unsophisticated ways of a local island architect, unaffected by the stylistic fashions of the larger architectural centres, the evidence of the Heraion B on Delos makes one think otherwise. The Heraion B has known architrave and frieze heights (0.470 m. + 0.665 m. respectively), although the cuttings on the top of the architrave seem to indicate that there was an intermediate element which supplied the taenia band which is absent from the extant architrave.³⁰ Plassart, in the main publication of the temple, adopts for his reconstruction a double taenia although there is no evidence for this, and his solution is clearly born of the desire to give the architrave and frieze roughly the same heights.³¹ More plausibly, Vallois suggests a single taenia with a height of 0.075 m.³² which therefore gives the Heraion B an estimated A/F ratio of 0.819. In the light of the other low A/F ratios at Thasos and Kea, this low figure at Delos does not seem amiss.

The fourth Archaic Cycladic A/F proportion under 1.0 is that of the Temple of Artemis in the Delion on Paros [#29], constructed c. 490-480 in the transitional period between the Archaic and Classical age. This temple is the first canonical Doric building on the Cyclades, but its somewhat below average A/F ratio of 0.956³³ is probably another instance of how in certain architectural forms and proportions it is influenced by the prevailing Cycladic-Doric architecture. Additionally, it seems likely that the Temple of Artemis played an important role in transmitting the idea of slight proportions to other otherwise canonical Cycladic temples, such as the Great Temple

²⁸ The older, adjacent North Building (mid 6th C.) would have had an Ionic porch at the time of the South Building's construction; the North Building's Doric portico was added c. 480-450.

²⁹ Østby attributes this entablature to the cella exterior of the adjacent Athena Temple (Østby, *OpAth*, pp.204-206), but the triglyph and metope dimensions more suitably fit Building D: Schuller, *JdI*, pp.337-380.

³⁰ *EAD*, XI, pp.196-198.

³¹ Plassart in fact adopts the suggestions of Marstrand and Risom, previous investigators of the Heraion: *EAD*, XI, p.197 + p.199, fig.165.

³² This is based on contemporary proportions of regula ht. / taenia ht.: *AHHD*, II.i, pp.230-231.

³³ Schuller, *Artemis-Tempel*, pp.57-58, pl.97.

of Apollo on Delos.³⁴

It is also worth noting that the Temple of Athena Polias [#10] on the Athenian Acropolis, rebuilt by the Peisistratids between 529-515, has an A/F ratio of 0.956,³⁵ thus being the only Archaic building outside the Cyclades to have an A/F ratio below 1.0. The actual disparity in height between the architrave height and frieze height is a relatively large 6.3 cms, thus ruling out any carelessness on the part of the stonemasons; the height difference was obviously intended by the architect. Perhaps the possible Cycladic involvement on the temple was influential in the adoption of a lower architrave than frieze.³⁶

It is certainly clear that there is a definite Cycladic tendency in the Archaic period to make the architrave lower than the frieze although there is no set difference. Nor does this tendency have any primary structural or aesthetic reason.³⁷ The determining factor appears to be one of region, and as we have already seen in the previous chapter, deviation from canonical Doric forms and proportions is common in Archaic Cycladic architecture.³⁸ This Cycladic eclecticism within Doric architecture is perhaps only to be expected in an area where the influence of Ionic architecture is very strong. And while the peculiarly low A/F proportions on the Cyclades and Thasos may well be the result of uncertainty or hesitancy in the use of Doric architectural elements, it is nevertheless also pertinent to examine whether more direct 'Cycladic-Ionic' influences, such as the A/F proportions of Ionic buildings, play a contributory part.

³⁴ The unusually slender interaxial rectangle of the Artemis Temple ($CH/I = 2.27$) seems to be directly copied by the Great Temple of Apollo ($c.2.26$); also the slender columns have almost the same ratios ($CH/D = c.5.59$ and 5.50 respectively): see pages 134-135. However, the A/F ratio of the Great Temple is much higher than that of the Parian temple – see pages 162-163.

³⁵ Wiegand, *Poros-Architektur*, pp.122-124, figs.118-119.

³⁶ Parian marble was used for the metopes, pediment sculptures, raking cornices, simas and, most significantly, for the roof tiles and the Ionic frieze (above the inner porches); both marble roof tiles and the Ionic frieze were Cycladic developments (see pages 29-30 and 161). The use of Cycladic materials and techniques may reflect Peisistratos' close ties with the Naxian tyrant Lygdamis.

The attribution of the frieze to the temple has been questioned by the lowering of its date on stylistic grounds (M. Robertson, *History of Greek Art*, [Cambridge, 1975], p.160 – 'end of the century'; J. Boardman, *Greek Sculpture, the Archaic Period*, [London, 1978], p.155, fig.200 – 'about 510-500'), but the date of the temple is not securely established and may have been begun only late in Peisistratid times and thus not finished until *c.* 510.

³⁷ For instance, the colonnades of all four buildings have two-metope spans.

³⁸ See page 128 and Appendix 1.

The Ionic frieze was a Cycladic development born of the need to cover the ends of ceiling beams which, being of marble, were larger in section than their wooden counterparts so as not to be so liable to crack under their own weight. The first known example in Ionic architecture of a frieze placed above an architrave is, as it happens, from a Cycladic building, namely the Eastern Prostoon of the Naxian Oikos on Delos which was constructed just before the middle of the sixth century. However, the exact proportion between the relatively low architrave and frieze cannot be determined owing to the loss of an intermediate element.³⁹ Ionic architrave and frieze heights can be restored at the prominent 'Town Temple' A, c. 525, on Paros; the resulting A/F ratio = 1.048, thus resembling the mainland A/F ratios of the Doric order.⁴⁰ However, at Delphi the entablature of the Siphnian Treasury, c. 525, is of particular interest. The treasury's actual architrave is very low in comparison with the sculpted frieze (A/F = 0.619), but an intervening egg-and-dart moulding should be included in the architrave's height, while a similar moulding above the frieze should be considered as part of that element's height; and even with these additions, the A/F proportion is still a slight one being only 0.677.⁴¹

Although the evidence is only slight, it is possible, indeed plausible, that the unusually low architraves of late Archaic Doric entablatures on the Cyclades and Thasos were strongly influenced by the approximately similarly proportioned entablatures of the more traditional Ionic monuments on the islands.

EARLIER CLASSICAL PERIOD (c. 480 – 400)

The first half of the Classical period is most notable for a distinct group of Attic A/F proportions. Consistently, all the major Periklean monuments whose A/F ratios are known have values of around 1.00. The core-group comprises: i. the Parthenon [#45] (0.997), ii. the Temple of Poseidon at Sounion [#46] (1.008), iii. the Temple of Nemesis at Rhamnous [#48] (0.984), and iv. the Propylaia [#49/50] (0.987),

³⁹ Cf. *EAD*, XXXIII, pp.105-116, figs.30-31.

⁴⁰ A = 0.852 - 0.855 m., F = 0.790 m.; A/F ratio includes both crowning mouldings (hts. = 0.245 m. and 0.256 m. respectively): *AA*, 1982, pp.216-218, 227-228, fig.16.

⁴¹ A = c. 0.422 m., architrave crown ht. = 0.177 m.; F = c. 0.681 m., frieze crown ht. = 0.203 m.: *FD, TrSiph*, pp.155-190 *passim* + fig.123.

while v. the Hephaisteion [#44] has a slightly higher ratio (1.024).⁴² Although certain earlier monuments had similar (and lower) ratios, these monuments from the 'Golden Age' of Athens were exceedingly influential and their A/F proportions, along with their other novel forms and proportions (including column slenderness and the entablature height in relation to column height⁴³), must have acted as catalysts in the continuing lightening of Doric proportions in general.⁴⁴ Even temples in the Western Greek colonies, which had some of the highest A/F ratios in the Archaic period, fall under the influence of these new trends: the Temple of Concord at Akragas [#51], c. 430, and the temple at Segesta [#55], c. 424-416, have ratios of 0.991 and 1.000 respectively.

Thus, from the Attic group of relatively low A/F ratios, one passes to the Cyclades, an area where one would certainly expect strong regional tendencies in the architecture. Unfortunately, from the fifth century there are only two Classical buildings with known A/F proportions on the islands, namely the Great Temple of Apollo, initially built c. 475-450, and the Temple of the Athenians, c. 425-417, both on Delos. The peripteral Great Temple of Apollo [#37] has an A/F ratio of 1.040,⁴⁵ a figure consistent with contemporary proportions on the mainland and in the western colonies, but which is much higher than the Cycladic A/F ratios of the late Archaic period including that of the largely canonical Temple of Artemis on Paros. However, above the frieze ran a decorative moulding-course, 0.245 m. high, comprising of – in

⁴² The actual discrepancy of the frieze having the same height as the architrave is respectively: +0.003 m., -0.007 m., +0.009 m., +0.014 m. and -0.012 m. While it would seem that the Parthenon was intended to have exactly the same A and F heights (0.3 cms discrepancy – less than $\frac{1}{7}$ of a dactyl), the variation at the Propylaia (1.4 cms – just under $\frac{3}{4}$ of a dactyl) can perhaps be regarded as deliberate, for in many other respects Mnesikles' monument shows exceptional precision.

Refs.: i. Orlandos, *'ΑρχΠαρθ'*, II, pp.199, 224 + p.240, fig.149; ii. W. H. Plommer, 'Three Attic Temples', *BSA*, 45, 1950, pp.83-85; iii. J. de Waele, *The Propylaia of the Akropolis in Athens*, (Amsterdam, 1990), p.73; iv. M. M. Miles, 'A Reconstruction of the Temple of Nemesis at Rhamnous', *Hesperia*, 58, 1989, p.170; v. H. Koch, *Studien zum Theseustempel in Athen*, (Berlin, 1955), pl.48.

⁴³ See pages 137 and 172 respectively.

⁴⁴ At least one treatise was written first-hand on the Periklean monuments, namely the lost book by Iktinos (according to Vitruvius, *De Architectura*, VII. pr. 12), co-architect of the Parthenon, and this must have played a large part in the transmission of current theories and designs, but also the masons working on these monuments may have helped to spread the new 'ideals' to the rest of Greece in their search for work when employment in Attica dried up.

⁴⁵ *EAD*, XII, pp.20-24, figs.26, 29, pl.5.

ascending order – a kyma reversa, fascia and ovolo.⁴⁶ If this course is included as part of the frieze, the A/F ratio becomes 0.782, a figure that conforms to several of the Archaic monuments on the Cyclades. Perhaps the architect not only wished to represent the Ionic traditions of the islands by including a highly ornate moulding in the first large-scale Doric temple on Delos, but also was aware of the architectural tradition of low architraves which the additional course above the frieze achieved, visually at least.

Oddly, the A/F ratio (0.920) of the Temple of the Athenians [#54] is far lower than those of the afore-mentioned, albeit somewhat earlier, Attic monuments.⁴⁷ It is, however, somewhat similar to that of the earlier Temple of Artemis on Paros [#29] (0.956) and close to that of the contemporary stoa at the Sanctuary at Brauron [#57] (0.927), but if the architect of the Athenian temple had been influenced by one of these buildings it is perhaps more likely that it was by the Parian temple rather than by the stoa at Brauron which is totally dissimilar in type and the ratio of which is the product of the stoa's use of three-metope spans.⁴⁸ Moreover the Temple of the Athenians, as on the adjacent Great Temple of Apollo, possessed a separate course above the exterior frieze although only c. 0.08 m. high;⁴⁹ including this with the ^{frieze} ~~architrave~~, the A/F ratio becomes 0.814, conforming even more to certain late Archaic Cycladic examples. That the architect of this temple was familiar with traditional and/or earlier Cycladic forms is supported by the inclusion of several such features in the temple; these include the prostyle plan, the short square cella, the inclusion of the moulded course above the frieze, the heavy use of carved decoration (*e.g.* on the sima

⁴⁶ EAD, XII, pp.25-28, figs.33-37; AHHD, II.i, p.255. Although Courby thought this moulding was an early Hellenistic addition (EAD, XII, p.105), it seems more likely that it was intended from the start since the profiles of its mouldings are characteristic of the later fifth century; in addition, its inclusion makes the entablature heavier in relation to its CH, thus conforming with the proportions of contemporary mainland entablatures (*cf.* Coulton, ParthKong, p.41, fig.3). See Graph 5.

⁴⁷ EAD, XII, pp.121-122, figs.131-133.

⁴⁸ The architect, either concerned about the weight of the entablature over the intercolumniations (which with the 3-metope spans were now wider than normal in relation to the entablature height), or realising that economy in stone could be safely achieved, reduced the height (and weight/volume) of the architrave. The frieze height had to remain fairly constant so as to maintain the usual shapes of the metopes and triglyphs. Ratio derived from Bouras, p.42, fig.19.

⁴⁹ EAD, XII, pp.121-124, figs.135-137, 211; AHHD, II.i, pp.250-251. On its material, see page 34.

and door-lintel), and perhaps the use of pillars – free-standing and engaged.⁵⁰ It is thus possible that this otherwise unusually low A/F ratio for a canonical Doric temple may have been, if not intended, at least accepted by the architect who was aware of and responsive to, earlier Cycladic proportions; he may even have been 'Cycladic' by birth or by training. This supposition is supported by the fact that the temple's architect was perhaps Kallikrates, who is known to have designed the Parthenon (with Iktinos) and the Temple of Athena Nike and to whom the Ilissos Temple has also been attributed, for all three temples possess certain forms and features which are characteristically Cycladic (in conception or use).⁵¹

The possible design procedure that led to this A/F ratio is also worth mentioning; it appears to follow one or even both of the following processes: given that the frieze height is set at 0.615 m. from the wish for it to be around $\frac{1}{3}$ of the interaxial (so as to keep the normal ratios and shape of the triglyphs and metopes), the architrave height (0.566 m.) is then derived either from the column height so that $A = \frac{1}{8} CH$ (actually 0.014 m. short of exactly $\frac{1}{8}$), or from the combined height of architrave, frieze and half the moulded element above the frieze, so that this combined unit is equal to exactly $\frac{2}{3}$ of the interaxial, the discrepancy being + 0.0003 m.⁵²

An earlier monument, however, which had a similar ratio to that of the Temple of the Athenians was the South Stoa in the Argive Heraion [#43] ($A/F = 0.922$), probably constructed c. 460 B.C. It is, in fact, the first monument other than a temple or treasury for which both the architrave and frieze heights are known, and the reasons

⁵⁰ The Cycladic preference for the prostyle plan (*e.g.* Naxos, Dionysos? Temple at Iria; Paros, 'Town Temple' A) and variable ground-plans that included square, even 'oblong' cellas (*e.g.* Delos, Letoon; Naxos, Demeter Temple at Sangri) is well documented: *cf.* AA, 1982, pp.222-223; GD, pp.48-49. The moulded course above the frieze is copied from the Great Temple of Apollo. The extensive use of carved decor is of course especially marked on the large Archaic Ionic temples of Naxos and Paros. The innovation of using pillars for conscious architectural effect is usually attributed to the architect(s) of these Athenian temples; however, while the use of pillars in the interior of the 6th C. Building Δ on Delos may be regarded as convenient rather than deliberate, the pillar *engaged* on the interior of the back wall of Treasury IV (c. 475-450) on Delos is perhaps too often overlooked as a significant, original architectural element (*cf.* AHHD, I, pp.128-129, 250-251; AHHD, II.i, p.79; GD, p.134).

⁵¹ See previous note and page 137 and note 51, and . For the association of the four temples to Kallikrates, *cf.* I. M. Shear, 'Kallikrates', Hesperia, 32, 1963, pp.375-424 (although columns rather than piers were probably used in the porch of the Ilissos temple: A. A. Barrett, M. Vickers, 'Columns *in antis* in the Temple on the Ilissus', BSA, 70, 1975, pp.11-16, pl.4).

⁵² This second design hypothesis is postulated in D. Mertens, Der Tempel von Segesta, (Mainz am Rhein, 1984), p.222. However, despite the discrepancy being negligible, it seems rather false due to the seemingly arbitrary inclusion of only half the height of the moulded element in the combined 'entablature'.

for its adoption of this A/F ratio – ground-breaking for a monument neither on the Cyclades nor Cycladic-influenced – are functional ones deriving from the small scale of its colonnade.⁵³ It would seem unlikely, though, that this Peloponnesian stoa had any direct influence on the Delian temple.

LATER CLASSICAL PERIOD (c. 400 – 323)

The dominant characteristic of this period is the marked downward trend in the A/F proportion. Moreover, this trend is evident in buildings from all parts of Greece, although the majority of known A/F ratios come from Peloponnesian monuments. As Graph 4 illustrates, there is a steady reduction in the normal A/F ratio from c. 0.95 at the start of the fourth century to c. 0.825 at the end of the Classical period.

The peripteral Temple of Asklepios at Epidauros [#61], built c. 380, set the 'standard' for most other Peloponnesian and Attic monuments for the next forty years with an A/F ratio of 0.886.⁵⁴ It is possible that the Asklepios Temple was influenced by the prestigious Temple of the Athenians on Delos (A/F = 0.920) to which it may also owe its plan of a short cella with no opisthodomos. The next sharp step downwards in the A/F ratio seems to have occurred at the Temple of Athena at Lindos [#73], dating probably to the mid fourth century, where the ratio is 0.837, a figure that was soon to be found in other entablatures.⁵⁵

Unfortunately the A/F values of most fourth-century monuments on the Cyclades are unknown, but the Tholos on Paros [#79], c. 350-300, has a ratio of c. 0.862. Although this figure is firmly within the normal range of A/F values of the second half of the fourth century, it would be slightly lower than normal if the tholos actually dated to the middle of the century. On Thasos the Paraskenia Building [#78],

⁵³ Using conventional proportions the actual space between the columns would have been rather small for the passage of people, so the interaxial was widened while keeping the column height the same (rather than increasing its height as was the usual practice) thus creating an interaxial rectangle that was squatter than normal; if the entablature height remained at the usual proportion to the column height it would now look uncomfortably heavy, so a compromise seems to have been effected in which the frieze remained related to the interaxial so as to keep the conventional proportions of triglyphs and metopes, while the architrave was related to the column height in its normal ratio; thus, the unusual ratio between architrave and frieze heights resulted. Cf. Coulton, *BSA*, 1973, pp.79-81.

⁵⁴ Roux, *Argolide*, pp.94-95.

See page 152, n. 3.

⁵⁵ *Lindos*, III, pp.104-105, pl.4, J.

c. 350-300, has an A/F ratio of only c. 0.820, amongst the lowest of the time.⁵⁶ If the monument were actually to date towards the mid fourth century its A/F ratio could be considered as particularly low for the period, and thus – deliberately or otherwise – directly in the tradition of Archaic entablatures on the Cyclades and Thasos.

Finally, the two major irregularities in the fourth century from the normal band of A/F ratios are both apparently explicable. The high, 'old-fashioned' ratio of 1.018 at the dodecastyle portico [#89] added to the Telesterion at Eleusis around 330-310 was necessary to match that of the adjoining entablature of the fifth-century hall behind.⁵⁷ Secondly, the Propylaia of the Sanctuary of Athena at Lindos [#99] (late IV century) has an A/F ratio of 1.075, presumably because the architect was basing the elevation, as well as the general ground-plan, on that of Mnesikles' Propylaia on the Athenian Acropolis.⁵⁸

HELLENISTIC PERIOD (c. 323 – 69)

The last quarter of the fourth century sees the continuation in the lightening of the A/F proportion, the lowest value (0.797) occurring at the tetrastyle prostyle Temple of Asklepios in Corinth [#97].⁵⁹ Again though, one of the lowest values during this final quarter of the century is on Thasos – the Gate of Zeus and Hera [#91], a two-storeyed marble façade (Ionic above Doric) decorating an entrance through the older city wall, which has an A/F ratio of 0.808.⁶⁰ This gateway would seem to testify, for the first time, to the influence of Macedonia upon Thasian architectural circles, for this monumental façade is typical of the essentially non-structural, highly decorative and extremely eclectic approach of Macedonian architecture, as exemplified at this date by the façades of chamber tombs⁶¹ and the eastern front of the Palace at Vergina.⁶² Yet

⁵⁶ *ET*, VI, pp.72-73 taking highest values recorded.

⁵⁷ *Eleusis*, pp.127-130.

⁵⁸ This unusually high proportion, not accounted for in the publication, may be erroneous since it is based on the heights of the façade architrave and the frieze from the side wall: *Lindos*, III, pp.161-162; p.198, pl.5,C; p.200, pl.5,E. Note: the A/F ratio given in the table (*ibid*, p.183) is irreconcilable with the figures presented in the main body of text.

⁵⁹ *Corinth*, XIV, pp.34-36, fig.9.

⁶⁰ Based on my own measurements.

⁶¹ Cf. Miller, 'MacedTombs', pp.153-166; Miller, *Lyson*, pp.9-11, 93-98. For an examination of the relationship between the Gate of Zeus and Hera and the façade of the Lefkadia Tomb, cf. R. Martin, (continued...)

even if the general scheme of the Gate of Zeus and Hera is influenced by Macedonian architecture, the architect may still have been, and the building-group most likely was, local. Perhaps most relevant to the A/F ratio is the fact that the construction was merely a façade and thus the Doric entablature did not have to carry the weight of any ceiling beams; the architect was therefore freed from certain structural considerations and the A/F ratio could reflect his (and perhaps Thasian) genuine aesthetic intentions for the relationship of the architrave to frieze.

Returning to the general picture of A/F proportions throughout Greece, the turn of the fourth century into the third coincides with a marked change in the pattern of A/F ratios; for, while the fourth century is characterised by a narrow range of falling A/F ratios, the period from 300 B.C. onwards is marked, contrarily, by an extremely wide band of A/F values, within which not only do some ratios continue to decrease but others – reversing the downward trend – return to values that are more characteristic of the early fourth century. Thus, from 300 to at least 100 B.C. the ratios of the architrave height to the frieze height range from *c.* 0.90 to *c.* 0.70.⁶³

It is difficult to present any definite reason for the return to higher A/F values; as Graph 4a shows the number of metopes per span does not seem to be an issue, for colonnades with two-metope spans as well as three and four-metope spans have higher ratios, just as all these types of colonnade have decreasing ratios. However, Pergamene architectural taste may have some influence since the Temple of Athena Polias [#120], constructed *c.* 290-275 and one of the first major Pergamene monuments, has one of

⁶¹(...continued)

'Sculpture et peinture dans les façades monumentales au IV^e siècle avant J.-C.', RA, 1968, pp.171-184.

Given the idiosyncratic nature of the architecture of tomb façades it is inappropriate, indeed detrimental, to closely compare individual details, especially proportions, with those of free-standing buildings, and use the results to comment on the nature of Greek architecture as a whole (*cf.* Miller, Lyson, p.9 + n.46). However, for interest, below are listed the A/F ratios of certain Macedonian tombs, revealing extreme variations between each other and contemporary figures elsewhere in Greece:

*c.*1.09 - 'Philip's Tomb', Vergina (*c.* 336): ratio from photo in M. Andronikos, Vergina, the Royal Tombs and the Ancient City, (Athens, 1984), p.101, fig.57.

1.02 - 'Soteriades Tomb', Dion (late 4th C.): Gossel, MakKamm, p.113.

0.833 - Great Tomb, Lefkadia (late 4th C.): Petsas, Τάφος, p.82, fig.29.

⁶² *Cf.* D. Pandermalis, 'Beobachtungen zur Fassadenarchitektur und Aussichtsveranda im hellenistischen Makedonien', in P. Zanker (ed.), Hellenismus in Mittelitalien, (Göttingen, 1976), pp.391-394. The architrave and frieze of the Doric peristyle at the Palace of Vergina are extant but their heights are not published.

⁶³ There is one notable exception – the Theatre Proskenion at Oropos (mid 2nd C.) has an A/F ratio of 1.091: E. Fiechter, Das Theater in Oropos, (Stuttgart, 1930), pl.4.

the highest ratios of the time – 0.900. In the following century two other Pergamene buildings have similarly high A/F ratios: the Stoa of Attalos I at Delphi [#127] = 0.903, and the N.E. Stoa in the Athena Sanctuary at Pergamon [#143] = 0.922. As is clearly illustrated by Graph 4, the majority of monumental buildings with known A/F proportions are located in the Cyclades and in Asia Minor; there are relatively few examples from other regions of Greece, and most notably there are no monuments in this period with known A/F ratios from Sicily or South Italy.⁶⁴

Of greater relevance to this present study, however, is the sharp decrease in A/F ratios around 300 B.C., for the three earliest monuments which either lead, or are a crucial part of, this advance in the lowering of the proportion are Cycladic and Thasian: namely the Monument of the Bulls and the Dodekatheon on Delos, and the Theatre Proskenion on Thasos. The Monument of the Bulls [#103], c. 306-290, has an A/F ratio of 0.791,⁶⁵ one of the earliest to go below 0.8, and although not a great break from a few contemporary ratios (Miletos, Harbour Stoa [#96] – 0.799; Corinth, Asklepios Temple [#97] – 0.797), it is still the lowest A/F ratio seen since the late Archaic instances from the Cyclades and Thasos. Even if this unusual monument is the product of a Macedonian architect, the eclectic essence of Macedonian architecture – combining forms and presumably proportions from different areas and from different chronological periods – could easily assume Cycladic architectural tendencies, including the preference for low architraves.⁶⁶

Advancing the A/F proportion even further are the entablatures of the early third-century Theatre proskenion at Thasos [#109] and of the Dodekatheon [#119], c. 290, on Delos. Both have A/F proportions that are exceptional for their time. The proskenion has an A/F ratio of 0.732,⁶⁷ structural factors (*i.e.* lack of roof-frame to

⁶⁴ The Propylon at the Demeter Malophoros Sanctuary at Selinous is probably not 'Hellenistic' (Dinsmoor, AAG, p.284) but late 5th C. (H. Berve, G. Gruben, Greek Temples, Theatres and Shrines, [London, 1963], p.421), a date in keeping with the forms of the capitals and triglyphs, as well as the A/F proportion of 1.04.

⁶⁵ A = 0.455 m. (AHHD, II.i, p.222); F = 0.575 m. (Th. Homolle, 'L'Autel des cornes à Délos', BCH, 8, 1884, pl.17; and used by Vallois in CAD, pl.6).

⁶⁶ See pages 216-217.

⁶⁷ F. Salviat, 'Le Batiment de scène du théâtre de Thasos', BCH, 84, 1960, pp.304-305, fig.3; p.310, fig.7. Smaller architectural members, presumably belonging to an upper storey of the skene building, and assigned the same date as the proskenion on the basis of triglyph form, have an A/F ratio of 0.712: *ibid.*, p.306, fig.9. Paradoxically, the Theatre proskenion on Delos has an A/F ratio of 0.888, relatively high for the 3rd C.

support) can only have reassured the architect about his preference for the use of such a reduced architrave height. And although, in this case, one has to be cautious about continuing to draw inferences about general Cycladic practice from a relatively minor piece of architecture on an island becoming more and more independent, in many spheres, from the Cyclades, the same warning cannot be levelled at the Dodekatheon on Delos. This hexastyle amphiprostyle temple, although influenced in numerous ways by the prestigious Temple of the Athenians nearby, has an A/F proportion of *c.* 0.712 – one of the lowest A/F ratios attained in Greek architecture.⁶⁸ Although there are several near-contemporary buildings in the Eastern Aegean and in Asia Minor which also have A/F ratios from 0.8 - 0.7, they are somewhat later in date than the 'pioneering' Cycladic monuments. Thus, it is tempting to see with these Cycladic and Thasian monuments a sure re-affirmation at the start of the third century of the preference for relatively low architraves, a Cycladic architectural proclivity that has its origins in the sixth century.

However, the majority of third-century buildings on the Cyclades actually have A/F proportions from 0.82 - 0.89, figures in the upper half of the band of values identified above, thus to some extent 'bucking' the trend for lighter than average A/F ratios that we have been following on the Cyclades. These monuments are: on Delos, i. the Temple of Asklepios [#118] (A/F = 0.838), ii. the Theatre Proskenion [#105] (0.888), iii. the Stoa of Antigonos [#126] (0.835), iv. the Stoa of Philip [#130] (0.871), and v. the Hypostyle Hall [#131] (*c.* 0.857); on Paros, vi. the Hellenistic Stoa [#129] (0.821); and on Thasos, vii. the N.W. Stoa in the agora [#112] (0.860).⁶⁹

Possible explanations can be proffered for the ratios of four of these monuments. Most straightforwardly, the Stoa of Antigonos and Stoa of Philip V are Macedonian dedications, and their above average A/F ratios (0.835 and 0.871 respectively) would seem to stem simply from the eclectic hand of their Macedonian architects,⁷⁰ while it is likely that the A/F ratio of the Hypostyle Hall (*c.* 0.857) was

⁶⁸ *EAD*, XXII, pp.36-40; pp.137-140, fig 54. The architrave height is based on that of the architrave-backer.

⁶⁹ i. *EAD*, XX, p.86-87, figs.51-53; ii. my own measurements; iii. *EAD*, V, pp.22-24, fig.25; iv. *EAD*, VII.i, pp.47-50, fig.99; v. *EAD*, II.i, pp.15-19, fig.29; vi. *AA*, 1978, p.376, fig.1; vii. *ET*, VI, pp.24-28, 94.

⁷⁰ Interestingly, another Macedonian stoa – Stoa J on Samothrace [#125], *c.* 250-150 – also has a high A/F ratio of 0.908 (F. Salviat, 'Addenda samothraciens', *BCH*, 86, 1962, p.296).

directly influenced by those of the two earlier Macedonian buildings on Delos from which it copied other architectural traits.⁷¹ Finally, the late third-century stoa on Paros apparently has several architectural similarities with the contemporary Stoa of Philip, and to these one can perhaps add that of the A/F ratio (0.821).⁷²

By contrast, the A/F proportions of the second century on the Cyclades, represented only by Delian monuments, are noticeable for mainly being among the lower ratios of the period. So excepting the L-shaped Stoa in the Delian Agora [#144] where the ratio (0.821) exactly matches that of the Stoa of Philip,⁷³ one finds lower than average A/F ratios at the peristyle of the Complex of the Poseidoniasts [#141] (0.745), at the Kynthion Propylon [#163] (0.769) and at the Agora of the Italians [#164] where it is *c.* 0.767.⁷⁴ With these ratios the Cycladic preference for relatively low architraves is re-established.

It is finally worth noting that there are only a few other instances from elsewhere in the Greek world of lower ratios, including the lowest A/F proportion cited in Table 10 of 0.684 from the Lower Agora at Pergamon [#146], dated *c.* 175-150. While this approaches Vitruvius's recommendation of the architrave being $\frac{2}{3}$ of the frieze height (*i.e.* 0.666),⁷⁵ there is, in fact, no major Classical or Hellenistic monument known to have had this proportion in the Greek world.

⁷¹ For typical Macedonian traits at the stoas on Delos, see page 205, note 58.

⁷² Koenigs does not elaborate much on the 'similarities in form and technique' other than that the Parian stoa was probably also single-aisled and that the lion-head water-spouts were similar; *cf.* AA, 1978, pp.379-380. Their A+F/I ratio is the same: see page 175.

⁷³ AHHD, II.i, p.222 (architrave ht.), F. Durrbach, 'Fouilles de Délos', BCH, 26, 1902, p.496 (frieze ht.).

⁷⁴ i. EAD, VI, pp.94-105; p.110, fig.93; pl.9; in addition, the short colonnade dividing the peristyle from the small court has a similar A/F figure of 0.753, not shown on Table 10 or Graph 4: *ibid.*, pp.37-43; p.34, fig.27; ii. EAD, XI, pp.98-99, fig.73; iii. EAD, XIX, pp.18-23, fig.25.

The published A and F measurements for the Temple of Isis (*c.* 100 B.C.) are: A = 0.42 m. (Roussel, CED, p.127, no.74), F = 0.40 m. (M. Hauvette-Besnault, 'Fouilles de Délos', BCH, 6, 1882, p.303). The resulting A/F ratio (1.05) is irreconcilable with the restored extant entablature; a photograph-based estimate of the ratio is *c.* 0.8.

⁷⁵ Vitruvius, De Architectura, IV, 3, 4.

OTHER ENTABLATURE PROPORTIONS

Within the elevation of a colonnade the ratio of architrave height to frieze height is of course not the only significant proportion, and not even the most visually striking. As mentioned at the beginning of the Chapter, the relationship between the height of the whole entablature and other significant units, such as column height, interaxial and lower column diameter, also changes over time. However, many of the horizontal cornices have not survived from Cycladic monuments and so as to be able to compare Cycladic entablatures with those from elsewhere in Greece, in the following brief discussion (and on the related Tables and Graphs) all cornice heights have been excluded and the *entablature* height will here refer to just the combined heights of the architrave and frieze (A + F) unless otherwise stated.

ARCHITRAVE + FRIEZE HEIGHT / COLUMN HEIGHT

Refer to Table 11 and Graph 5.

For a person standing in front of a colonnaded façade, this ratio (A+F/CH) is one of the most visible and easily appreciated of all the proportional relationships within the architecture. Its importance was obviously well known to all ancient architects and, indeed, it was a key element in the general lightening of façade architecture that occurred between the Archaic and Hellenistic periods when the height of the entablature steadily declined in relation to the column height.

As one can see from Graph 5 the general A+F/CH ratio in the second half of the sixth century is 0.35 - 0.30 during the late Archaic period, but this drops down in fairly well defined steps to ratios between 0.20 - 0.15 by the second century. It is also interesting to note that certain monuments have A+F/CH ratios that are, or very close to, simple fractions. Thus, for example, the ratios at Temple FS at Selinous [#11] and the stoa at the Artemision at Brauron [#57] = $\frac{1}{3}$ (0.333); a group of mainly fourth-century monuments beginning with the Temple of the Athenians on Delos [#54] = $\frac{1}{4}$ (0.25); and the Monument of the Bulls [#103] and the Asklepios Temple [#118] on Delos = $\frac{1}{5}$ (0.20). This would seem to indicate strongly that the A+F/CH proportion was a primary one in the design of these buildings.

The late Archaic and early Classical monuments on the Cyclades and Thasos are striking for having lower A+F/CH ratios than contemporary buildings from elsewhere in the Greek world:⁷⁶ Delos, Heraion B [#17] = *c.* 0.288; Thasos, South Building at Alikí [#18] = *c.* 0.286 - 0.238; Paros, Temple of Artemis [#29] = *c.* 0.295; and the Great Temple of Apollo on Delos [#37] = *c.* 0.292. These low Cycladic ratios can be related either to the slenderness of their columns or to the relative lowness of their architraves or both, although of course these two factors are not necessarily requisite for the occurrence of a low A+F/CH ratio. The similarity between all three Cycladic ratios is striking, the correspondence between the Temple of Artemis in the Delion on Paros and the Great Temple of Apollo on Delos having been noted previously in the CH/I proportion.⁷⁷ At the Great Temple of Apollo the addition of the profiled frieze crown in the entablature – apart from increasing the frieze height in relation to the architrave height – perhaps would also have been intended by the architect to increase the height of the entablature as a whole, the resulting A+F/CH ratio being 0.339 and thus similar to contemporary ratios in the rest of Greece.⁷⁸

These low Cycladic A+F/CH ratios are forerunners of, and may have influenced, the A+F/CH ratios of the Periklean buildings in Attica, most of which form a distinct slightly lower group (0.26 - 0.28). Of these Attic buildings, the Hephaisteion [#44] is especially notable, for its ratio is 0.292, the same as at the Great Temple on Delos. It is possible that with this ratio we may have further evidence for the influence of Cycladic architecture upon Periklean architecture.

In the first three-quarters of the fourth century, dominated by Peloponnesian monuments, the ratios take another marked step downwards, the ratios now lying between 0.21 - 0.26. That of the Paraskenia Building on Thasos [#78] is one of the lowest of this period: *c.* 0.215.

At the start of the Hellenistic period there is another drop in the ratio; on Delos, the Monument of the Bulls [#103] and the Temple of Asklepios [#118], with ratios of 0.196 and 0.197 respectively, are among this initial defining group. That this

⁷⁶ An exception is the Temple of Apollo on Aigina (*c.* 520-510) where the ratio is probably 0.237; however, Cycladic influence could well be responsible for this particular ratio as it is for a number of other traits on this temple and on that of Aphaia. *See page 131, note 25*

⁷⁷ See pages 133 and 135.

⁷⁸ See pages 162-163.

ratio is not necessarily dependent on slender columns is shown by the late fourth-century Propylaia at Lindos [#99] which, while having a very low A+F/CH ratio (c. 0.192), has relatively stocky columns (CH/D = 5.92) for its time. Whilst the stoa on Paros [#129], c. 220-200, also has one of the lowest ratios of its time (c. 0.182), most Hellenistic monuments on the Cyclades have A+F/CH proportions that are consistent with contemporary monuments elsewhere in Greece.

ARCHITRAVE + FRIEZE HEIGHT / LOWER COLUMN DIAMETER

Refer to Table 12 and Graph 6.

The proportion A+F/D also declines from the Archaic to the Hellenistic period but despite the great variation between the highest and lowest ratios, the average value declines only minimally. There are several reasons for these circumstances. Firstly, entablatures in relation to column heights become lighter over this period – mostly owing to an actual reduction in overall entablature height (as seen in the A+F/CH ratio, and independently, by the decrease in the A/F ratios); secondly, the columns themselves become more slender – sometimes owing to a decrease in the lower column diameter. Thus, with entablatures becoming lighter and column diameters often becoming smaller, the two factors in the proportion A+F/D tend to counterbalance each other, resulting in only a small decline in the average ratio. The wide variations from the average band of ratios are caused by anomalies from these specifications; for instance, column slenderness primarily resulting from an actual heightening of the column rather than a reduction in the lower column diameter.

Only a very few A+F/D ratios match up with simple fractions: for instance, Olympia, Sikyonian Treasury [#32] = $1\frac{2}{3}$; Temple at Segesta [#55] = $1\frac{1}{2}$; Pergamon, Pi-shaped Stoa in the Upper Agora [#147] = $1\frac{1}{3}$. From the fact that the lower column diameter may very well determine ^{frieze}~~architrave~~ height but not ^{architrave}~~frieze~~ height,⁷⁹ together with the fact that monuments – such as those of the Periklean age – which form tight groupings in several other ratios are here spread widely apart, it seems fair to conclude that in the design of colonnades the matter of this A+F/D ratio was not foremost in the

⁷⁹ See page 152, note 8.

mind of the architect.

Despite this, it is still interesting to note the Cycladic A+F/D ratios of the Hellenistic period especially, since the majority are then higher than most ratios from contemporary buildings from the Eastern Aegean and Asia Minor: many of the Cycladic proportions lie between *c.* 1.4 - 1.6,⁸⁰ while the rest lie between *c.* 1.2 - 1.4. This seems to suggest that it is the lower column diameter that plays a major role in determining many proportions, for generally these Hellenistic Cycladic monuments not only have more slender columns than normal (*i.e.* with more lower column diameters 'fitting' into the column height – see Graph 1) but also, as seen on this Graph, heavier entablatures in terms of diameters (*i.e.* with more lower column diameters fitting into the entablature height); the common determining factor in both these proportions is the relatively small lower column diameter.

ARCHITRAVE + FRIEZE HEIGHT / INTERAXIAL

Refer to Table 13 and Graph 7.

The A+F/I proportions naturally fall into groups depending on whether the interaxials are of two, three or four-metope spans. It is in the two-metope span group that a decline – albeit only slight – in the ratios is most apparent (from *c.* 0.7 - 0.55). The interaxial of a colonnade is essentially tied to the rhythm of the frieze and short of expanding the triglyphs and metopes out of their usual shapes, the interaxial – in each group of metope-spans – remains essentially static in relation to the frieze height. Thus, the decrease in the A+F/I ratios can largely be attributed to the relative decrease in height of the architrave, thus confirming the A/F ratios of Graph 4.

While this proportion does not seem to have been a primary one in architectural design – not least because the majority of ratios do not fall on, or close to, values which have practicable fractions – there are, however, a few instances where this ratio does appear to have been actively used for just this reason: with an A+F/I ratio of $\frac{2}{3}$ (0.666) are the Great Apollo Temple on Delos [#37] (0.660) and the Temple of

⁸⁰ Delos: Monument of the Bulls [#103] = *c.* 1.431; Theatre Proskenion [#105] = 1.417; Dodekatheon [#119] = *c.* 1.439; Stoa of Antigonos [#126] = 1.536; Hypostyle Hall [#131] = *c.* 1.596; Complex of the Poseidoniasts [#141] = *c.* 1.537; L-shaped Stoa [#144] = 1.443].

Poseidon at Sounion [#46] (0.660); and with a ratio of $\frac{5}{8}$ (0.625) – a neat fraction of the 16-dactyl foot – are the Temple of Aphaia on Aigina [#24] (0.629), the Athenian Treasury at Delphi [#28] (0.628) and the Parthenon [#45] (0.628 – a discrepancy in this case of only + 0.014 m.). As one can see from Graph 7, there are also a few ratios around the figure 0.375 or $\frac{3}{8}$. In some cases it would appear that the interaxial was related to just the frieze height.⁸¹

Although many of the Cycladic buildings show no distinct differentiation from other buildings elsewhere in Greece in this proportion, there are some notable exceptions. As one would expect from previous ratios, the late Archaic buildings also have low A+F/I ratios owing to their generally low architraves (Delos, Heraion B [#17] = 0.583; Kea, Building D [#26] = 0.623; and Thasos, South Building at Aliko [#18] = 0.479). The late Classical Paraskenia Building on Thasos [#78], *c.* 350-300, has a very low ratio both for the two-metope interaxials of the wings (*c.* 0.552) and the three-metope interaxials of its central body (*c.* 0.366), again corresponding to its low A/F ratio. In the Hellenistic period on the Cyclades it is interesting to note the Temple of Asklepios on Delos, *c.* 297 [#118] where although the A+F/I ratio is 0.547 – the lowest ratio on Graph 7 for a two-metope span with the exception of the late Archaic South Building at Aliko on Thasos – its A/F ratio (0.838) is only average for its time; this in fact results from the relatively wide central interaxial of the façade above which the metopes are also wider than normal.⁸² Even more striking is that many of the lowest A+F/I ratios of three-metope Hellenistic monuments come from the Cyclades: the central section of the Stoa of Antigonos [#126] = 0.371,⁸³ the Stoa of Philip = 0.369 [#130], the stoa on Paros = 0.369 [#129], the L-shaped Stoa = 0.371 [#144] and the Agora of the Italians = 0.360/0.351 [#165]. Within this group the similar ratios among the Macedonian stoas, and between them and the other Cycladic monuments, are notable although not necessarily deliberate. However, in general the Cycladic A+F/I ratios are spread amongst the average range during the Classical and Hellenistic periods.

⁸¹ See page 152, note 8.

⁸² The 'Triglyph width : Metope width' ratio = *c.* 1.64 rather than 1.45-1.55 as is usual. Cf. *EAD*, XX, pp.86-87, fig.52.

⁸³ Although actually only carrying two metopes per interaxial so as to centre the bull's head/triglyph.

CONCLUSIONS

Unlike for column slenderness, the case for a continuous Cycladic tendency for lower architraves and lighter entablatures than found elsewhere in the Greek world is more difficult to establish. These tendencies were certainly present in the late Archaic period, and from time to time there are significant smaller groupings with lighter ratios than normal.

In the case of the architrave height to frieze height (A/F) proportion, the Archaic and Classical Doric buildings on the Cyclades nearly always have ratios that are below the average figure. Their greatest deviation from the norm is in the late Archaic period when the architraves are consistently smaller in height than their friezes, probably owing to the hesitant, eclectic nature of the first instances of the Doric order on the islands, while the influence of Ionic entablature proportions should also not be overlooked. Yet despite the adoption of many canonical Doric forms and proportions around the beginning of the Classical age, the Cycladic tendency for relatively lower architraves apparently continues in the Classical period – albeit including the frieze crown in the A/F ratio of the Great Temple of Apollo on Delos. At the start of the third century the Dodekatheon on Delos has an exceptionally low ratio, and whether or not this temple had any direct influence on the subsequent general decrease in the ratios, it is tempting to see here a strong echo of, or reassertion of, the traditional Cycladic preference for low architraves. However, many of the Cycladic A/F ratios of the Hellenistic period form two groups: the buildings with higher ratios mainly date to the third century and it may be significant that some are Macedonian dedications; the buildings with lower ratios, apart from those at the start of the period, date to the second century. Yet both the ratios of both these groups are firmly within the band of average ratios of their time.

A similar picture emerges from the A+F/CH proportions. Many Cycladic buildings have a lighter than usual entablature in relation to their column heights. This distinct trend of late Archaic and early Classical monuments is also apparent at the start of the Hellenistic period, although thereafter Cycladic entablatures follow the pattern of ratios of monuments elsewhere. And in the A+F/I proportion certain Cycladic monuments of the Hellenistic period have ratios that are, or are among, the lowest.

Thus, although one cannot claim that the Cycladic region had a significant and continuous tendency for lighter Doric architraves or entablatures in the Classical and Hellenistic periods – as was certainly the case in the late Archaic age – there are nevertheless definite examples of both individual and groups of Classical and Hellenistic monuments possessing the lowest, or among the lowest, ratios for these proportions. While perhaps in general it is true to say that in these particular proportions Cycladic architecture largely conformed to the architectural *koine*, at least in the Hellenistic period, nevertheless there is still some indication of the individuality of the Cyclades as an architectural region.

TRIGLYPH FORMS

The most characteristic features of a Doric entablature are the triglyphs which continue the vertical momentum of the columns up through the otherwise horizontal architrave, frieze and cornice. Whatever the origin of these three grooves (τρί-γλυφος: 'thrice-cloven' – in fact two grooves and two chamfers or half-grooves)¹ the way in which the grooves (or glyphs) terminate at their top altered significantly, yet quite subtly, between the Archaic and Hellenistic periods, with two or more variations current at certain times. Moreover, some of these triglyph forms are particular to certain regions of Greece, and although some of these particular forms have been noted before,² there has never been a full treatment of the subject. Since Cycladic architecture also has a propensity towards certain triglyph forms it seems appropriate here to present a detailed discussion.

The form of a triglyph-top is determined by the following three specific features, each of which is examined in turn in this Chapter: the frontal appearance of the glyph-top; the treatment of the 'ceiling' of the glyph; and the presence and form of 'ears' on the half-glyphs.

Table 14 lists the details of these features, where known, of many major Doric monuments in the Greek world after 550 B.C.

FRONTAL FORM OF THE GLYPH-TOP

The most immediately obvious aspect of a triglyph is the frontal form of its glyph-top (Figs.4a-d). There are three basic forms: curved, flat with curved corners (here termed 'intermediate' for ease of expression) and flat. The earliest triglyphs date

¹ Some scholars follow Vitruvius (*De Arch.*, IV, 2, 2) and see them as direct translations in stone of the wooden beam-ends or coverings (Robertson, *GkRmArch*, p.65; Dinsmoor, *AAG*, pp.50, 56-57; and more sceptically Lawrence, *GkArch*³, pp.125, 130-131); others regard them as an independent monumental invention (R. M. Cook, 'A Note on the Origin of the Triglyph', *BSA*, 46, 1951, pp.50-52; *ibid.*, 'The Archetypal Doric Temple', *BSA*, 65, 1970, pp.17-19; Coulton, *Architects*, pp.37-39.

² E.g. Coulton, *BSA*, 1968, pp.172-174; Rumscheid, I, pp.313-314.

to the start of the sixth century³ and have curved tops like the majority of later triglyphs in the Archaic period. The curve is more often than not quite pronounced (column 1 on Table 14; Fig.4a), although there are also somewhat flatter, but nevertheless continuously curved, examples (column 2 on Table 14; Fig.4b). On the Cyclades and Thasos the earliest known triglyphs belong in fact to some of the earliest Doric buildings on these islands and date to the decades either side of 500 B.C. (Pl.88).⁴ All have curved tops, the use of which, like the Doric order *per se*, was undoubtedly in imitation of contemporary mainland Doric architecture rather than through any independently original preference for this style.

At end of the Archaic period on the Cyclades, as elsewhere in Greece, there came into fashion a new type of glyph-top that was flat with rounded corners – the 'intermediate' type (Fig.4c; Pl.89). Although apparently originating on the mainland,⁵ the intermediate top spread quite quickly and was first employed on the Cyclades at the Temple of Artemis in the Delion on Paros (c. 490-480).⁶ Its use at this small but nevertheless significant distyle temple (the first truly orthodox example of the Doric order on the archipelago) may perhaps have been directly influenced by the same form on the slightly earlier or contemporary Temple of Aphaia on Aigina (c. 500-485) where Parian marble – and perhaps Parian work-groups – were used.⁷

From the start of the Classical period until about 380 B.C. this intermediate glyph-top almost completely replaced the curved glyph-top on the mainland and in the

³ E.g. at Temple of Artemis at Kerkyra (c. 580). Note: Lawrence, GkArch³, p.155, fig.119 is a reconstruction of the entablature of the early 6th C. Temple of Apollo Alaeus at Crimisa in South Italy, but this combines the 6th C. terracotta cornice-facings with 'much later' triglyphs with flat glyph-tops.

⁴ Kea – Temple of Apollo at Karthaia (Graindor, 'Kykladika', p.100, fig.17); Building D (*ibid.*, p.92, fig.11; Schuller, JdI, p.377, figs.43-44); Despotiko, Doric Building (Schuller, JdI, p.354, fig.28); Delos – Heraion B (EAD, XI, p.197, fig.163 - the exact form of the curve is no longer discernable, although it appears steeper than that given in the reconstructions, fig.165 + pl.5, which also seem erroneous in the inclusion of triglyph 'ears'). Thasos – South Building at Alikí (ET, IX, p.61, figs.72-73). There are no entablatures extant from the earlier (c. 550-525) Treasury V or Minoe Fountain on Delos.

⁵ Its first known appearance is at the Treasury of Selinous at Olympia (Olympia, II, pl.29), variously dated within the second half of the 6th C: 550-500 (*ibid.*, p.50); c. 530 (E. N. Gardiner, Olympia. Its History and its Remains, [Oxford, 1925], p.222); 525-500 (Dinsmoor, AAG, p.116); c. 540-530 (A. Mallwitz, Olympia und seine Bauten, [Munich, 1972], p.313, fig.239).

⁶ Schuller, Artemis-Tempel, pp.25-26, fig 11, pl.32 (D108).

⁷ See page 131. Gill dates the temple 'after 480' based on the pottery of the temple terrace fill (D.W.J. Gill, 'The Temple of Aphaia on Aegina: Further Thoughts on the Date of the Reconstruction', BSA, 88, 1993, pp.177-181), although the fill could have been put in after the temple's construction.

western colonies. Unfortunately, nearly all of the Classical buildings on the Cyclades have lost all evidence for the types of triglyph-top that they possessed, but it is known that the intermediate glyph-top was used on the peripteral Great Temple of Apollo on Delos (c. 475-450).⁸ This style's prior use on Paros is consistent with the supposition that Parian building-groups were engaged in the construction of the Great Temple.⁹ It is interesting to note that the curved glyph-top apparently continued to be used into the early Classical period on Delos, at Treasury III on Delos (c. 480-450);¹⁰ perhaps this was the *oikos* of a 'provincial' island town.

Between 380 - 330 the shallower type of curved glyph-top made an unexpected comeback in various regions in Greece, and was used on approximately half the known triglyphs while the other half continued to be given the intermediate glyph-top. The partial return to a markedly older form has no obvious explanation: the majority of the monuments which have curved glyph-tops are neither provincial nor archaizing (e.g. Temple of Asklepios at Epidauros; Temple of Athena Alea at Tegea), and neither is this type of glyph-top confined to a certain geographical area (although half are from the Peloponnese), nor are the relevant triglyph blocks badly weathered.

In the second quarter of the fourth century another type of glyph-top appeared in Greek architecture. The new glyph-top was completely flat; right-angles replaced the curved corners of the intermediate top (Fig.4d; Pl.90). Although its region of origin is difficult to pinpoint because there are several roughly contemporary instances from diverse parts of Greece (see Table 14),¹¹ the flat glyph-top rapidly became the predominant form of Hellenistic triglyphs in virtually all areas of Greece. Cycladic architecture had also adopted this form by the end of the fourth century, as it was used at the Prytaneion (colonnade added c. 314-290) and the Monument of the Bulls (c. 306-290) on Delos, and at the Fountain-Exedra (c. 320-280) in the Sanctuary of

⁸ *EAD*, XII, p.23, figs.29, 32.

⁹ See pages 50, 69 and 134.

¹⁰ *AHHD*, II.i, p.243.

¹¹ The earliest instance is at the Temple at Segesta (c. 424-416) but it seems unlikely that this Sicilian example would have influenced the architects of mainland Greece over fifty years later. For Andron B (c. 377-353) at Labraunda in Caria, see page 183 and note 22.

Poseidon on Tenos (Pl.93).¹² The flat glyph-top was thereafter used on nearly every Cycladic triglyph frieze whether it was on the exterior colonnade of a major monument or on the peristyle of a Delian house (Pls.90, 92, 94-95).

There are a few exceptions to this. The Stoa of Philip V on Delos (c. 216-200) has fully rounded glyph-tops (Pl.91).¹³ Since this monument was not only a Macedonian dedication but more significantly of Macedonian design (as indicated by many architectural forms), perhaps the rounded glyph-tops were also a feature favoured in Macedonia; certainly their use conforms to the eclectic spirit of that region's architecture.¹⁴ Equally, the architect may simply have been influenced by the revived use of this glyph-top form in many third and second-century Pergamene or Pergamene-influenced monuments, the most immediate example of which was at the Stoa of Attalos I at Delphi (c. 241-223).¹⁵ On Thasos the glyph-tops of the Oblique (N.E.) Stoa in the agora, dating probably to the first century, are also curved, again perhaps reflecting Macedonian architectural influence which was particularly strong on the island in the Hellenistic period.¹⁶

A feature that was not in the Cycladic architectural repertoire was the use of

¹² i. H. Lauter, 'Struktur statt Typus', AA, 1982, p.715, fig.11; ii. personal inspection; iii. Ténos, pls.16-17. A single triglyph block from the Parian Asklepieion dated with other architectural parts by Rubenshon to c. 350-300, although it could well be later, has flat glyph-tops (O. Rubensohn, 'Paros III', AM, 27, 1902, p.217, fig.17).

¹³ EAD, VII.i, p.48, pls.3, 5.

¹⁴ At the Sanctuary of the Great Gods on Samothrace which was widely patronised by the Macedonian kings, the Altar Court, dedicated by Philip III Arrhidaios c. 340-330, and the Hieron built c. 330 (its religious importance, richness and architectural forms indicating a royal Macedonian donor), both had curved glyph-tops in addition to intermediate and flat glyph-tops (Samothrace, IV.ii, pls.26-29, and *ibid.*, III, pls.49-51 respectively). The use of a curved and a flat top on a single block further confirms that these differences in form were not due to a later rebuilding. These variations (together with those in the shape of the guttae) speak for the employment of different workmen from different areas who were 'imported' into the island along with the marble: cf. Samothrace, IV.ii, p.82; *ibid.*, III.i, p.169; Miller, MacedArch, p.220. In Macedonia, the 3rd C. tomb at the Haliakmon Dam also has curved glyph-tops.

¹⁵ FD, TerrAtt, p.61, pl.35. At Pergamon itself, curved glyph-tops are used at the Athena Polias Temple, c. 290-275 (Pergamon, II, pls.9, 12); and among 'Building-group III' in the upper city (Pergamon, V.i, p.23, fig.16b). Within the Pergamon sphere they are used at Mamurt-Kale on the 'Mother of the Gods' temple, c. 283-263 (A. Conze, P. Schazmann, Mamurt-Kaleh, [Berlin, 1911], pp.23-23, fig.3 – the flat glyph-tops are from a later repair); at Aigai on the N.W. Stoa, c. 150-125 (Aegae, p.37, fig.38), the Temple of Demeter and Kore, 2nd C.? (*ibid.*, p.41, fig.49), the possible Bouleuterion, c. 150-125 ? (*ibid.*, p.33, fig.34), and the N.W. Temple, c.150-125 ? (*ibid.*, p.36, fig.37); at Assos on the Bouleuterion, c. 241-133 (Assos, p.59); and at Kyme on the Doric Stoa, 'shortly before 129' (J. Bouzek, Kyme, II, Results of the Czechoslovak Expedition, [1980], figs.7, 13-16; figs.44, 47).

¹⁶ Personal inspection.

a bevelled lip on the front edge of glyph-tops (denoted with a 'b' on Table 14; Pl.89). This bevel was employed virtually only during the second half of the fourth century¹⁷ and occurred on approximately half the known monuments from this period, irrespective of whether the glyph-tops were curved, intermediate or flat. Moreover, the known Classical and Hellenistic instances form strong regional clusters. The majority occur on Peloponnesian monuments (most of which possess the bevel during its period of vogue), while there is also a distinct Macedonian group, the associated buildings being either in Macedonia or neighbouring areas strongly influenced by her architecture: i. the House of the Abduction of Helen at Pella (late IV century); ii. the Altar Court (c. 340-330) and iii. the Hieron (c. 330) in the Sanctuary of the Great Gods on Samothrace; and on Thasos, iv. the Paraskenia Building (c. 350-300) and v. the N.W. Stoa (c. 300-280) in the agora.¹⁸ It seems as though that this was an essentially Peloponnesian form, thus accounting for its absence from the Cyclades and other regions, which Macedonian architecture – true to its eclectic spirit – sometimes copied mainly during its period in vogue in the second half of the fourth century.

FORM OF THE GLYPH-CEILING

The form of the 'ceiling' of the glyph also changed over time throughout Greece including on the Cyclades (Figs.4.i-iii). During the sixth and fifth centuries the glyph-ceilings were almost always undercut (see 'Sectional Profile' column on Table 14). This undercutting was irrespective of whether the frontal appearance of the glyph-top was curved, intermediate or flat. The exact form of the undercutting obviously

¹⁷ The earliest examples are on the 6th C. Temple of Athena and Temple FS at Selinous: Koldewey-Puchstein, p.117, fig.94. However, the 4th C. is more likely to have been primarily influenced by the glyphs of the peristasis of the Temple of Apollo at Bassai (c. 430-400) which are the earliest mainland examples of bevelled glyph-tops: *Bassitas*, IV, pl.42.1.

¹⁸ i. C. Makaronas, E. Giouri, *Οἱ οἰκίαι ἀρπαγῆς Ἑλένης καὶ Διούγσου τῆς Πέλλας*, (Athens, 1989), p.39, figs.36-39; ii. + iii. note 24; iv. *ET*, VI, p.73, plan M; v. *ET*, VI, plan H. It is unclear in the published accounts of Macedonian tombs whether bevels are present or not. Although, for reasons stated elsewhere (see page 166, note 61) these tombs are not included in the main body of the text or Table 14, noted here are the known glyph-top forms from 8 tombs: 5 have the flat top – 'Soteriades Tomb', Dion (late 4th C.); Great Tomb, Lefkadia (late 4th C.); Doric tomb, Aghios Athanasios (3rd C.); 'Kinch Tomb', near Lefkadia (late 3rd - early 2nd C.); Doric tomb, Pydna (late 3rd - early 2nd C.). In addition, at Philip's Tomb (c. 336) at Vergina both the flat and intermediate top occur, while at the Palace at Vergina (late 4th C.) there is only the latter; the Tomb at Haliakmon Dam (3rd C.) has a shallow curved glyph-top. Cf. Gossel, *MakKamm*, *passim*.

varied between masons, and one can distinguish two basic methods: the ceiling is angled upwards in a straight or slightly curved plane towards the vertical back of the glyph,¹⁹ or the back of the glyph also curves forward to form a kind of domed ceiling (Figs.4.i-ii).²⁰ However, no chronological or geographical distinction can be made between the different methods.

In the fourth century two new types of glyph-ceiling – a horizontal and a downward sloping one – came into common use alongside the undercut ceiling.²¹ The horizontal glyph-ceiling (Fig.4.ii; Pl.92) was the first of these two types to be practised, although it is again difficult to determine its origin as the earliest examples in the first half of the fourth century are from diverse regions of Greece (see Table 14).²² On the Cyclades, the first known monuments to have flat glyph-ceilings were the Tholos on Paros (c. 350-300), the Fountain-Exedra on Tenos (c. 320-280) and the Monument of the Bulls (c. 306-290).²³ In these Cycladic instances the horizontal ceiling was used in conjunction with glyph-tops which are flat in their frontal appearance (although this was not always the case in the earliest examples), thus conforming to the customary practice of Greek mouldings where the frontal design copies the sectional profile (e.g. egg-and-dart on ovolo profile, leaf-and-dart on kyma reversa profile).

The sloping glyph-ceiling developed later in the fourth century from the horizontal ceiling (Fig.4d; Pl.90). The transition, conscious or otherwise, is apparent at the Altar Court (c. 340-330) and the Hieron (c. 330) on Samothrace where some of the glyphs have extremely gently sloping ceilings.²⁴ Distinctly sloping glyph-ceilings

¹⁹ E.g. Alikí, South Building on Thasos; 3rd Temple of Athena Pronaia at Delphi; the Parthenon.

²⁰ E.g. Aigina, Aphaia Temple; Delphi, Athenian Treasury; Paros, Artemis Temple in the Delion.

²¹ An earlier instance of a horizontal ceiling occurred at the South Stoa at the Argive Heraion (c. 460-450).

²² Despite its early use at Andron B, dedicated by Mausolus c. 377-353, at Labraunda in Caria (Rumscheid, II, pl.67.2), the building's architect and masons are likely to have been trained in, if not actually native to and 'imported' from, mainland Greece or even the islands. This would have been in line with the Hellenizing zeal of the Hekatomnid dynasty. Cf. P. Hellström, 'Labraunda. Mixed Orders in Hekatomnid Architecture', *ICCA*, XII, p.73 (although he believes the architect to have been Ionian or Carian owing to the bold mixing of Ionic columns with Doric entablature).

²³ i. *AA*, 1972, p.424; ii. *Ténos*, pls.16-17; iii. (personal inspection; *pace* Vallois, *AHHD*, II.i, p.244, n.1). In Macedonia horizontal glyph-ceilings occur by the late 4th C.: at 'Soteriades Tomb' at Dion and at the Great tomb at Lefkadia.

²⁴ i. *Samothrace*, IV.ii, pls.26, 28; ii. *ibid.*, III, pl.51.

are first found in the late fourth century on the Harbour Stoa at Miletos and on Delos at the Prytaneion colonnade (c. 314-290), the Asklepios Temple (c. 297) and the Dodekatheon (c. 290).²⁵ The sloping glyph-ceiling in fact seems to be the treatment favoured by Cycladic architects/masons in the Hellenistic period.²⁶ Of the 18 known Cycladic examples of horizontal and sloping glyph-ceilings listed in Table 14, 7 are horizontal and 11 are sloping, but two buildings of the first group²⁷ have direct or indirect links with Macedonian architecture and can reasonably be excluded from the 'native' Cycladic count, thus making the numerical ratio 5 to 11 in preference for sloping glyph-ceilings. No downward sloping triglyph ceilings are known to me from Macedonia itself,²⁸ but in other areas of Greece the division between these two types seems fairly equal, there being no coherent pattern for the use of one type or the other.

Practical reasons for the use of horizontal and sloping glyph-ceilings include greater facility in their cutting resulting in beneficial economies in time and labour, and the elimination of the thin fragile 'lip' on the front created by undercutting, thus reducing the likelihood of damage during construction or of weather erosion.

THE TRIGLYPH 'EAR'

A final significant feature of triglyphs is the treatment of the tops of the outer half-glyphs. This is of importance because in the form of these 'half-tops' there are strong regional tendencies – including a Cycladic one. Throughout Greece in the sixth century their form was simply that of the adjacent whole glyph-tops (whether curved or intermediate) cut vertically in half. In the early fifth century, however, a small plain pendant began to be attached occasionally to the outermost part half-tops (Pl.94); this is the so-called triglyph 'ear', which is here termed 'Type 1' to distinguish it from the

²⁵ i. Milet, I.vi, pp.9-10, fig.11; ii. H. Lauter, 'Struktur statt Typus', AA, 1982, p.715, fig.11; iii. EAD, XX, p.87, fig.63; iv. EAD, XXII, fig.11. All confirmed by personal inspection (*pace* Roux, Argolide, p.325 ascribing horizontal ceilings to the two last buildings).

²⁶ As Vallois (AHHD, II.i, p.244) who links its use to Delian political independence.

²⁷ The Monument of the Bulls (personal inspection) and the Stoa of Antigonos (EAD, V, pp.22-23, fig.25, pl.3).

²⁸ They are present on the Stoa of Philip at Megalopolis but they date to its rebuilding in c. 183 (Megalopolis, p.62, fig.57). As mentioned above, the glyph-ceilings at the Altar Court and the Hieron on Samothrace are so gently sloping as to be virtually horizontal; in any case building-groups from different areas seem to have been used: see page 181, note 14.

later 'Type 2' ear.²⁹ This ear is not found on any Archaic triglyphs from the Cyclades.³⁰

It is very unfortunate that there are no tops of half-glyphs surviving from definite Classical monuments on the Cyclades, for in this period there were a number of developments in these forms elsewhere in Greece; the Cycladic response would have been informative. However, there are no triglyph-ears present on either the Tholos on Paros or the Paraskenia Building on Thasos, both dating c.350-300 and so either late Classical or early Hellenistic; their non-use of the ear may well reflect the usual practice of the high Classical period on the Cycladic islands.³¹ This would be in keeping with the Peloponnesian form of the half-glyph, and in contrast to that of Attica in the Classical period when the 'Type 1' rapidly became the norm (see Table 14).

Furthermore, during the second quarter of the fourth century a more ornate version of the pendent ear arose. This 'Type 2' ear was shaped like an apostrophe curving inwards, created by drilling a hole, either part of the way or, obliquely, right through the solid top of the half-glyph (Pl.95). The earliest examples come from Andron B (c. 377-353) and Andron A (c. 351-344) at Labraunda in Caria.³² The 'Type 2' ear, in fact, was virtually the only type of triglyph ear used in Asia Minor in the Hellenistic period – on Table 14 it is used on two-thirds of monuments, with the other third having no ear at all.³³ The 'Type 2' ear was never used in the Hellenistic age

²⁹ As at Buildings B and C on the Athenian Acropolis (Wiegand, Poros-Architektur, p.155, fig.145 + p.162, fig.156), and at the Temple of Athena at Alipheira in Arcadia (A. K. Orlandos, 'H 'Αρκαδική 'Αλιφείρα καί τὰ Μνημεῖα της, [Athens, 1967-68], p.73, fig.47).

³⁰ E.g. those from the Apollo Temple at Karthaia (Graindor, 'Kykladika', p.100, fig.17), Building D at Karthaia (*ibid.*, p.92, fig.11 [attributed to Athena Temple]; Schuller, JdI, pp.377-380, figs.43-44), the 'Doric Building' on Despotiko (Schuller, JdI, p.357, fig.28); and an unattributed 'Archaic' triglyph from Palaiopolis on Andros (Sauciuc, Andros, p.25, fig.31). The triglyphs from the Cycladic-built Athenian Treasury at Delphi (FD, TrAth, pl.19) and the South Building at Aliko on Thasos (ET, IX, p.59, figs.72-73) also have no ears.

³¹ i. AA, 1972, p.424; ii. ET, VI, p.73, plan M.

³² i. Rumscheid, II, p.313, pl.67.2 (vestiges indicate this ear); ii. *ibid.*, pl.65.7. See page 183, note 22. The Stoa in the Amphiarion at Oropos in Attica (c. 360) has triglyph ears with a slight inward curve but they are closer to 'Type 1' than 'Type 2': Coulton, BSA, 1968, pp.172-173, fig.8c, pl.47b.

³³ Contrary to Roux, Argolide, pp.324-325, the majority of Pergamene and Pergamene-influenced monuments possess the glyph ear. However, his assertion (*ibid.*, and FD, TerrAtt, p.61) that the hardness of the local andesite stone used in earlier monuments accounted for a certain lack of embellishment (e.g. omission of crowning moulding [and triglyph ears] on Doric friezes) not only on those monuments but also on some later marble ones in Pergamon still has validity. The absence of

(continued...)

either in the Peloponnese (where 'Type 1' ears were also not used) or in Attica (where the 'Type 1' ear continued to be more common than its omission).

On the Cyclades 'Type 2' ears were employed several times in the Hellenistic age but, as we shall see, their first known appearance was not until the third quarter of the third century. Indeed, in the early part of the Hellenistic period the preference for plain tops to the half-glyphs is apparent. In addition to the Parian Tholos mentioned above there are no ears present on the triglyphs of: i. the Prytaneion (c. 314-290); ii. the Monument of the Bulls (c. 306-290); iii. the Asklepios Temple (c. 297) on Delos; or, iv. the Fountain-Exedra (c. 320-280) on Tenos (Pl.93).³⁴ Thereafter, despite the adoption of both types of ears, the omission of triglyph ears was still common as exemplified by: i. the Propylon of the Athena Sanctuary at Karthaia on Kea (III century); ii. the Dionysos Temple at Thera (Hellenistic); iii. the Asklepieion (Hellenistic) and iv. an unattributed block in the Museum (Hellenistic) on Paros; v. an unattributed block from Palaiopolis on Andros ('IV century or later'); and on Delos, vi. the South Stoa (c. 270-230); vii. the L-shaped Stoa in the agora (c. 187-173); viii. the Temple of Isis (c. 130); ix. the House of the Pediments (c. 125); and ix. the Kynthion Propylon (c. 125-100).³⁵

The simple 'Type 1' ear was perhaps first used on the archipelago at the Temple of the Athenians (425-417) because, although its triglyph-tops are no longer extant, one can assume that their design followed the usual contemporary Attic practice. The nearby Dodekatheon (c. 290) may also have possessed this type of triglyph ear for in the temple's plan and in many of its details of form, it closely copies the Temple of the Athenians.³⁶ However, the first certain use of the simple ear

³³(...continued)

triglyph ears on the Athena Polias Temple at Pergamon, the Athena Temple at Troy and the Asklepios Temple at Kos may be due to the fact that ears were considered too decorative for these major temples, building-types traditionally very conservative in Doric architecture.

³⁴ i. AHHD, II.i, pp.243-244 & personal inspection; ii. *ibid.*; iii. *ibid.* & EAD, XX, p.87, fig.63; iv. Ténos, I, pls.16-17. On Thasos the Gate of Zeus and Hera (c. 325- 300) also has no ears: personal inspection.

³⁵ i. Graindor, 'Kykladika', p.97, fig.15 (attributed to Athena Temple); ii. Thera, III, p.108, fig.89; iii. O. Rubensohn, 'Paros III', AM, 27, 1902, p.217, fig.17; iv. personal inspection; v. Sauciuc, Andros, pp.23-24, fig.27; vi. AHHD, II.i, p.244; vii. R. Vallois, 'Attiques déliens', CRAI, 1912, p.108, fig.1; viii. personal inspection; ix. EAD, XXVII, pp.60-63, fig.50, pl.D; x. EAD, XI, p.99, fig.73 + personal inspection.

³⁶ The exact form of the ear on the Dodekatheon is difficult to establish (EAD, XXII, p.39, fig.11; although Vallois believed it to be of a recurving nature: AHHD, II.i, p.243).

on the Cyclades occurs at the Proskenion (c. 275-250) of the Delian theatre (Pl.94); its only other known use is at the Poseidoniasts' Complex (c. 200-150) also on Delos.³⁷ On Thasos, the first known use of 'Type 1' ears is at the N.W. Stoa in the agora (c. 300-280) (Pl.89), perhaps reflecting the Macedonian preference for glyph-ears (as described directly below) and indicating the growing influence of Macedonia within the region.³⁸

The 'Type 2' ear was certainly used more often on the Cyclades than 'Type 1'. Its first known use was on Delos at the Stoa of Antigonos (246-239) followed by the Stoa of Philip V (c.216-200) and the Hypostyle Hall (c. 210-200).³⁹ However, the two stoas are Macedonian dedications with strong architectural traits from that region and the Hypostyle Hall, dedicated by the Delians themselves, has several features that suggest that, even if it was not designed by a Macedonian architect, it copied architectural details from the two stoas.⁴⁰ Thus, the use of the curving ear on these monuments can perhaps be assigned to Macedonian rather than native Cycladic architecture.⁴¹ Later, 'Type 2' triglyph ears appear on Delos at the House of Kerdon (II century), the House of the Comedians (c. 125) (Pl.95) and the Agora of the Italians (c. 110-88), where one can really only attribute their use to local architects and stone-masons.⁴²

Thus, allowing for the discounting of third-century 'Macedonian' instances, it would appear that the triglyph ear was not a characteristic of Cycladic architecture at least until the second century (14 Hellenistic examples without ear, 6 with ear). In addition, there are more cases of the typically Asiatic 'Type 2' ears than the typically Attic 'Type 1' ears.

³⁷ i. AHHD, II.i, p.244; ii. EAD, VI, p.41 + p.104, fig.93.

³⁸ ET, VI, plan H omits the ear and Martin makes no reference to its presence.

³⁹ i. EAD, V, pp.22-23, fig.25; ii. EAD, VII.i, p.49, pls.3, 5. iii. EAD, II.ii, p.18, n.1, fig.35.

⁴⁰ See page 205, note 58.

⁴¹ Although in Macedonia 'the only example of a recurved ear ('Type 2') is at an unknown structure near Vergina Palace' (Miller, MacedArch, p.81), many of the Macedonian dedications on Samothrace have 'Type 2' ears: the Altar Court, c. 340-330 (Samothrace, IV.ii, pls.26-29); the Hieron, c. 330 (*ibid.*, III, pls.49-51); the Arsinoeion, c. 289-281 (*ibid.*, VII, pl.48); and Stoa J, c. 250-150 (F. Salviat, 'Addenda samothraciens', BCH, 86, 1962, p.296, fig.24).

⁴² i. A. Jardé, 'Fouilles de Délos', BCH, 29, 1905, p.42, pl.11, figs.7-8; ii. EAD, XXVII, pp.23-25, figs.17-18, pl.4; iii. EAD, XIX, p.22, fig.21.

CONCLUSIONS

Although the form of the tops of triglyphs is a minor detail in the context of a whole monument and then, as now, probably went unnoticed by the majority of people, it can sometimes reveal a good deal about the origin and date of a particular building. As we have seen, the triglyphs of Cycladic monuments indicate that the island work-groups had preferences and habits too. The frontal appearance of the glyph-tops followed not far behind the general development seen in other parts of Greece, although the bevelled 'lip' which was characteristic of fourth-century Peloponnesian architecture and was later also used in some Macedonian architecture, was never employed on the archipelago. The strongly sloping glyph-ceiling, which may indeed have originated on the Cyclades where some of the first instances occur, became a much favoured form on the islands to the virtual exclusion of other forms on 'native' monuments. Finally, the use and type of triglyph ears is probably the most regional aspect of triglyph forms. Despite the lack of evidence from Classical monuments, there seems a definite Cycladic propensity in the Hellenistic period for continuing the general Archaic practice of not sculpting any ears on the half-glyphs. Although this is in line with Peloponnesian practice, it does not mean in this instance that Cycladic architecture was following that particular region's style of architecture. Instead it reflects a certain amount of architectural independence from the influence of both Attica and Asia Minor. It is only in the second century that one can definitely say local architects/masons were freely using the 'ear', and then the preference is for the Asiatic (and to a certain extent Macedonian) 'Type 2' rather than the Attic 'Type 1' ear.

So in the relatively minor architectural details of triglyph-tops, Cycladic architecture, although at first following the lead of mainland Doric architecture, had by the Hellenistic period asserted certain preferences and may have initiated certain forms in triglyph-top design. In this, as in other aspects, Cycladic architecture shows itself to have been distinctly regional yet, at the same, time receptive to the architectural forms of other areas. This duality is seen particularly in the form of Ionic volute capitals, as discussed in the next chapter.

IONIC CAPITALS

The majority of Cycladic islands were inhabited by people of Ionian stock, whose ancestors had migrated from mainland Greece at the beginning of the first millennium, and this is reflected in the extensive use of the Ionic order in Cycladic architecture. However, the pre-eminence of the Ionic order was in the Archaic period; between the years 600 and 480 B.C. two-thirds of Cycladic temples, whose orders are known, were constructed in the Ionic order. Furthermore, throughout the sixth century experiment and diversity was also a key issue in the use and development of the Ionic order on the islands. Even in its orthodox form, the Ionic order of the Archaic Cyclades varied fairly substantially from that of Asia Minor, and so the Cycladic version or rather versions have been embraced by the term 'Island-' or 'Cycladic-Ionic'. One can include as its main characteristics a preference for very slender, often monolithic and unfluted column shafts (interchangeable with Cycladic-type Doric capitals); a variety of column bases (torus, spira and torus and even cylindrical or truncated cones); distinct forms of column capital; anta capitals with only one main moulding (a kyma reversa); an ornamental, monolithic door-frame; and perhaps most significantly the use of a frieze instead of a dentil course.¹

In regard to the Ionic column capital, the Cycladic islands also adopted their own particular forms of volute capitals in the Archaic period, and it is possible that these types and their forms were a greater influence on the development of capitals in both Asia Minor and Attica than has previously been considered. As seen in the following chronological examination of Ionic volute capitals, the Classical period was a time when the traditional island forms of the Ionic capital became intermingled with Attic and Asian capital forms and proportions, while the Hellenistic period sees the re-emergence of a truly local Ionic capital form. However, to properly ascertain some of the important features of Classical and Hellenistic capitals, the most influential Archaic ones must first be examined.

¹ Cf. in general Gruben, *MüJb*, pp.7-36. See also pages 128 (column shafts), 161 (Ionic frieze), Appendix 1 (monolithic door-frames); *AHHD*, II.i, pp.127-130 (column bases).

MIDDLE and LATE ARCHAIC PERIODS (c.580 – 480)

A variety of Ionic and related capitals have been found from this epoch on the islands, and they can be categorised into different groups based on their forms and proportions.² These include Aeolic capitals with volutes springing vertically from the column shaft,³ so-called 'pendant leaf-wreath' capitals consisting of a circular convex moulding sculpted into a ring of pendant leaves,⁴ and a group of volute capitals that are distinguished for displaying certain traits that are limited to the islands, and which can thus be termed 'Cycladic-type' Ionic capitals or 'Island-Ionic' capitals (Pl.96); their principal characteristics (not necessarily always appearing simultaneously) are: an elongated form with far-spaced volutes which are almost fully disengaged from the shaft; lack of an 'eye' on each volute; often incised rather than fully sculpted ornament; an echinus with a torus or an ovolo profile which projects strongly and is higher than the canal; the absence of an abacus; and the baluster decorated either with one or many astragals⁵ standing above the surface of the baluster (most examples from Delos) or with many astragals 'sunk' into the baluster and the areas between slightly hollowed (as occurs on many Naxian-Parian capitals, and which is a precursor of the baluster treatment on Samo-Milesian capitals). Examples of this 'Cycladic-type' capital, most of which date to c. 580-550, are found not only on the Cyclades but also in areas with known Cycladic links.⁶

² The two specific studies of Archaic Ionic capitals on the Cyclades are: AHHD, II.i, pp.163-185 and Martin, 'ChapDél', pp.371-398 where Vallois' typology is refined.

³ Delos – AHHD, II.i, pp.163-170 [nos. 1-2, 4-5, 7-8]; Martin, 'ChapDél', pp.373-378, figs.1-5 [nos. 1-3]; P. P. Betancourt, The Aeolic Style in Architecture, (Princeton, 1977), pp.90, 140, fig.45 [no.31]. Paros – i) *ibid.*, p.93, 140, [no.33]; ii) *ibid.*, pp.92-93, 140, fig.46 [no.32].

⁴ Examples on Delos (Martin, 'ChapDél', pp.378-382, figs.6-8 [no.4]) and Siphnos (in the museum at Kastro, unpublished; Martin makes no reference to this capital).

⁵ In accordance with Dictionnaire, I, p.158, the term astragal is here used to mean an undecorated 'roundel'; when the moulding is decorated with bead-and-reel it is known as a 'beaded astragal'.

⁶ Delos – i-vii) AHHD, II.i, pp.168-169, 170-178 [nos.3, 9-11], refined and expanded in Martin, 'ChapDél', pp.382-391, figs.9-18 (fig.18 actually depicts capital no.10, not no.9 as stated) [nos.5-11]. Naxos – i) Lambrinoudakis, Gruben, AA, 1987, p.597, fig.41 (from the temple at Iria). ii) Mace, pp.72-73, 206-208, figs.12-15 [no.48] and Kirchhoff, pp.17-18 [no.5]. iii) Kirchhoff, pp.18-19 [no.6]. iv) G. Gruben, 'Das älteste marmorne Volutenkapitell', IstMitt, 39, 1989, pp.165-168, fig.3, pl.19.5. Paros – i) Ohnesorg, AA, 1982, p.271, fig.1 ('Archilochos' capital). ii) Mace, pp.73-75, 211-212, figs.16-17 [no.52] and Kirchhoff, pp.22-23 [no.9]. iii) Mace, pp.77-78, 212-214, figs.41-43 [no.53]. Aigina – i) G. Gruben, 'Die Sphinx-Säule von Aigina', AM, 80, 1965, pp.170-208, fig.2. Delphi – FD, Colonne, pp.12-13, 18-26, pls.11-12 (from the Naxian Sphinx column). Thasos – i-iii) Martin, 'ChapThas', pp.303-315 [nos.1-3].

(continued...)

However, a change occurs on Delos in the style of Ionic capitals around the middle of the sixth century. The new direction is evident with the capitals attributed to the Naxian Stoa on Delos, which is dated, solely on the basis of the style of the capitals, to sometime in the second half of the sixth century, with a date of *c.* 525 falling in the dating range of most scholars.⁷ The differences that distinguish these capitals from the 'Cycladic-type' are in both form and proportion: they always carry sculpted decoration; the echinus is usually of an ovolo profile; astragals border the top and bottom of the canal (although they merge into one astragal in the volutes – unlike in many examples in the Naxian-Parian sub-group of the Cycladic-type capitals⁸); the baluster is nearly always sculpted into vertical flutes separated by astragals or fillets; the canal and echinus are roughly the same height; the volutes are brought closer to the column, and the plan of the capital is more square. This type of capital is usually termed 'Samo-Milesian' after the region from where many capitals of this form have been found.⁹ In fact, if one accepts a mid sixth century date for the Naxian Stoa capitals (although there is no archaeological basis for this), they would be some of the earliest known capitals in the Samo-Milesian group, if not actually at the head of the group as has been proposed.¹⁰

Finally, for the fuller understanding of certain Classical capitals to be later described, it is useful here to fully set forth the details of one of the most celebrated of all Ionic capitals on the Cyclades – the corner capital commonly and probably

⁶(...continued)

There is a Naxian-Parian sub-group where the capitals have in addition: i) upper and lower borders – astragals or fillets – to the canal (later adopted by 'Samo-Milesian' capitals) which continue around the spirals; and ii) concave volutes (rather than the usual convex profile). *E.g.* 's on Naxos (Iria temple), Delos (Naxian Oikos [acc. to Mace, pp.177-178]; votive sphinx), and Aigina (votive sphinx). Moreover, as mentioned in main text above, many balusters on Naxian and Parian capitals have astragals sunk into them while the spaces in between are concave (*e.g.* Naxos, Iria capital; Paros, 'Archilochos' capital; Delphi, Naxian Sphinx), a trait found later on 'Samo-Milesian' capitals.

⁷ Capitals – *AHHD*, II.i, pp.178-180 [nos.13-19]; Martin, 'ChapDél', pp.392-398, figs.19-21 [nos.12-17]; Mace, pp.53-54, 180-182, fig.77 [nos.24-30]; *EAD*, XXXII, pp.103-105, pls.14-17 [caps.A-F]; Theodorescu, pp.114-115; Kirchhoff, pp.31-35 [nos.17-22].

Dating – *AHHD*, II.i: 530-525; Martin, 'ChapDél': 525-500; Mace: 530-525; *EAD*, XXXII: mid 6th C.; *GD*: end 6th C.; Theodorescu: mid 6th C. - 525; Kirchhoff: 550-525.

⁸ See note 6 above.

⁹ However, the Archaic capitals of Miletos and Didyma (*c.* 575-550) possess an abacus, perhaps copying the capitals from Ephesos; *cf.* Martin, 'ChapDél', pp.397-398.

¹⁰ Theodorescu, pp.114-115.

correctly ascribed to the 'Poros Temple' on Delos (Pl.97).¹¹ This marble capital, variously dated between 530 and the early fifth century,¹² is a blend of older 'Cycladic-type' and more recent Samo-Milesian capital characteristics.¹³ The key feature, however, on this corner capital is a novel one – the division of the echinus into two registers, the echinus 'proper' and an upper band known as the 'cushion'.¹⁴

This division is one of a number of effects caused by – or solutions to – the restriction of the echinus width between the volutes, this very restriction a result of the trend of contracting the volutes in towards the column shaft. Various solutions were adopted, the most obvious being to reduce the number of eggs to perhaps four on the face, as seen on many Samo-Milesian capitals (in contrast to Cycladic-type capitals which often had six or more eggs between the volutes). The use of less than four eggs at this date was obviously avoided for examples are few (Pl.99), and they look odd due to the relatively large eggs in contrast to the normal proportions of the other parts of the capital.¹⁵ However, the more normal solution was to create relatively smaller eggs by limiting their height; the free space thereby created between the top of the reduced eggs and the canal was then treated in basically two different ways: either the lower border of the canal was given a greater downwards curve,¹⁶ or the echinus itself was split into two (sometimes three) registers, the lowest being the echinus 'proper' decorated with the eggs, while the upper zone or 'cushion' generally assumed the aspect of a flat band as is seen in the two sets of Delian capitals in question. Yet another solution may have been the deliberate avoidance of sculpting or incising eggs

¹¹ *EAD*, XII, pp.209, fig.264; *AHHD*, II.i, pp.180-182, [no.20]; Martin, 'ChapDél', pp.396-397; Mace, pp.64-66, 182-184; Theodorescu, pp.118-119; Kirchhoff, pp.36-38.

¹² In addition to the refs. in note above, cf. J. Boardman, 'Chian and Early Ionic Architecture', *AntJ*, 39, 1959, p.210; G. Gruben, 'Das Archaische Didymaion', *JdI*, 78, 1963, p.168, n.159; A. Bammer, 'Beiträge zur Ephesischen Architektur', *JOAI*, 49, 1968-1971, p.8, n.28; Dinsmoor, *AAG*, p.133. The Poros Temple was probably built by the Athenians c. 540-527 – see page 24.

¹³ The lack of abacus, and the long darts are characteristics of 'Cycladic-type' capitals, while the vertical fluting of the baluster and the double astragals framing the volute channels are traits associated with both the Naxian-Parian sub-group of the 'Cycladic-type' and the Samo-Milesian group; the palmette design is found specifically on capitals from Samos, Miletos, Didyma.

¹⁴ Not to be confused with the same word sometimes used in older works (including those of Vallois) to describe the side of the volute-scroll otherwise known as the baluster (in Latin the term for the baluster is *pulvinus*, literally 'cushion', from where the double usage of terms arises).

¹⁵ E.g. 3 eggs appear on 4 different Thasian capitals, c.500-450: Martin, 'ChapThas', pp.308-310, 315-318, figs.4-5, 8-12. The Delian 'poros capital' only has 2 eggs on its face (see page 195 and n. 22).

¹⁶ E.g. pronaos capital at the Temple of Athena at Paestum (c.510): Krauss, *Athenatempel*, pl.24.

altogether, although the decoration may have been painted on.

The presence of the cushion on this Delian corner capital has almost always been considered the result of Attic influence, due to the large number of 'Athenian-type' Ionic capitals from Attica which employ this feature,¹⁷ as well as because the Poros Temple to which it is attributed, was an^{probably} Athenian dedication. However, even if one accepts that the capital comes from this temple, it does not necessarily imply that the extant corner capital was designed by an Athenian hand, for as we have seen it is essentially of a Cycladic character; moreover, if one assigns to the capital a stylistic date of *c.* 530-520 (admittedly a fairly high date in the proposed range but one which is justifiable¹⁸), not only is the capital even more unlikely to be an Athenian creation since 'capitals with linked volutes do not appear in Athens until *c.* 530',¹⁹ but the use of the cushion would here be its earliest known appearance on an Ionic capital in Greece. Indeed, up to this time all the creativity in the design of Ionic column capitals appears to originate in the Cycladic islands and on the coast of Asia Minor rather than in Attica,²⁰ a point reinforced by the use of the cushion. Thus, it is entirely credible, if not yet provable, that the capital attributed to the Poros Temple on Delos was the first to use the intermediate band, a form that very soon afterwards becomes widely adopted on Athenian-type capitals. Indeed, it may be significant that the cushion

¹⁷ These capitals, current in the late 6th – 5th C., are characterised by the use of the cushion, large closely placed volutes, a thin outlining to the canalis, painted rather than sculpted decoration, and most notably an echinus with kyma reversa profile. Earliest examples are from votive columns ('Alkimachos capital', *c.* 520-500: Mace, pp.28-29, 159-160, figs.124-125); first used architecturally at the Athenian Stoa at Delphi, *c.* 478-470 (FD, Colonne, pp.45-48, pls.29-30). Celebrated examples are from the Athena Temple at Sounion, *c.* 475-450 (A. K. Orlandos, 'Σουνίου ἀνασκαφαί', *AE*, 1917, pp.183-184, figs.E, H) and from the Agora on which there are considerable traces of painted decor, *c.* 450-425 (H. A. Thompson, 'Activities in the Athenian Agora: 1959', *Hesperia*, 29, 1960, pp.354-356, pl.77).

¹⁸ The stylistic arguments for a lower date (underlined in the following), can all be countered: i). Its contracted proportions result from it being a corner capital, for the angle volute projects less than if it lay flat. ii). The relatively long darts separating the eggs from mid-height (normally a later trait) are fairly similar to those of the Naxian Stoa, *c.* 525, while full-length darts are not unknown at this time, *e.g.* an Ephesian capital, *c.* 530 Mace, pp.196-198, figs.71-75, [no.40]; Thasian capital, *c.* 550-540 (Martin, 'ChapThas', pp.303-307, fig.2, [no.1]); also an older Delian 'leaf-wreath' capital, *c.* 600-550, (Martin, 'ChapDél', pp.378 [no.4]). iii). Slightly pointed eggs occur on an Ephesian capital, *c.* 530 (Mace, *ibid*). iv) Short scotia darts emerging between ends of the baluster scotiae occur on a capital from Didyma, *c.* 535-530 (Mace, pp.40-42, 188-189, figs.60-67 [no.35]).

Furthermore and perhaps equally significantly, the unusual form of the corner palmettes stretching over the cushion on to the eggs (rather than limiting themselves to the cushion as becomes usual) seems to reveal a sculptor still mastering the new technique, thus making the capital early in date.

¹⁹ J. Boardman, 'Chian and Early Ionic Architecture', *AntJ*, 39, 1959, p.206.

²⁰ Theodorescu, p.118.

was used on the capitals of the Poros Temple, a prestigious monument (one of the first Athenian dedications outside Athens) in an important pan-Hellenic sanctuary. If a new form needed a 'seal of approval' its use here this was surely it.

Even leaving aside possibility of Cycladic origins for Samo-Milesian capitals and the intermediate cushion, the presence of a distinct 'Cycladic-type' capital in the sixth century indicates that the Cyclades were keen and active participants in the development of the volute capital, just as they were innovators in other major elements of the Ionic order (notably the Ionic door-frame and the Ionic frieze). This independent artistic streak continues to be vigorous throughout the Classical and Hellenistic periods although certain elements of capital design are indeed copied and adapted from non-Cycladic areas, while, contrarily, certain characteristic forms of the 'Cycladic-type' Ionic capital have great influence on later capitals not just on the islands but in other areas of Greece as well.

CLASSICAL PERIOD (c. 480 – 323)

The number of extant Ionic capitals from the Classical period on the Cyclades is unfortunately quite small, and it is fairly difficult to follow the thread of continuous development from the Archaic capitals. Nevertheless, the surviving capitals are extremely interesting examples in their own right revealing intriguing blends of Attic, Peloponnesian, and Asiatic forms with Cycladic characteristics.

One of the earliest sets of Classical capitals is that from the interior of the so-called 'Thesmophorion' on Delos (probably to be identified with the Hestiatorion of the Keans), erected c. 480-450.²¹ This large rectangular building (37.65 x 14.75 m.) had two square dining-rooms, opening off a central Doric peristyle, in each of which were four Ionic columns supporting the roof. The two extant Ionic capitals are still on site (Pl.98). They lack all sculpted or incised decoration; an abacus is absent; the faces of the canal and volutes are flat, while the echinus projects only very slightly from this vertical plane; and there is a cushion between the echinus and

²¹ Vallois, 'TopDél', p.257; Roux, *Argolide*, p.342, pl.90.2; *AHHD*, II.i, pp.186-189 [no.22]; Alzinger, *JOAI*, p.197, n.73; Martin, 'ChapDél', pp.396-397; G. Roux, 'Salles de banquets à Délos', *ÉtDél*, p.536, fig.8; Theodorescu, p.123; Kirchhoff, pp.43-45. Building's date based on its Doric capital proportions and socle construction (cf. Vallois, 'TopDél', pp.253-256; *GD*, p.160), and apparently confirmed by the historical probability that the building is the Hestiatorion of the Keans which Herodotus (*Histories*, IV, 35) says was in this area: cf. G. Roux, 'Salles de banquets à Délos', *ÉtDél*, pp.525-544, esp.542-543.

the canalis. This last feature, as we have seen with the corner capital attributed to the Poros Temple, is a result of the inward contraction of the volutes towards the column shaft, and this action accounts not only for a squaring of the capital plan, but also for a distinctive upward curve forming the top edge of the canalis on the 'Thesmophorion' capitals; this arc, prolonging and uniting the two curves of the volutes, is a fairly infrequent feature on volute capitals. The 'Thesmophorion' capitals – together with a similar, although much smaller, capital of poros in the Delos museum²² – have the basic characteristics of form of 'Athenian-type' capitals,²³ and although it is possible that they were mainly influenced by contemporary Athenian capitals, one cannot discount the possibility that the sources of inspiration were on Delos itself: the cushion had been used on the corner capital attributed to the Poros Temple, and many Archaic 'Cycladic-type' capitals were either left unsculpted or only lightly incised.

However, of greater significance is the fact that both the 'Thesmophorion' capitals and the poros capital are the earliest known Ionic capitals with an curved upper edge; this, together with other facets mentioned below, places them at the head of a limited but very influential set of Peloponnesian capitals, the most celebrated member being the interior capitals from the Temple of Apollo at Bassai (c. 430-400).²⁴ Indeed, the similarities between the Ionic capitals of the 'Thesmophorion' and those of Bassai have often been noted, but only Roux appears to grant the Delian capitals the recognition that they deserve as being the true predecessors of the Bassai capitals.²⁵ For nearly every one of the idiosyncratic features that characterise the Bassai capitals (and the subsequent 'Peloponnesian-type, Group 1' capitals) is foreshadowed on the 'Thesmophorion' capitals: as well as both sets of capitals having arced upper borders

²² *AHHD*, II.i, pp.186-189, [no.23]; Roux, *Argolide*, pl.90.3; Theodorescu, p.123; Kirchhoff, pp.57-58. This capital has some decoration: two lightly incised eggs; two asymmetrical palmettes; and the flat volute-spirals end in an eye. It was also perhaps from an interior due to the rudimentary working of its back face, suggesting that it was placed against a wall. Dated, presumably on analogy of the 'Thesmophorion' capitals, to c. 475-450.

²³ See page 193, note 17.

²⁴ Roux' 'Peloponnesian-type, Group 1', dating to the 4th and 3rd C. (Roux, *Argolide*, pp.339, 342-348). For Bassai capitals, cf. Roux, *Argolide*, pp.37-40, pls.11.3, 13-15. The date of the temple's interior is disputed: c. 425 (Dinsmoor, *AAG*, p.159); c. 400-390 (Roux, *Argolide*, pp.55-56).

²⁵ Roux, *Argolide*, p.342. However, Roux does not regard the 'Thesmophorion' capitals as having upward-arc'd canales perhaps because, in contrast to the capitals at Bassai, their curve is not as strong and their faces lie on the same plane rather than canting inwards, the latter being a factor which Roux regards as the *raison d'être* for the upward-curved canalis. He does not mention the upward arc on the Delian poros capital.

to their canales, both sets also significantly lack an abacus; both lack angle palmettes; both possess an intermediate cushion; both have essentially flat volute-faces; the tautly profiled echinus of the 'Thesmophorion' capitals stand half way between a true ovolo and a true kyma reversa moulding, the latter being the profile of the echinus at Bassai; and the Bassai capitals have no linking fillet running along the lower border of the canalis between the volutes, a feature shared with the 'Thesmophorion' capitals (for although the Delian capitals are generally unsculpted there is a fillet running along the outer edge of the canalis and volutes). Perhaps, the main difference between the two sets is that at the 'Thesmophorion' both faces of the capital remain parallel and are vertical, unlike the inward canting and forward leaning volutes at Bassai.

Other capitals that have often been put forward as models for the Bassai set – those from the Temple of Athena at Sounion, and the Athenian Propylaia capitals – do not share as many major features with the Bassai capitals as do the 'Thesmophorion' ones. Thus, while not denying other influences, one seems justified in firmly establishing the importance of the 'Thesmophorion' capitals as a distinct precursor of the Bassai capitals and its subsequent series. Moreover, the building in which they were used – probably the Hestiatorion of the Keans²⁶ – was a large, prominent and important monument in the centre of the Delian sanctuary, and the capitals would have been highly visible features in the centre of the dining-rooms; their position was thus not insignificant and indeed may have been advantageous in their subsequent influence.

Before looking at other fifth-century Classical capitals on Delos, it is worth pausing to briefly mention what Puchstein called the 'Mnesiklean' capitals – *i.e.* those from the Propylaia, the Temple of Athena Nike and the Ilissos Temple in Athens – which are regarded by many as the epitome of Classical Ionic capitals.²⁷ The present question concerning these capitals is one of influence, more precisely the architectural influences upon the architect Kallikrates who is known to have designed the Temple

²⁶ See page 194, note 21.

²⁷ Puchstein, pp.14-19, figs.10-12. He so termed them believing that the capitals of the Propylaia were the earliest of the group, although the Ilissos capitals are now often regarded as being earlier (but *cf.* C. A. Picón, 'The Ilissos Temple Reconsidered', *AJA*, 82, 1978, pp.47-81 lowering date of this temple to the 420's, mainly on the stylistic evidence of the sculptured frieze).

of Athena Nike and most probably, on the basis of the similarity in plan and architectural forms, the Ilissos Temple. As mentioned earlier, in both these Ionic temples and his Doric works (the Parthenon and the Temple of the Athenians on Delos) Kallikrates seems to have displayed a strong knowledge of Cycladic architecture.²⁸ Thus, these famous 'Mnesiklean' capitals (at least those of the Athena Nike and the Ilissos temples) may also reflect certain elements and tendencies of Ionic capital design on the Cyclades – perhaps, most notably, the plain and beaded astragals on the balusters.²⁹

However, Athenian influence perhaps accounts for some of the forms of two fragmentary capitals from Delos. The first capital, of white marble, has only its two volutes and canalis remaining; yet according to Vallois, its greatest affinity in both form and scale is with an 'Athenian-type' capital found in the Pinokothek of the Athenian Propylaia, and on stylistic analogy to the Pinokothek capital, the Delian one can be dated to the first half of the fifth century.³⁰ However, traditional Cycladic capital forms are reflected in the relatively smaller volutes as well as their greater spacing from each other. The second capital, of blue tinted marble, lacks its volutes and is located near the south-west corner of 'Building GD 42'.³¹ Its unsculpted echinus and its unbordered canalis recall Archaic 'Cycladic-type' capitals, but again an Athenian model may account for its flat canalis and its 'total height / lower diameter' ratio (0.43) which closely matches a set of Athenian capitals that date perhaps to the fourth century rather than the mid or second half of the fifth century as Vallois

²⁸ See pages 163-164.

²⁹ Older Athenian capitals normally had a flat band around the baluster: *e.g.* Acropolis Museum Inv.15246 and Inv.15247. However, on the Cyclades one central or many astragals are sometimes found: *e.g.* Paros, 'Aeolic' capital in museum, late 6th/early 5th C.; Delos, 'Cycladic-type' capital, c.580-550 (Martin, 'ChapDél', p.384, fig.5 [no.5]); and 'Aeolic' capital, c.550 (*ibid.*, p.375, fig.5 [no.3]).

Shear, writing before the Delian series of capitals had been published, sees influence from Asia Minor as responsible for many of the new forms on these capitals, apart from the bulbous volute eye which seems to have been Attic in origin (I. M. Shear, 'Kallikrates', *Hesperia*, 32, 1963, pp.380-383, pl.88, with earlier refs.); Theodorescu (p.127, n.188) sees them as 'more insular than from Asia Minor'.

³⁰ *AHHD*, II.i, p.190, [no.24]. Pinokothek capital: Puchstein, p.7, fig.4.

³¹ *AHHD*, II.i, pp.190-191, [no.25]. I could not locate this in 1995.

believed.³²

Chronologically, the next capital in the Cycladic series of Ionic capitals is an extremely interesting and equally revealing corner capital from the 'Ionic Peristyle Building' on Paros (Fig.5); the numerous elements which can be attributed to this peristyle date stylistically to the early fourth century.³³ Here again one can discern a distinct mix of different regional influences within the capital's form. The features that are reminiscent of older 'Cycladic-type' capitals are its relatively small and wide-spaced volutes (thus the minimal three eggs of the echinus front spread wide and the darts pass fully between them),³⁴ and the absence of a fillet or astragal marking the bottom edge of the canalis, which is also a characteristic of later Peloponnesian capitals and Hellenistic Asiatic capitals.³⁵

However, the most indicative features on the Ionic Peristyle capital are the thin astragals bordering the volute-spirals, the number of turns of the spiral, the form of the eye, the sag of the canalis, and the inclination of the vertical faces; for these forms almost exactly match those on the somewhat earlier capitals from the interior of the Temple of Apollo at Bassai.³⁶ Yet, apart from the 'Cycladic-type' forms mentioned above, the Parian capital is no direct copy of Bassai not least because the canalis and volutes are almost flat and parallel having negligible frontal curvature in contrast to the Bassai capitals which moreover are three-sided. One should also bear in mind that this Parian capital may have been influenced by 'Athenian-type' capitals as well as the 'Thesmophorion' capitals on Delos.³⁷

Furthermore, it is interesting to note that this Parian capital brings together

³² Cf. the capital erroneously attributed to the Gymnasium of Kynosarges (P. Rodeck, 'The Ionic Capital of the Gymnasium of Kynosarges', *BSA*, 3, 1896-1897, pp.89-105, pls.6-8); also *AHHD*, II.i, p.191, n.2. Martin ('ChapAsclép', p.369) dates the 'Gymnasium' capital to the 4th C.

³³ Gruben, *AA*, 1982, pp.626-631, 679-680, figs.3, 6, 8.

³⁴ Cf. Gruben, *AA*, 1982, p.630, n.11 for comparative ratios; that of the Ionic Peristyle capital closely matches the ratio of the late Archaic capital, M73, from Paros.

³⁵ Roux' 'Peloponnesian-type Group 2' capitals; cf. Roux, *Argolide*, pp.348-350. The lack of a lower canalis edge on Asiatic capitals dates 'at the earliest to the second quarter of the 3rd C. ... with the earliest firmly dated example being at Temple of Zeus in Magnesia, c.221-180 B.C.': Rumscheid, I, p.305.

³⁶ See page 195.

³⁷ See pages 193, note 17 and 194-195.

many features – lack of a moulding on the lower edge of the canalis, the unsculpted baluster and abacus, and the volute–spirals having no secondary 'edge' - that not only occur on 'Peloponnesian-type, Group 2' capitals from the late fourth century, but also are characteristic of a major group of Hellenistic Cycladic capitals. Could the famous fourth-century Parian architect and sculptor Skopas have played a part in the transmission of Cycladic capital design to the Peloponnese when he worked at Tegea? Strengthening somewhat this hypothesis is the discovery on Paros of a wall base, possibly to be attributed to the Ionic Peristyle, the profile of which (a torus, scotia, and a reversed kyma reversa) is unusual in the rest of Greece, yet apparently a fairly common Parian profile;³⁸ significantly, it occurs again, although now decorated with ornament, as the interior wall-base at the Temple of Athena Alea at ~~Nemee~~^{Tegea} (c. 350), Skopas' most famous work.³⁹

A new spirit is felt on a set of Delian capitals of white Parian marble that date stylistically to the mid fourth century; the two extant capital fragments, one from a corner capital, thus strengthening their possible attribution to the prostyle colonnade of 'Building GD 42' (c. 340-330), appear to have their greatest inspiration in forms and proportions from Attica and Asia Minor.⁴⁰ Nevertheless, older 'Cycladic-type' capital forms may account for the echinus being of a greater height than the canalis, (a feature which only occurs in Asia Minor from the second century), and the long, narrow form of both the eggs and the darts on the echinus. However, mainland influence, probably Attic, can be seen in the presence of a fillet above the abacus which appears on an adequate number of 'Athenian-type' capitals to indicate that it was a recognised form in Athenian design;⁴¹ in the Peloponnese, however, the crowning fillet only becomes usual at the end of the fourth century,⁴² while this feature

³⁸ Gruben, AA, 1982, p.643-644, fig.15: similar mouldings at an Archaic monument on Paros, and on the cult statue base (c.420), made by Agorakritos of Paros, at the Nemesis Temple at Rhamnous.

³⁹ Tegea, pl.21.

⁴⁰ AHHD, II.i, pp.191-194, [nos.26a, 26b].

⁴¹ E.g. 2 capitals from the Acropolis (Puchstein, p.8, fig.5 + p.10, fig 7); capital found in the Library of Hadrian, c.450-430 (W. Wrede, 'Ein Ionisches Kapitell in Athen', AM, 55, 1930, pp.191-200, figs.1-4).

⁴² The earliest example is on the half-columns in the 3rd Athena Pronaia temple at Delphi, c. 365-360 (FD, TmpCalc, pp.63-65, pl.27). Macedonian capitals took this feature either from Athens or the
(continued...)

was not employed in Asia Minor until after 250 B.C.⁴³ The abacus itself has a kyma reversa profile decorated with leaf-and-dart; this has contemporary parallels in Asia Minor, at the Mausoleum at Halikarnassos (c. 350) and at the Temple of Athena at Priene (c. 340),⁴⁴ although influence may have been derived from the 'Athenian-type' capitals of the late sixth and fifth centuries. Finally, one may note that in many of its main proportions (at least those in relation to its lower diameter) the Delian capital is similar to the capitals of the Mausoleum.⁴⁵

Thus, with this set of capitals, we are amidst the artistic intermingling of architectural forms from areas both east and west of the Cyclades; this amalgamation seems entirely appropriate to architectural members attributed to 'Building GD 42', a major Ionic monument built by the Athenians on the central Cycladic isle and contemporary with the great temple building projects of Asia Minor.

Finally, before leaving the Classical period it should be noted that on Thasos there are even fewer Ionic capitals dating to this period; moreover, they belong to a tradition very different from the Ionic capitals of Cycladic, Attic, Samo-Milesian or Ephesian type. Their origin lies somewhere on the north-west coast of Anatolia, perhaps even Phoea or Smyrna, and they make their first appearance on Thasos in the second half of the sixth century and continue into the fifth century (Pl.99).⁴⁶ These Thasian capitals share the same principal characteristics which include large volutes set close together with two or three sculpted eggs in between; the absence of an abacus; and a clearly defined eye. Such capitals were not just limited to Thasos but have also been found at Kavalla, Thessalonike, Istria and Halikarnassus, as well as in

⁴²(...continued)

Peloponnese: e.g. a three-quarter engaged capital at the palace at Pella, c. 350-300 (Miller, MacedArch, p.24, pl.13b; Ginouvès, Macedonia, p.90, fig.76); the Philippeion capitals at Olympia, c. 335, have a cavetto on the abacus (H. Schleif, W. Zschiezschmann, 'Das Philippeion', OlyForsch, I, pl.4).

⁴³ E.g. at Magnesia: Temple of Artemis, c. 221-180 (Rumscheid, II, [prior refs.: pp.37-39], pls.78,3-6; 79,1-2, 5-6;), for date, see page 205, note 56; Temple of Zeus, c.221-180 (*ibid.*, II, [p.40], pl.88,1-2).

⁴⁴ Mausoleum: Rumscheid, II, [pp.21-22], pl.46,6; Priene: *ibid.*, II, [pp.69-71], pls.142-143. A sculpted kyma reversa abacus was also used on certain capitals of the Archaic Artemision at Ephesos, c.560 (Dinsmoor, AAG, pp.130-131, pl.30).

⁴⁵ $L.ab/d = 1.16$; $D/d = 1.21$; $L/d = c.1.50$; $Dist.V/d = c.0.61$; $H/d = 0.38$.

⁴⁶ Martin, 'ChapThas', pp.315-325 [nos. 4-7].

Western colonies such as Paestum.⁴⁷

Thus, the Classical period on the Cyclades is characterised by the diversity of influences that inspire the design of Ionic capitals. The capitals on the Cyclades essentially become hybrids, possessing forms and proportions not only directly derived from the older Cycladic capitals, but also from models common in Attica and Asia Minor. These diverse influences continue to affect Ionic capitals, and indeed architecture in general, on the Cyclades in the Hellenistic period, although a distinctive Delian-type capital emerges on that island in the second century.

EARLIER HELLENISTIC PERIOD (c. 323 – 166)

After the relatively plain Cycladic capitals of the Classical period, it is all the more pleasing to encounter a highly decorated capital, perhaps to be attributed to the Propylaia of the Monument of the Bulls, that would appear from its forms and high quality of workmanship to date to the third century (Pls.100-101). This capital of white (Pentelic?) marble, today located to the south-west of the Monument of the Bulls, is on first sight a loose copy of the Erechtheion capitals, for it has a necking band (here carved with closed flame-palmettes alternating with and linked by voluted stalks to an upside-down circumscribed element which is undetailed but was probably painted as a lotus, palmette or lily); a transitional zone between the balusters and the abacus which is moulded in to a smooth kyma reversa; a beaded astragal between the necking band and the echinus; balusters banded with beaded astragals (here four rows on each baluster); no fillet above the abacus; a canal bordered at the top and bottom by a fillet.⁴⁸

However, certain forms (*e.g.* abacus decorated with leaf-and-dart, and lack of

⁴⁷ Cf. G. Bakalakis, 'Νεάπολις, Χριστοῦπολις, Καβάλλα', *AE*, 1936, pp.17-19; D. Theodorescu, 'Un Chapiteau ionique archaïque de Histria', *Dacia*, 12, 1968, pp.261-303; R. Martin, 'Chapiteau ionique d'Halicarnasse', *REA*, 61, 1959, pp.65-75.

⁴⁸ *AHHD*, II.i, pp.194-198, [no.27]. A reconstruction by H.-P. Nénot appears in *Paris, Athens, Rome: le voyage en Grèce des architectes français aux XIX^e et XX^e siècles*, (École Nationale Supérieure des Beaux-Arts, exhibition catalogue, Paris, 1982), p.263, fig.5>114 *right*. For the five-bayed Propylaia of the Monument of the Bulls, cf. *AHHD*, I, pp.244-246. Of course certain features of the Erechtheion capitals are not present, notably the guilloche-carved band between echinus and canal, and the double spirals of the volutes. Vallois places this Delian capital 'well in the period c. 270-220 B.C.'

fillet above abacus)⁴⁹ and proportions (especially relating to height)⁵⁰ would seem to be more directly derived from the fourth-century capitals of Asia Minor. Contemporary Asian models could well have influenced the Delian capital's use of three eggs on the front of the echinus, the lateral ones partly covered by the corner palmettes: this system, as well as the use of deep relief, occur on the capitals of 'younger' Artemision at Ephesos (c. 356-236) and the Temple of Artemis at Sardis (*from* 300); the latter's earliest capitals also have a further noticeable similarity with our capital in the low continuous swing of the canalis down to the eggs.⁵¹ However, one should also bear in mind the forms of the Archaic corner capital attributed to the Poros Temple on Delos for it too has just three eggs on the front of its echinus and a canalis that swings low down (Pl.97).

It is also worth pointing out that the beaded astragals on the balusters of our Delian Propylaia capital stand proudly out from the rest of the surface, unlike on the 'Mnesiklean capitals' and to some extent on the Erechtheion capitals where the intermediate parts of the balusters rise up and thus enframe the 'sunken' beaded astragals, seemingly derived from 'Samo-Milesian' capitals where astragals formed edges to the vertically fluted baluster; however, some earlier capitals on the Cycades have just such prominently raised astragals, plain and sculpted, and this trait is used increasingly on the islands in the Hellenistic period.⁵²

Thus it seems very likely that this capital is a hybrid of forms, combining traits associated with capitals both from the mainland, in particular the Erechtheion, and from Asia Minor, perhaps specifically from Sardis. The result is one of the most

⁴⁹ See pages 199-200.

⁵⁰ Propylaia, Mon.Bulls, 3rd C.: H.tot/d = 0.4 H.ech/H.tot = 0.34 H.can/H.tot = 0.49
 Athena Tmp., Priene, c.350: H.tot/d = 0.43 H.ech/H.tot = 0.35 H.can/H.tot = 0.46
 Mausoleum, c.340: H.tot/d = 0.38 H.ech/H.tot = ? H.can/H.tot = ?
 Didymaion, c. 300: H.tot/d = 0.35 H.ech/H.tot = 0.38 H.can/H.tot = 0.43

For abbreviations see page 204.

Vallois (AHHD, II.i, p.197) mistakenly writes 'abacus ht.' in place of 'canalis ht.' in the final Delian ratio.

⁵¹ Ephesos: Robertson, GkRmArch, p.148, fig.63. Sardis – Capitals Type C, D and G, probably c. 300: Sardis, II/I, figs.43, 73-76, 118, 124, 128, pls.B-C, Atlas pls.8-11; Rumscheid, II, [p.82], pl.180.

⁵² See page 190. The 3 central astragals on certain 5th and 4th C. capitals from Athens only stand out from the baluster on the two outer edges, the rest are sunk into the baluster: e.g. capital found at Stoa of Hadrian, c.450-430 (Alzinger, JOAI, pp.197, 203-204, fig.30); capitals attributed to Gymnasium of Kynosarges (see page 198, note 32). Of the major 4th C. capitals in Asia Minor, only the Nereid Monument at Xanthos has astragals on its baluster – two rows of beaded astragals which stand out, although they are also in conjunction with a carved balteus (Dictionnaire, II, pl.45.1).

delicate and decorative Ionic capitals found on the Cyclades of any period; in turn its subsequent influence on Delian capitals should not be overlooked.

At the end of the third century a new influence – that of Macedonia – is felt upon the form of Ionic capitals on the Cyclades. It is perhaps the strongest and most immediate of the several possible influences that determined the form of the twenty interior capitals of the Hypostyle Hall on Delos, *c.* 220-200 (Pl.102).⁵³ They are without any sculpted ornament, for there are no other mouldings other than the ovolo echinus, and the kyma reversa abacus (without fillet), while the eyes of the otherwise flat volutes are hollowed so as to receive an inserted element. There are in fact three types of this capital: a normal Ionic capital, an angle capital or 'diagonal' capital (with one corner volute between two faces and two balusters at right angles to each other) and a three-sided capital (with two corner volutes between three faces and one baluster). On the normal capital significant features include the feeble height and the wide spacing of the volutes – the total length of the capital is almost 3½ times as great as the width of a volutes; the faces of the capital are angled downwards; and the centres of the eyes are level with the bottom of the echinus as well as in line with the edge of the shaft, providing one of the earliest examples of a characteristic feature of second-century and subsequent Asiatic capitals, and as in fact prescribed by Vitruvius (De Architectura, III, 5, 5-7).⁵⁴

While Leroux wishes to stress comparisons in the proportions of the Hypostyle capitals with those of the later Vitruvian capital, Vallois more appropriately draws links with capitals from Asia Minor; however his table of proportions contains some errors and omissions of many ratios that can now be included to the advantage of drawing comparisons;⁵⁵ the following table is an amended version.

⁵³ EAD II.i, pp.25-32, figs.39-46; AHHD, II.i, pp.198-200, [no.28].

⁵⁴ Erroneously represented in EAD, II.i, fig.46 where the column shaft, for no understandable reason, is made thinner than one would expect; R. Martin, BCH, 68-69, 1944-45, Chron., p.445 also regards the volute-eyes to be in line with the shaft.

⁵⁵ AHHD, II.i, p.199. Moreover, at *ibid.* p.198 the maximum echinus diameter (D) is given as 0.79 m. when it should read *c.* 0.85 m.

Table A. Proportions of Hellenistic Ionic Capitals.

	Hypo.H.	Mausol.	Priene	Didyma	Mg.Art.	Mg.Agr.	Vitruv.
L.ab / d	1.145	1.10		1.13	1.13	1.08	1.188
D / d	1.22		1.17	1.13	1.21	1.09	1.313
L / d	1.46	1.50	1.62	1.38	1.48	1.46	1.53
L / D	1.18		1.39	1.22	1.22	1.34	1.17
Dist.V / d	0.62	0.63	0.63	0.58	0.62	0.59	0.656
Dist.V / D	0.51	0.51	c. 0.5	0.52	0.50	0.54	
Dist.C / d	1.00	0.99	1.08	0.98	1.00	0.97	1.00
H / d	0.34	0.38	0.43	0.35	0.41	0.38	0.375
H.tot / d	0.53		0.63	0.535	0.65	0.58	0.593
H.ech / H	0.36		0.35	0.375	0.31	0.31	0.417
H.can / H	0.45		0.46	0.43	0.46	0.44	0.333
H.ab / H	0.19	0.13	0.19 0.23 ¹	0.18	0.24	0.25	0.25
Dist.V/V.br	1.48		1.34	1.47	1.40	1.36	

¹ 0.19: capital from Pergamon-Museum, Berlin; 0.23: capital from British Museum, London

Abbreviations:

Hypo.H.: Hypostyle Hall, Delos (c. 220-210)
Mausol.: Mausoleum, Halikarnassos (c. 350)
Priene: Temple of Athena Polias, Priene (c. 340)
Didyma: Temple of Apollo, Didyma (c. 300)
Mg.Art.: Temple of Artemis, Magnesia (c. 221-180)
Mg.Agr.: South Stoa, Agora, Magnesia (c. 221-200)
Vitruv.: capital according to Vitruvius, De Architectura, III, 5, 5-7.

L.ab	Abacus length		
d	lower capital diameter (on echinus)		
D	greatest capital diameter (on echinus)		
L	total length (from volute to volute)		
H	combined height of echinus, canalis and abacus		
H.tot	total height of capital from bottom of volutes to top of abacus		
H.ech	echinus height	Dist.V	distance bewteen volutes
H.can	canalis height	Dist.C	distance between centre of volute eyes
H.ab	abacus height	V.br	breadth of volute

One can see that the capitals from both the earlier (at least in design if not execution) Hellenistic Didymaion (c. 300) and the contemporary Temple of Artemis at Magnesia (c. 221-180) have the most similar ratios to those of the interior capitals of the Hypostyle Hall;⁵⁶ interestingly, the Artemis Temple has its closest similarities in proportions of length, while those of the Didymaion are in height. Due to the scale, grandeur and reputation of the Didymaion, the influence of its architectural forms upon later capitals further afield is not extraordinary, while the similarities between the Hypostyle Hall capitals and those of the Artemision at Magnesia raise interesting possibilities about the actual direction and speed of transmission of the 'new' capital proportions, for the buildings are roughly contemporary (in fact, one knows from the building accounts that the Ionic columns of the Hypostyle Hall were cut and dressed under the archonship of Sotion in 208 B.C.⁵⁷).

However, as stated higher up, it is actually Macedonian influence that would seem to be the primary influence upon the Hypostyle Hall capitals, an influence that has surprisingly been overlooked (certainly not mentioned) by previous scholars; for the Hypostyle Hall itself offers many indications that it was designed either by a Macedonian architect (even if commissioned by the Delians as its dedicatory inscription on the architrave states), or by a local architect who drew heavily upon the forms used at the earlier and contemporary Macedonian stoas on Delos – of Antigonos Gonatas (c. 246-239) and of Philip V (c. 216-200) respectively.⁵⁸ Moreover, in

⁵⁶ Work on the new Didymaion 'was probably undertaken at c. 313 B.C.' (Dinsmoor, *AAG*, p.229), but the column capitals are usually thought to date from the first half of the second century (*cf. ibid.*, p.231; W. Voigtländer, *Der jüngste Apollontempel von Didyma. Geschichte seines Baudekors*, [Tübingen, 1975], p.107.); however, Rumscheid, I, pp.227, 236 convincingly argues that the columns of the inner peristasis should date stylistically to c. 300, a date backed by literary testimonia.

The date of the Temple of Artemis at Magnesia (and the *floruit* of its architect Hermogenes) is also disputed in modern scholarship with preferences usually either for an 'early' date of c. 200 or for a 'late' date of c. 130 (*cf.* Dinsmoor, *AAG*, p.274, n.1; and more comprehensively Rumscheid, I, pp.25-28, 198-214); again, Rumscheid, *ibid.* on stylistic, constructional and epigraphical evidence puts the case clearly for an early date of c. 221-180 B.C.

Likewise, for the date of the South Stoa in the Magnesian Agora, *cf.* Rumscheid, I, 25-28.

⁵⁷ *EAD*, II.ii, p.37. See also page 26, note 82.

⁵⁸ The Hypostyle Hall has the following features that can be regarded as 'Macedonian': the plan of the long colonnade between return walls (as at Stoa of Philip), and oddities of architectural detail including Ionic fluting on Doric shafts, the treatment of the upper ends of the flutes (as at Stoa of Philip), the front of the triglyph put on the same plane as the taenia face (as at Stoa of Antigonos), and the unusual form of the Ionic column base.

The Stoa of Antigonos, the first Macedonian dedication on Delos erected at a time when the influence of the Macedonians is tending to supplant that of the Ptolemies (as already attested by the
(continued...)

conjunction with the Hypostyle Hall, one needs also to consider the fragment of a poros capital from the interior columns of the Stoa of Antigonos.⁵⁹ Only one volute remains but it shows a marked resemblance with the Ionic capitals of the Hypostyle Hall, for it is flat and smooth as well as inclining from top to bottom. While one must bear in mind the unsculpted interior capitals from the nearby 'Thesmophorion',⁶⁰ a link with Macedonian design not only seems attractive in both cases, but given the other Macedonian traits of the two buildings concerned, virtually assured: for painted ornament rather than fully sculpted decoration of architectural forms is characteristically Macedonian, and Miller's 'Group 1' Macedonian Ionic capitals 'rely heavily on paint to suggest profiles of many of the mouldings',⁶¹ although other examples of capitals as plain as the present Delian ones are not apparently known in Macedonia.

Although it is not known for certain whether the West Stoa on Delos – that is the extension of the Stoa of Philip built sometime between c. 180-150 – was also a Macedonian construction, the Ionic marble capitals from its 'North Room' could perhaps suggest that this was the case.⁶² Four of the interior capitals are double half-capitals, their backs attached to pillars (Pl.103), while the two end ones are also attached to the wall-ends and are thus double quarter-capitals. Despite the remaining pieces being in poor condition (some of the detail and dimensions in the restored drawings should be treated with caution), the general form of the capitals can be made out including their most prominent feature, the 'calyx' volutes; the balusters, because

⁵⁸(...continued)

foundation of the Antigoneia and Philippeia games), is characteristically Macedonian in scale (120 m. in length), in construction (omission of angle-contraction in corners of facade and wings; use of a complex roofing system involving pitched cross-beams), and in Doric detail (in addition to triglyphs on plane of the taenia, the omission of mutules, and the use of two types of cornice crowns (as at Stoa of Philip)).

The Stoa of Philip, in addition to the traits mentioned above, also has the odd Doric form of a double fascia below the the soffit moulding of the cornice.

Cf. Miller, *MacedArch*, pp.202-212; Ginouvès, *Macedonia*, pp.197-200, 202.

⁵⁹ *EAD* V, p.34, fig.51.

⁶⁰ See pages 194-196.

⁶¹ Miller, *MacedArch*, p.23; for Macedonian Ionic capitals cf. *ibid.*, pp.21-30. Peloponnesian capitals of Roux' Type 2 also are characterised by unsculptured ornament (Roux, *Argolide*, p.350).

⁶² *EAD* VII.i, pp.90-93, figs. 127-137; *AHHD*, II.i, pp.200-202, [no.29].

they are split in half, are shaped as horns or flower calices with their smaller ends curling round and merging into the bottom beaded astragal. While it would appear that this type of volute capital originated in the Peloponnese, it was certainly embraced in Macedonia, a region strongly influenced by Peloponnesian architecture in general.⁶³

However, Cycladic architects and/or stonemasons created their own styles as well as being influenced by other regional architectural fashions, as an idiosyncratic corner capital on Paros illustrates (Pl.104). This marble capital, dating to *c.* 200 B.C. as indicated by the leaf-and-dart ornament on its abacus, nevertheless presents an archaizing air since its volute-spirals are convex and its baluster is fully decorated with overlapping leaves.⁶⁴ Moreover, in the later Hellenistic period, that is the period here corresponding to the Second Athenian Domination of Delos, nearly all the extant capitals on the Cyclades display a distinct local style, so that they can be termed 'Delian-type' after the origin of the majority of examples.

LATER HELLENISTIC PERIOD (*c.* 166 – 69)

The fundamental characteristics of this Hellenistic 'Delian-type' of capital are:

- an unsculpted abacus;
- the eggs of the echinus (usually three whole eggs, ^{and} ~~and~~ two end ones almost fully covered by palmettes) are deeply separated by full length darts;
- a baluster decorated with astragals;
- volute-spirals with no lower edging.

They thus differ considerably from earlier and contemporary types from Asia Minor, although often they have the typical Hellenistic arrangements of the volute-eyes being level with the bottom the echinus, and the canalis being taut between the volutes. Most of the 'Delian-type' capitals come from Delos (13 sets), although many unpublished examples are also found on other islands.

⁶³ The 'head' of this calyx-volute series are the capitals from the interior of the 3rd Temple of Athena Pronaia at Delphi (*c.* 365-360), although the ends of the volutes do not merge with the bottom astragal: *FD, TmpCalc*, pp.111-112, including previous refs.; *cf.* Miller, *MacedArch*, p.24. Moreover, double half-columns make one of their earliest appearances at the entrance of the Palace at Vergina, probably end 4th C. (Ginouvès, *Macedonia*, pp.86, 200, fig.72), although at the time of the West Stoa they were also becoming common in Pergamene architecture.

⁶⁴ *BCH*, 112, 1988, Chron., pp.673-674, figs.110-111; Rumscheid, I, p.305.

On Delos, belonging to this category are capitals from: the Kynthion Oikoi, exterior (c. 281-225) which are a century before the rest of the examples but which apparently are fore-runners of them;⁶⁵ the L-shaped Stoa in the Artemision, exterior (c. 150-100);⁶⁶ the stoa North East of the Artemision, exterior (c. 166-88);⁶⁷ the Palaestra of Granite, upper floor exedra (c. 150-125) (Pl.105);⁶⁸ the 'Distyle Base' in the Artemision, (c. 110);⁶⁹ the Monument to Mithridates VI in the Samothrakeion, exterior (c. 102/101);⁷⁰ the Monument of Granite, 5 sets, upper floor, interior and exterior (c. 150-100) (Pls.106-107);⁷¹ and the Stadium Quarter, House II A, 2 sets, (II – I century) (Pl.109).⁷²

On Tenos, there is the capital from the Sanctuary of Poseidon and Amphitrite (II century);⁷³ and those from Tenos Museum (3 sets unpublished that appear similar to 'Delian-type').

On Syros, there is a capital in the Museum. In form and size it is exactly the same as one of the capitals (Type 3.i) from the Monument of Granite on Delos, from where it was perhaps carried off in antiquity (Pl.108).

Of the typical features specified above, the unsculpted abacus is worth noting for it is uncommon on Asia Minor capitals,⁷⁴ although it is typical of Peloponnesian and Macedonian Ionic capitals.⁷⁵

⁶⁵ EAD XI, pp.88-89, fig 66.

⁶⁶ AHHD, II.i, p.203-205 [no. 31]. In this and the following capital from the 'Distyle Base' in the Artemision [AHHD, II.i, no.30] Vallois puts greater emphasis on influence from Ephesos and Sardis than is perhaps there; for although there are certain similarities in form and proportion with capitals from the 'Hermos and Caister valleys', Delian style probably played a greater part – thus, the unsculpted abacus, and the astragals on the otherwise plain baluster, while the low downward swing of the canalis may well have been equally influenced by the capitals attributed to the earlier Temple of Poros and the Propylaia of the Monument of the Bulls (rather than merely the capitals [C, D, G - c. 300 B.C.] from the Temple of Artemis at Sardis) - see pages 192-194 and 201-203.

⁶⁷ F. Courby, 'Le Sanctuaire d'Apollon délien', BCH, 45, 1921, pp.218-219.

⁶⁸ EAD, XXV, pp.56-58, fig.12, pl.10 (photo 78).

⁶⁹ AHHD, II.i, pp.203-205 [no. 30].

⁷⁰ EAD, XVI, p.22, fig.29.

⁷¹ EAD, XXIV, pp.88-89, pls.66-69.

⁷² A. Plassart, 'Fouilles de Délos', BCH, 40, 1916, p.238.

⁷³ Ténos, p.157, pl.58.1; 'similar in form and proportion to capitals from the Artemision on Delos.'

⁷⁴ Cf. Bingöl, p.31; Hellenistic instances of unsculpted abaci: the Bouleuterion at Miletos, Exedra D at Pergamon, 2 capitals from Ephesos, and the Apollo Temple at Aigai.

⁷⁵ Cf. Roux, Argolide, p.349; Miller, MacedArch, pp.27-28.

It is also worthwhile expanding on the baluster decoration, the general scheme of which is very simple with two, three or four rows of astragals, spaced apart at varying distances and occasionally paired, upon an otherwise plain baluster (the astragals are only beaded at the Monument of Mithridates); the scheme is thus close to that of Classical capitals from Athens.⁷⁶ It is thus quite different from contemporary baluster decoration used in the Peloponnese (usually plain balusters), Athens or Asia Minor at this time; indeed, the only known Hellenistic capitals from Asia Minor with 'Delian-type' balusters come from the N.E. Stoa in the Sanctuary of Athena at Pergamon (c. 197-159), the Bouleuterion at Miletos (c. 175-164) and the Temple of Apollo at Aigai (c. 46-30) dating to after the probable abandonment of Delos following the second Mithridatic raid in 69 B.C.;⁷⁷ the last two buildings have already been noted in connection with their use of an unsculpted abacus. This decoration comprising merely astragals is in stark contrast to that of the majority of Hellenistic Ionic capitals in Asia Minor where commonly the baluster is either given only a central balteus usually decorated with an overlapping leaf pattern,⁷⁸ or it is covered in a horizontal wreath of leaves emerging from the sculpted balteus.⁷⁹ In fact, this last treatment of the baluster occurs on two different capitals from House IIA in the Stadium Quarter, although the other forms of the capitals lead them to be classed as 'Delian-type' (Pl.109).⁸⁰ Thus, although this 'Attic' style of baluster had largely gone out of fashion elsewhere in Greece by the start of the Hellenistic period, we have seen that it especially characterises the Ionic capitals on the Cyclades during the second and first centuries B.C.

Another of the 'Delian-type' traits is the lack of a second, lower 'edge' on the volute-spirals, which is presumably a labour-saving measure. In fact it is also a general

⁷⁶ Cf. Bingöl, pp.51-52; see also pages 196-197.

⁷⁷ Cf. Bingöl, pp.80-81, pl.22 'Attic Type' (though no mention of the N.E. Stoa at Pergamon); Rumscheid, II, pls.1.1, 101.2, 114.4, 115.4.

⁷⁸ Cf. Bingöl, pp.78-80, 118, pl.21: 'Attic – Asia Minor Type'. Exemplified first at the Nereid Monument (c. 410-400), then on the Mausoleum and the Temple of Athena at Priene; a Hellenistic example is at the Temple of Zeus at Magnesia.

⁷⁹ E.g. Temple of Athena at Magnesia; cf. Bingöl, pp.81-96, 118-120, pls.23-30; Rumscheid, I, pp.305-306.

⁸⁰ A. Plassart, 'Fouilles de Délos, *BCH*, 40, 1916, p.238. It is also interesting to note that at the Monument of Granite four capitals (Group I, nos.1-3, and Group III, no.5) have astragals on their balusters which continue up to the abacus (*EAD*, XXIV, pls.29, 66.133, 67.139); this trait has been described as 'Pergamene': Rumscheid, I, p.306 + n. 370.

characteristic of Roman imperial capitals in Asia Minor;⁸¹ perhaps these latter capitals were directly influenced by island forms after the influx of the Delian population after the Mithridatic raids.

Thus, the number of capitals on the islands that adhere to this basic form allow one to assume that this was a popular one on the islands, in vogue primarily during the Second Athenian Domination, and moreover its very distinctness from contemporary capitals from other parts of Greece also lets one claim that even in this late period of Cycladic history, the architects and stonemasons still maintained to a large extent their own regional identity, not merely becoming slaves to powerful 'extra-Cycladic' fashions.

Finally, and paradoxically, one should briefly mention that it is from domestic and not monumental architecture that two of the most exquisite Ionic capitals come. For during the Second Athenian Domination, it was exactly the prosperous merchants who lived in many of the luxurious Delian houses and could afford expensive sculptures, mosaics and architectural decoration. The capitals attributed to the House of the Lake (Pls.110-111) (normal and four-sided 'diagonal' capitals with almost identical patterns) and the single 'diagonal' capital found in the House of the Diadoumenos (Pl.112) are fairly similar: the prominent features are an intermediate cushion with a decorative pattern of spirals or waves; and a highly decorative baluster, the outer halves being shaped into a 'pleated' scroll thus giving the edge of the volute-face a 'toothed' crest (even around the edges of the volutes on the 'diagonal' capitals with no balusters), while the pleated scrolls are enveloped at their bases by acanthus leaves, are bound in the centre of the baluster by a knotted cord; also acanthus leaves rise vertically up from the knot to touch the abacus; moreover, the abacus remains unsculpted while there is no edging to the volute-spirals, typical Hellenistic 'Delian-type' capital traits.⁸² These decorative details are interesting: firstly, the pleated volute is to my knowledge unique; the intermediate cushion is also unknown to me on any other capitals during the Hellenistic period; the acanthus and/or tendrils rising up to the abacus are found on a few Hellenistic capitals, and then becoming common during

⁸¹ Bingöl, p.33, pls.11-14.

⁸² House of the Lake: EAD, VIII, pp.253, 419-20 + fig.248; AHHD, II.i, pp.202-203. House of the Diadoumenos: EAD, VIII, pp.253-254, fig.121; AHHD, II.i, pp.202-203.

the Roman imperial period;⁸³ and lastly knotted cords occur on capitals that can only realistically be later than the Delian examples.⁸⁴ This combination of traditional 'Delian-type' capital traits with a more flamboyant decorative style reveals that there was at least one major architectural workshop on the Cyclades sometime in the second and first centuries; that it may well have been at the forefront of current design is a situation that one finds entirely fitting for a thriving commercial and religious centre such as Delos in the later Hellenistic period.

CONCLUSION

The Classical and Hellenistic Ionic capitals from the Cyclades that we have examined⁸⁵ reveal the diverse and changing influences that affect their forms and proportions throughout the centuries. The first of these influences is, in fact, their very own Archaic 'Cycladic-type' capital and its Naxian-Parian sub-group. Indeed, the Cycladic islands apparently play a central role, in the literal and metaphorical sense, in the development, production and distribution of the Ionic capital during the Archaic period, Asia Minor perhaps not having so large an influence over the rest of Greece as previously thought. After the early Classical 'Thesmophorion' capitals, this influential Cycladic vigour becomes somewhat dimmed during the rest of the Classical period, when Athens politically and artistically dominates the islands, with Attic capital forms becoming widely adopted; the capitals of the great Ionic temples and tombs of Asia Minor in the fourth and third centuries must also certainly have acted as models

⁸³ The following instances are shown in Rumscheid, and/or Bingöl: Temple at Messa on Lesbos (c.340-320), the Ptolemaion on Samothrace (285-246), the Temple of Apollo at Chryse in the Troad (c.150-125), a capital from Pergamon (inv. AvP VII/2; 1st C.).

⁸⁴ Pergamon, Gymnasium, Exedra B (of Diodoros Paspáros) on upper terrace, (c.69-60): Rumscheid, II, [inv.228] pl.133 – correcting Bingöl, p.62 [inv.214] – but knot is here vertical and alone; Ephesos, Basilika in State Agora, (c. 27-14 A.D.): Rumscheid, II, [inv.44.6] pl.44.4.

⁸⁵ Ionic capitals not treated include: those from the L-shaped Stoa of Sarapieion C (CE, p.54); from Agora of the Italians, Exedra no.42 (EAD, XIX, p.47, pl.13.3), and Baths' vestibule (EAD, XIX, p.78, fig.62); a capital today lying to the south of 'Building GD 42'; a 4-sided capital found within the Roman peristyle built on top of the Hypostyle Hall (EAD, II.i, p.65, fig.95; AHHD, II.i, p.203); a double half-capital with 'calyx' volutes from the same area (EAD, II.i, p.65, fig.93 [photo]; EAD, VII.i, fig.143 [sketch]). Ionic capitals were most likely used at: the Gymnasium (EAD, XXVIII, p.20); the West Stoa's 'Ionic Naiskos' (EAD, VII.i, p.114); the Propylon of the Sanctuary of the Foreign Gods, (EAD, XXXV, p.25); the Agora of the Italians, Exedra no.15 (EAD, XIX, p.43); Stadium Quarter, House II B (BCH 1916, pp.169-170); and Theatre Quarter, House III N (EAD VIII, p.245).

in certain forms and proportions for contemporary and later capitals on the Cyclades. Yet, paradoxically, with the Second Athenian Domination beginning in 166 B.C. a new 'independence' in Ionic capital design becomes prominent on Delos and the surrounding islands – such architectural vitality is no less than we have come to expect from the architects and sculptors of the Cycladic islands; in fact, certain ornamental features on these so-called 'Delian-type' capitals seem to be precursors of those found on Roman imperial capitals.

CONCLUSIONS

The aspects of Cycladic architectural constructional techniques, proportions and forms considered in the preceding pages all contribute to the overall picture of the architecture of the archipelago in the Classical and Hellenistic periods. Three main characteristics emerge: conservatism, originality, and regionalism. The essential architectural conservatism is tempered by a certain amount of significant innovation, and both combine to establish a distinct regional architecture.

This architectural regionalism and the aspect of innovation certainly conform to what we know of Cycladic architecture during the Archaic period, especially the sixth century when the skill of the marble workers was not just limited to the creation of monumental stone sculpture but also extended to the field of architecture. In the latter there was not only an unrivalled technical and decorative mastery in some of the stonework, but also the innovative use of huge marble monoliths for both door-frames and ceiling and roof beams. The use of these bulkier stone ceiling beams led directly to the adoption of a frieze in place of the dentil course in the Ionic order – the region's usual architectural style in the Archaic period. This petrification of forms (including roof tiles) together with the use of monolithic door-frames and the 'Ionic frieze' were to be extremely influential in the rest of Greek architecture, perhaps finding their greatest expression in the Periklean buildings on the Athenian Acropolis.

On the other hand, the conservative nature of Cycladic architecture is seen in its response to the influence of the Doric order, which seems to have started 'infiltrating' the islands around the middle of the sixth century. Even at this late date, when the order had taken on an established form on the mainland and in the western colonies, the Doric forms were, initially, only partially accepted into Cycladic architecture. Certain key Doric elements were combined with characteristically 'Island' architectural forms and techniques; thus, the Doric capitals were often grafted on to exceptionally slender, smooth column shafts which occasionally stood on bases, while the triglyph friezes were limited to the façade and sometimes used in conjunction with Ionic cornices. The Doric forms themselves were often simplified; thus one finds 'Cycladic-type' Doric capitals, and triglyphs without a top fascia or 'head-band'. This

'moderation' of the Doric order, which is found throughout the archipelago in the sixth century, is one of the first instances of the innate conservatism that permeates through many aspects of Cycladic society and its architecture in the Classical and Hellenistic periods, and further establishes the regional aspect of Cycladic architecture of the Archaic age.

The architecture of the Cyclades in the Classical period largely follows the historical vicissitudes of the age, and thus falls into two distinct phases: the fifth century, coinciding with the political domination of Athens under the guise of the 'Delian League', and the fourth century which coincides with the dissolution of the first League and the establishment of a second, less harsh Athenian alliance. On Delos the first monuments of the Classical period (the 'Treasures' and the 'Thesmophorion') are constructed in the usual Cycladic manner with 'Parian-type' foundations and heterogeneously skinned walls of gneiss and marble; even the Great Temple of Apollo employed certain typically Cycladic techniques and proportions despite probably being commissioned by the Athenians as the seat of the League's treasury and being of 'mainland' style in its use of a full ashlar wall structure and orthodox Doric forms. Cycladic innovative tendencies may be reflected in the use of lanterns over the two 'Ionic rooms' of the 'Thesmophorion'. The arrangement of the internal columns would suggest such a scheme, as does the building's probable function as a hestiatorion in which hearths are attested elsewhere, the lanterns here providing ventilation as well as light. However, Attic architectural forms and techniques are established with the Temple of the Athenians, dedicated probably in 417 following the purification of the island and the expulsion of the Delian inhabitants some years earlier; built of Pentelic marble, it stood as a symbol of Athenian power.

In contrast to the building activity on Delos in the Classical fifth century, stand the architectural fortunes of the other Cycladic islands on which there are no known monumental buildings in this period. Unless there is a major discrepancy in the archaeological record, this is most likely due to the drain in local resources caused by the forced membership of the Delian League to which substantial tribute in ships or money had to be paid. In the case of Paros, the terms must have been so harsh as to cause the island's wealth to come to a temporary end, as amply demonstrated by the

termination of the island's once busy architectural activity.¹ Likewise, the Athenian 'cleruchy' or garrison colony on Naxos perhaps further discouraged local displays of wealth. Delos was now the sole focus of new monumental architectural activity of the Cyclades; this was almost certainly not fortuitous.

The Cyclades recovered their independence in the years immediately after the defeat of Athens in 404 B.C., and this was undoubtedly the spur for the major resumption in the building activity on Paros in the fourth century; local wealth no longer went out of the island in tribute but was expended on civic architecture. The Parian projects included the construction of at least two large temples (the Temple of Apollo Pythios, probably amphiprostyle; and the temple at Marmara, probably peripteral), an Ionic peristylar colonnade and a small tholos (perhaps both part of a combined Hestia Sanctuary and Prytaneion), and an early Hellenistic Heroon to the Archaic poet Archilochos. All these Parian buildings are characterised by a thoughtfulness in the design and a quality in the execution of the marble working; moreover, they possess a number of traits that were also evident on the early Classical Great Temple of Apollo on Delos and even the late Archaic Temple of Artemis on Paros.² This retention of certain traits found in much earlier Cycladic buildings naturally indicates a certain amount of continuity in Parian architectural practices which is most amply demonstrated at the temple of Apollo Pythios. Here the 'triglyph problem' was solved, not by the use of full angle contraction (as was usual elsewhere in Greece), but by the contraction of the column inwards by two-thirds of the required amount and widening the corner metope by the final third – a hesitancy recalling the Great Temple of Apollo on Delos, where no angle contraction was used. However, the Parian architects were not unaffected by outside architectural influences as is shown most clearly in their rejection of the heterogeneously skinned walling technique and the adoption of full ashlar construction. Furthermore, an important, distinct local trait is displayed in their use of extremely slender orthodox Doric columns. The first three quarters of the fourth century on Delos and the other Cycladic islands, in contrast to

¹ The excellently crafted Nike in Paros Museum, early Classical in style, may perhaps have been a potent symbol of domination placed by the Athenians as an akroterion on 'Town Temple' A (c. 525) which once dominated the main harbour: cf. *AA* 1982, p.219, fig.13 + n.46.

² E.g. main walls not recessed above orthostates; sporadic lack of joint concordance; stippled surfaces; and use of moulded course above frieze. See Appendix 1.

Paros, were still relatively quiet architecturally; the most notable building was the little known 'Building GD 42' on Delos constructed by the Athenians, combining an Ionic exterior with a Doric interior (the reverse of usual practice), and including a clerestory with slit-like openings for light and ventilation. The other main construction was the 'Temple of the Dioskouroi' in the Samothrakeion where the building was constructed with heterogeneously skinned walls and given a tetrastyle *in-antis* colonnade of small slender 'Cycladic-type' columns and capitals which were spaced widely apart. This was a typically Cycladic 'diminutive' colonnade that would not have been out of place in the Archaic period.

If the Classical period begins to illustrate that the native architecture of the Cyclades has an innate conservatism and a distinct regionalism, the evidence of the more numerous monuments of the Hellenistic period confirms and strengthens this, while at the same time providing further examples of an originality in the island architecture which was allowed to flourish and which was patronised by some of the Hellenistic rulers. As in the Classical period, one can distinguish periods of architectural activity that coincide with, and are related to, the political developments of the time. Thus, in the couple of decades following the liberation of the Cyclades from Athenian control (314 B.C.) and the establishment of the Nesiotic Confederacy, there is a notable surge in architectural activity on Delos, Tenos and Naxos. The early Antigonids patronised some of these new architectural projects including the idiosyncratic Monument of the Bulls and perhaps the Dodekatheon on Delos,³ and possibly the Fountain-Exedra in the Sanctuary of Poseidon on Tenos. Other notable contemporary constructions included the Temple of Asklepios on Delos and the 'monumentalization' of the city's agora on Naxos which was surrounded on four sides by a number of stoas. Many of these monuments demonstrate apposite aspects of the nature of Cycladic architecture in this period.

For instance, the Monument of the Bulls (Fig.6), probably a dedication of Demetrios Poliorketes celebrating his naval victory off Salamis on Cyprus in 306 B.C. and built essentially to house a warship, is of a highly original design. The use of certain architectural forms (walls formed from pillars joined by a thin walling within

³ The Dodekatheon loosely copies the Temple of the Athenians, a symbol of a former power's control, in plan and style. The head of a statue found in the cella is recognised by some as that of a Hellenistic sovereign. Cf. Bruneau, CDH, pp.439, 567-568.

which are windows, and the hollow pediment over the door from the gallery into the *thalamos*) being novel in Greek architecture. Certain features speak for a Cycladic architect – foundations of granite, the absence of ceilings, the use of a lantern, and the unusually slender Doric columns,⁴ although it may well have been designed by the eclectic hand of a Macedonian architect.⁵

The Fountain-Exedra on Tenos (Fig.3) presents a more certain example of Cycladic architectural originality. The separate elements of the monument – a semi-circular exedra flanked by two projecting rectangular fountain-basins, fronted by a colonnade – are, admittedly, not new but their combination is certainly exceptional.⁶ Yet traditional Cycladic features are witnessed in other areas of the construction; indeed, both the heterogeneous wall construction and the simple cornice without mutules⁷ imply that the monument, despite perhaps being a Macedonian dedication (as suggested by the eight-pointed star sculpted on the marble ceiling coffers⁸), was very probably the design of a Cycladic architect. Indeed one can see this building as a succinct expression of Cycladic architecture – originality combined with traditional constructional techniques.

The dichotomy between orthodox mainland architectural construction and that of the islands is apparent also at the Temple of Asklepios on Delos. Although the marble monument largely adheres to the orthodox form of a Doric temple, the total absence of a krepis construction on the sides and back (where there is not even a toichobate) is a strong echo of Archaic Cycladic practice, as possibly is the lack of mutules on the sides and rear of the temple.⁹

⁴ The foundations of known Macedonian dedications are mostly of poros; omission of ceilings occurred in early Cycladic monumental architecture, *e.g.* the Temple of Demeter at Sangri on Naxos (*c.* 550), the Great Temple of Apollo pronaos and opisthodomos (very probably planned *c.* 475-450 but not executed until after 314); lanterns may have been used at the early Classical 'Thesmophorion'.

⁵ *Cf.* Ginouvès, *Macedonia*, pp.200-201 citing the unusual form *per se*, and the combination of Egyptian (lantern, hollow pediment, architectural setting of a ship) and Oriental (bull *protomes*) motifs. The use of half-columns attached to pillars are also attested at Vergina, now dated to the late fourth century.

⁶ *Ténos*, pp 159-162.

⁷ *Cf.* *AHHD*, II.ii, pp.293-304 (plain 'slabs'), 304-324 (with uncanonical mouldings).

⁸ *Ténos*, p.191, pl.19. Demetrios also had a particular devotion to Poseidon.

⁹ The omission or alteration of basic Doric forms as well as details (*e.g.* lack of annulets on capital; lack of guttae on mutules; lack of a triglyph 'headband') was a feature of late Archaic Doric architecture on the Cyclades; see Appendix 1.

Finally, it is worthwhile noting that the framing of the Naxian agora on three sides (with either a single pi-shaped stoa or an L-shaped and a straight stoa) in the early Hellenistic period, followed by its enclosure with another stoa on the remaining open side in the mid third century, is an early, if irregular-shaped, example of what was to become a characteristic of Ionian cities.¹⁰

During the period of Ptolemaic control of the Nesiotic Confederacy it was Thera, more than Delos, that reaped the benefit architecturally of their patronage owing to the stationing of the Ptolemaic garrison on that island. While Delos has no major monuments that are attributable to the Ptolemies,¹¹ much of Thera's civic and religious architecture dates from the third century onwards although extensive re-modelling during Roman times impedes study of the former period.

In the second half of the third century the Macedonian kings further patronised the Apollo sanctuary on Delos with the large Stoa of Antigonos and the Stoa of Philip V, and perhaps in the first half of the second century with the West Stoa, although of course no political *control* is necessarily implicated in these dedications.¹² Both are typically Macedonian (or at least non-Cycladic) in scale, materials and many constructional techniques and detail of forms.¹³

The general up-turn in the local Cycladic economy in the third century (especially after the middle of the century when the islands became genuinely independent) resulted in the growth of the transit trade through Delos which, in turn, strengthened that particular island's economy. These circumstances are reflected in the renovation of the harbour on Delos from around 225 B.C. onwards,¹⁴ and in the construction of significant buildings on or near the docks, most notably: the South Stoa (c. 270-230), the Stoa of Philip (c. 216-200), the Hypostyle Hall (c. 210-200) and the West Stoa (c. 175-150), the last two undoubtedly being trade related. In addition, on Paros, a marble L-shaped Stoa dates to the end of the third century, while on Tenos

¹⁰ The stoas have only been partially excavated. The L-shaped 'S.W. Stoa' may be joined with the 'N. Stoa' at an approx. 80° angle so as to form a pi-shaped stoa although there is no evidence for their unity (B. Lambrinoudakis, *Ergon* 1991, p.86, fig.132). Cf. Coulton, *Stoas*, pp.62-63, 97.

¹¹ On Delos, the Sanctuary of Agathe Tyche on the western slopes of Mt. Kynthos may have been consecrated to Arsinoe, the sister-wife of Ptolemy II. Cf. Bruneau, *CDH*, pp.533-545.

¹² Bruneau, *CDH*, pp.579-583.

¹³ See pages 205, note 58.

¹⁴ *GD*, pp.113-114.

a new building programme at the Sanctuary of Poseidon, which included the construction of an amphiprostyle Temple of Poseidon, also dates to the end of the third century or the start of the second. This economic prosperity probably led to the well-documented rise of piracy around the Cyclades which, in turn, led to many of the Cycladic towers being built for purposes of look-out and the safe-guarding of crops and people.¹⁵

With the exception of the already mentioned Macedonian dedications, these buildings are built (where one can tell) in typical Cycladic fashion. For instance, the South Stoa and the Hypostyle Hall, despite having monumental façades, have side and rear walls built of gneiss rubble; their euthynteriai are only roughly shaped and play no architectural delineating role; the Hypostyle Hall employs dove-tail clamps in its foundations and euthynteria; the South Stoa lacks a krepis even on the marble section of its side walls (both monuments have no krepis below their gneiss walls); and the South Stoa maintains the Cycladic preference for extremely slender columns with one of the highest CH/D ratios of the period.

The re-establishment of the Nesiotic Confederacy under Rhodian control around 200 B.C. (and lasting until c. 166) seems to have had little effect on the economy or architecture of the Cyclades, except possibly on Tenos which was the seat of the Confederacy. At the Sanctuary of Poseidon and Amphitrite, where all the decrees of the Confederacy were displayed, the new building programme included, in addition to the Temple of Poseidon already noted, the sanctuary's enclosure within marble walls and its 'landscaping' with a small yet notable arrangement of steps and terraces. This architectural activity dates to shortly before, and the first few decades of, the Rhodian domination, and some of it may be directly due to their patronage, thus reflecting the new chief status of the sanctuary. Furthermore, while the general scheme of terracing may owe something to Rhodian influence,¹⁶ the placement of the Poseidon Temple on the edge of a seven-stepped terrace, with steps on two adjacent sides only, is an original, if subtle, architectural concept.¹⁷

¹⁵ Reger, *Economy*, pp.44-45, 261-264. Cf. Ashton, *SiphTwrsg*, pp.26-30; R. Osborne, 'Island Towers: The Case of Thasos', *BSA*, 81, 1986, pp.174-175.

¹⁶ *Ténos*, pp.193-194. The monumental staircase and winged stoa at the Sanctuary of Athena at Lindos was added c. 208; the Temple of Asklepios at the Asklepieion on Kos (and its staircases) dates later to c. 160-150.

¹⁷ *Ténos*, pp.162-165.

The period of the Second Athenian Domination on Delos, during which the island became the centre of a trans-Mediterranean trading network and enjoyed an economic 'boom', is reflected architecturally in the level and types of construction. In addition to new 'warehouses' and commercial structures built to the south of the main port,¹⁸ there are new civic amenities (Palaestra of Granite, interiors of the Gymnasium and the Lake Palaestra are rearranged, Agora of the Italians – including baths, and possibly used for gladiatorial combats¹⁹), sanctuaries dedicated to 'foreign' deities (the Sanctuary of the Syrian Gods, the Synagogue, the Temple of Isis) and perhaps even private 'club-houses' for ethnic groups (the Monument of Granite following the example of the earlier Complex of the Poseidoniasts, and again the Agora of the Italians). The majority of the houses on Delos also date to this period. Architecturally, the effect of this economic and demographic explosion, apart from levels of activity, was mainly limited to the much greater use of rough rubble in both foundations and walls necessitated by the need for rapid construction.

The frenetic economic activity of Delos after the mid second century had repercussions on at least one of the other islands; on Tenos, where groups of 'Romans' were established, more building activity was undertaken in the Sanctuary of Poseidon including the construction of Stoa L – at 170 m. in length one of the longest stoas in Greece; and here again the foundation and wall construction was completely Cycladic. However, the economic well-being of other Cycladic islands is uncertain and the poverty of the archaeological record at this time perhaps indicates their separation from the trans-Mediterranean trade centred on Delos. The influx of foreign traders and goods may well have swamped the local wealth-generating inter-island economies.²⁰

As has emerged throughout this thesis the main characteristics of Cycladic architecture are conservatism and a certain degree of innovation. The retention of traditional methods and forms is a distinctive trait and it is especially apparent in certain constructional techniques. Native Cycladic foundations whether of fairly loosely fitting rows of granite or gneiss blocks, or of more solid 'Parian-type',

¹⁸ E.g. *Magasin des Colonnes*, *Magasin à la Baignoire*: cf. Rauh, *Sacred Bonds*, pp.85-89; the Agora of the Compitaliastes was also laid out: cf. *ibid.*, pp.92-102.

¹⁹ Cf. Rauh, *Sacred Bonds*, pp.291-338.

²⁰ Cf. Reger, *Economy*, pp.270-271.

remained essentially the same throughout the Classical and Hellenistic periods despite direct exposure to the Athenian and Macedonian techniques employing a tight 'interlocking grid' of individual stones. The change to rough rubble foundations on Delos in the mid second century was necessitated by the need for rapid construction following the island becoming a 'free port' and the ensuing population 'explosion'. The Cycladic use of *euthynteria* also remained slightly different from that used elsewhere in Greece; the gneiss commonly used provided a level platform but the visible parts were never accurately cut so as to form the usual well-defined edge around the building. However, it is in wall construction that one best sees the traditionalism of Cycladic constructional techniques, with rubble and heterogeneously skinned walling, both products of the available local materials, remaining major walling methods throughout the Classical and Hellenistic periods for all but the most prestigious monuments. In addition, the use of stacked jointing in a distinct and decorative manner was a characteristic feature throughout the epochs. We have also noted that the Archaic trait of not using orthostates was maintained at the Great Temple of Apollo on Delos, even though the impression of orthostates was given by a difference in surface patterning; moreover, orthostates (when used) were often flush with the main wall, and not set slightly forward as usual elsewhere. Lack of joint concordance was another Archaic trait often maintained in later periods, as was the sporadic use of dove-tail clamps, a technique not specifically examined in the chapters above.²¹

Traditional architectural forms found in the Classical and Hellenistic periods on the Cyclades include the diminutive 'Cycladic-type' Doric columns with their exceptionally slender, often smooth shafts and their wide interaxial spacings. The general tendency for not sculpting any 'ears' on the half-glyphs of triglyphs would also seem to be a conservative trait. The Ionic capitals of the Cyclades are a blend of styles, yet during the fifth and early fourth centuries one can still detect certain forms such as small, widely spaced volutes and unbordered *canales* that were typical traits of Archaic Cycladic capitals. Other traditional architectural forms, not discussed in the chapters above, include the use of 'simple' slab-like cornices and Doric cornices without mutules.²²

²¹ Cf. *AHHD*, II.ii, pp.550-562.

²² Cf. *AHHD*, II.i, pp.293-304 (plain 'slabs'), 304-324 (with uncanonical mouldings).

Of course, these numerous traits speak for local architects and building-groups. And this is overwhelmingly confirmed by the accounts of the Apollo temple on Delos. They name almost a hundred contractors and of the twenty-eight whose origins are known, twenty-one are from the Cyclades (including one from Karystos on near-by Euboia).²³

The pre-eminence of the Doric order in Classical and Hellenistic monumental architecture is especially notable, given that the Cycladic islanders were of Ionian stock and that in the Archaic period the Ionic order was by far the most common architectural style. Of the Cycladic buildings treated in this study (as listed in the catalogue) whose order is known, the ratio of Doric to Ionic in the Classical period is 5:1 and in the Hellenistic period is 4:1. Not only are many of these Doric monuments stoas, and so follow the general Greek trend in stoa architecture of the outer order being Doric,²⁴ but also many are temples. In both the Classical and Hellenistic periods, the ratios of known Doric temples to Ionic temples are virtually the same as those quoted above for all monumental buildings. Ionic is often reserved for the interiors of buildings and, especially in the years following 166, for small distyle *in-antis* honorific monuments. In this overwhelming preference for the Doric order, Cycladic architecture – in temples at least – is distinct from Ionian (although less so from Pergamene), and is consistent with Attic and Peloponnesian architecture. While in a few cases this reflects the origins of the donors (e.g. Temple of the Athenians), this preference is perhaps another example of the 'conservatism' inherent in Cycladic architecture, Ionic being considered too ornate for temples. Similarly, the Corinthian order is poorly represented on the Cyclades, including Delos where there are only four different capitals known to me; the most significant belongs to an unpublished small monopteros, the members of which are collected in the area of the theatre.²⁵ All are probably of a late Hellenistic date.

Yet the Cycladic architecture of the Classical and Hellenistic periods should not be pictured as either stubbornly clinging on to traditional practices and forms,

²³ Reger, *Economy*, p.58.

²⁴ Coulton, *Stoas*, p.99.

²⁵ A brief reference to this monopteros is given by Roux in *Samothrace*, VII, pp.146-147. Another attributed capital is to the 'Midas Exedra' in the Sanctuary of the Foreign Gods, c. 113-105 (*EAD*, XXXV, pp.51-52, figs.37-38, 41, pl.16.5); other capitals lie to the south-west of 'Building GD 42', and in the 'magasins' to the south of the main port.

without regard to the new, or no longer possessing any spark of creativity that characterised the Archaic period. The extreme slenderness given to otherwise orthodox Doric columns on the Cyclades, undoubtedly with its origins in the Archaic 'Cycladic-type' columns, is a very marked and fairly constant characteristic of the islands. These columns – the most slender, or among the most slender, in the Greek world – are certainly another element in the distinct regionality of Cycladic architecture, and would seem to have influenced the slender column proportions of Periklean architecture (and are yet another Cycladic feature employed in the famous and highly influential Athenian monuments). In the area of architectural forms, the Cyclades still displayed some of their typically Archaic originality. On triglyphs the characteristic downwards sloping glyph-ceiling may have originated on the islands, while the Ionic capitals of the 'Thesmophorion' on Delos are the earliest known capitals to possess an upwards curving upper canal border and so they stand at the head of a very influential series of capitals which include, most notably, those of the temple of Apollo at Bassai. The Ionic corner capital from the Peristyle Building on Paros brings together, for the first time, certain elements that are later characteristic of a group of Peloponnesian capitals – perhaps the Parian architect and sculptor Skopas was responsible for the transmission of parts of Cycladic capital design to the Peloponnese when he was active in Tegea. Later on, the Ionic capitals which are found on Delos after the middle of the second century are of a type that is distinct from other contemporary capitals in Greece, with their combination of certain old-fashioned forms (astragals on a plain baluster) with those that were, until then, uncommon (lack of a lower edge on the volutes). Finally, the two sets of Delian capitals from the House of the Diadoumenos and the House of the Lake are certainly indicative of originality: the pleated volute edges appear to be unique, while the knotted cords binding the acanthus leaves on the balusters are the earliest known examples of a form that later became common in Roman Asia Minor.

Originality in concept even if employing traditional forms, can also be seen in a number of building-types on the Cyclades. Thus, as we have already noted, examples are the Fountain-Exedra and the second Temple of Poseidon in the Sanctuary of Poseidon and Amphitrite on Tenos, and possibly the Monument of the Bulls on Delos. The use of lanterns, a prominent characteristic of Delian architecture, may have in fact originated on the island, being first used perhaps at the early Classical 'Thesmophorion'. The use on the Cyclades, in particular Delos, of rectangular or

square pillars, in both public and domestic architecture, is an equally notable characteristic, wherever its origin lies.²⁶ Both pillars and lanterns, if in fact not Cycladic conceptions, are certainly significant and repeated elements in their architecture, and add to the architectural individuality of the islands.

The architecture of the Cyclades of course follows 'main-stream' developments and forms in Doric and Ionic architecture in the Classical and Hellenistic periods, as well as being receptive to the influences and new directions of the other architectural 'schools' and regions – most notably those of sixth and fifth-century Attica and Hellenistic Ionia. The Macedonian monuments on Delos must also have been influential, with similar architectural proportions and details appearing at the late third-century Parian stoa and the contemporary Hypostyle Hall on Delos. The increasing Macedonian influence is most strongly felt, however, on Thasos in the northern Aegean; here, in the Archaic and Classical periods many architectural techniques and forms closely follow the Cycladic practice but from the end of the fourth century the presence of its politically and artistically powerful neighbour is keenly felt in the few monuments of the Hellenistic period.

The distinctive local architecture of the Cyclades conforms to the strong regionality of the archipelago itself. Bound geographically by the sea, the area has a marked inter-island community and economy; history details the often fierce resistance to outside control. That the Delians were highly protective of their own identity and were also a conservative society, is shown by their retention of traditional social divisions and political institutions, a characteristic that was likely to have been shared with the other islands.²⁷ These social and political traditions are certainly mirrored in the basic architectural conservatism of the Cyclades and confer a strong regional identity.

The distinguishing features of Cycladic architecture are, however, too diverse and chronologically sporadic to be seen as a 'school' (although elements of fourth-

²⁶ Attica is a possible source for these '*columnae atticae*' (Pliny, *Natural History*, XXXVI, 23, 56.), but pillars may have been an early local trait: e.g. interior of Building Δ on Delos (6thC.). Cf. AHHD, II.i, pp.78-81; Coulton, *Stoas*, pp.129-130 with references, to which add the alternation of pillars with columns at the late 4th C. stoa at Palaionpolis on Andros (N. M. Kontoleon, *Chronika*, AE, 1964, p.3).

²⁷ They even had to marry among themselves, and gave their children names that recalled their myths and sacred rites. Cf. C. Vial, *Délos indépendante (314-167 avant J.-C.): Étude d'une communauté civique et de ses institutions*, BCH, suppl. 10, (Paris, 1984), pp.87-88, 385-390.

century Parian architecture speak for such), but like Delian sculpture in the Hellenistic period, which neither belongs to a school nor is part of the Hellenistic 'koine',²⁸ Cycladic architecture is a local craft with local preferences for certain materials, building-types, practices, proportions and forms.

The aspects of Cycladic architecture which have been treated in the above chapters were necessarily select, but have gone some way to establishing the existence, and defining the style, of a distinct regional architecture on the Cyclades in the Classical and Hellenistic periods.

²⁸ Cf. J. Marcadé, Au Musée de Délos. Étude de la sculpture hellénistique en ronde bosse découverte dans l'île, (Paris, 1969), pp.249-259.

~ APPENDICES ~

~ APPENDIX 1 ~

CONSTRUCTIONAL TECHNIQUES TYPICAL IN ARCHAIC CYCLADIC ARCHITECTURE

(with reference to their use in later periods)

Listed here are the most notable typical techniques of Cycladic architecture; they first come to prominence in the sixth century and have their greatest vogue from then until the early Classical period, although some features linger into the fourth century especially on Paros.

• **Absence of step construction, or use of a 'reduced' step construction**

One of the most visible constructional traits in Archaic and Classical Cycladic architecture is the lack of a full, encircling krepis both on *in-antis* and peripteral buildings – usually temples and treasuries. Often there is just a single step on the façade – *i.e.* the stylobate. When more steps are present on the facade they sometimes continue around the side walls (and back wall if not an amphiprostyle building) in a 'reduced', vestigial manner, their projection being so minimal (*c.* 2 - 6 cms) that they are merely decorative elements enhancing the large expanse of wall. There are many notable examples of both treatments:

Single front step:

Naxos, Iria, 'Dionysos Temple', *c.* 580-550
Naxos, Sangri, Demeter Temple, *c.* 550
Thasos, Aliko, North Building, stage I, mid 6th C.
Delos, Stoa of the Naxians, late 6th C.
Thasos, Aliko, South Building, *c.* 500
Delos, Heraion B, *c.* 500
Kea, Karthaia, T. of Athena, W. + N. sides, *c.* 500-480
Delos, Treasuries I-III

AA, 1987, p.588, fig.46
PAE, 1977, p.384, pl.H
ET, XI, p.16, fig.17
EAD, XXXII, p.99, plans 20, 23
ET, XI, p.53, figs.57, 60
EAD, XI, fig.154, pls.4-5
Østby, OpAth, pp.191-194, figs.2, 6-7
AHHD, II.i, p.38.

Vestigial side/back steps:

Paros, 'Town Temple A', *c.* 525
Delphi, Athenian Treasury, *c.* 490
Paros, Temple of Artemis, *c.* 490-480
Paros, Archilocheion, *c.* 325-300
Delos, South Stoa, *c.* 270-230
Delos, Artemision, Temple D, *c.* 179-167?

AA, 1982, p.200, fig.15
FD, TrAth, pp.11-14, pls.3-6
Schuller, Artemis-Tempel, p.40, pls.97-102
AA, 1982, p.285, figs.3, 9
AHHD, II.i, p.38
AHHD, II.i, p.36

One can also note the Temple of the Athenians on Delos, *c.* 425-417, whose side steps, despite being fairly broad (*c.* 0.299 m.), project less than those on the ends (EAD, XII, pp.111-

112, fig.122).

It should also be noted that the use of vestigial steps occurs at the Megarian Treasury at Olympia, c. 500, which was probably either influenced by Cycladic examples or was an independent, coincidental innovation; this was shortly followed by the Sikyonian Treasury at Olympia, c. 480-475, its use of vestigial steps probably being directly inspired by the neighbouring Megarian Treasury.

Cf. Schuller, JdI, pp.353, 389 and *passim*; Schuller, Artemis-Tempel, p.89 and *passim*; AHHD, II.i, pp.29-31.

- **'Heterogeneously-skinned' walls**

See pages 79 - 84.

- **Orthostates sometimes lacking on exterior walls**

The lack of orthostates on walls (of gneiss, granite or marble) is a constructional characteristic of many Archaic Cycladic buildings; even with more monumental walls of marble the old habits continued to a certain extent, as the following instances show.

Naxos, Sangri, Temple of Demeter, c.550

Praktika, 1977, p.383, pl.H

Delos, 'Building GD 68', late 6th C.

AHHD, II.i, p.61

Thasos, Aliko, South Bldg, s. wall, c.500

ET, IX, p.63, fig.78

Delos, Heraion B, c.500

EAD, XI, pp.185-186, fig.153

[Delphi, Athenian Treasury - antae only, c. 490

FD, TrAth, p.17, pl.3]

Kea, Karthaia, Temple of Athena, c. 500-480

Østby, OpAth, p.200, figs.11-13

Delos, Great Temple of Apollo, c.475-450

EAD, XII, p.62, pl.10.

- **Exterior walls not recessed above orthostates**

In canonical Doric buildings the main exterior wall is usually set back a few centimetres from the outer face of the orthostates, a relic of the architecture's origins – a mud-brick wall upon a stone socle; however, this feature is uncommon in early Cycladic architecture which made little use of mud-brick preferring the readily-available and easily-worked gneiss, and indeed marble. The most easily appreciated examples of this lack of recess are on marble walls, which as one can see from the following list of major Cycladic monuments, continued to be oblivious to mainland influence up to the end of the fourth century.

Thasos, Alikí, Nth. Bldg., stage I, mid 6th C.	<u>ET</u> , IX, pp.18-22, figs.19, 24-25
Delos, Letoon, c. 500	<u>EAD</u> , XXIV, pp.38-40, pls.5-6, 20
Thasos, Alikí, South Bldg, north wall, c.500	<u>ET</u> , IX, p.65, fig.58, 81
Delos, 'Monument of Hexagons' c. 500	<u>EAD</u> , XXXII, p.21, plans 8-10, 15
Paros, Artemis Temple, c.490-480	Schuller, <u>Artemis-Tempel</u> , pp.49-50
Paros, Temple of Apollo Pythios, c.400-350	<u>AA</u> , 1982, pp.250-251, fig.7
Paros, Tholos, c.350-300	<u>AA</u> , 1972, p.422
Paros, Archilocheion, c.325-300	Schuller, <u>Artemis-Tempel</u> , p.119; <u>AA</u> , 1982, p.274, fig.3.

• **Absence of joint concordance**

The established method of wall construction from gneiss and granite during the Archaic period did not entertain the use of stone blocks with the same length or indeed of exactly the same height – the exterior walls like many interior walls may have been plastered over (see page 115). This economical method was also applied to early marble buildings, although the height of each particular stone course was usually constant even if each course differed in height from the others. These marble walls were not usually plastered over and sometimes received decorative stippling (see below). This lack of joint concordance played a notable role in marble wall construction in Cycladic buildings from the sixth century to the end of the fourth century, and occurred even on large, prestigious temples. Some significant occurrences include:

Naxos, Sangri, Temple of Demeter, c.550	walls	<u>PAE</u> , 1976, p.302
Paros, 'Town Temple' A, c.530-525	walls	<u>AA</u> 1982, p.224
Delphi, Siphnian Treasury, c.525	walls	<u>FD</u> , <u>TrSiph</u> , pp.84-116 <i>passim</i>
Delos, Heraion B, c. 500	stylobate, walls	<u>EAD</u> , XI, pp.186-188, fig.153
Kea, Karthaia, Temple of Athena, c.500-480	krepis, walls	Østby, <u>OpAth</u> , p.200, figs.2, 11
Paros, Temple of Artemis, c.490-480	walls	Schuller, <u>Artemis-Tempel</u> , pp.18-19
Delos, Great Temple of Apollo, c.475-450	walls	<u>EAD</u> , XII, pp.63-64
Paros, Ionic Peristyle, c.400-350	walls	<u>AA</u> , 1982, p.625
Paros, Temple at Marmara, c. 400-350	steps	<u>AA</u> , 1982, p.267
Paros, Archilocheion, c. 325-300	steps, walls	<u>AA</u> , 1982, p.283

Joint concordance may also have been absent at:

Paros, Temple of Apollo Pythios, c. 400-350	walls	<u>AA</u> , 1982, pp.245-246.
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Joint concordance is almost but not quite obtained on these Cycladic monuments:

Delphi, Athenian Treasury, c. 490	walls	<u>FD</u> , <u>TrAth</u> , p.50, pls.3-6
Paros, Tholos, c. 350-300	walls	<u>AA</u> , 1982, p.119

- **Excellent, refined quality of marble stonemasonry**

Cycladic stonemasons were able to practise their highly developed skills in the cutting and joining of marble blocks in the construction not just of first-rate, prestigious monuments, such as 'Town Temple' A on Paros, but even on 'provincial' temples such as the Temple of Apollo at Koressia on Kea. Apart from the close jointing obtained by anathyrosis on horizontal as well as vertical marble surfaces, one can also mention:

- unusual anta construction, using L-shaped blocks to prevent vertical joints on anta surface:

Naxos, Apollo Temple, c. 530-525	<u>AA</u> , 1982, pp.162-163, fig.4
Naxos, Building at Kaminiaka, late archaic	<u>AA</u> , 1982, pp.165, fig.8
Delos, Heraion B, c. 500	Schuller, <u>JdI</u> , pp.342, fig.20
Paros, Artemis Temple, c. 490-480 (also complex jointing system involving mortise and tenons)	Schuller, <u>Artemis-Tempel</u> , p.54, fig.21

- elaborate anta capital, on an otherwise third-rate temple with rough rubble wall construction:

Kea, Koressia, Temple of Apollo, c. 500	Schuller, <u>JdI</u> , pp.364-367, figs.32-33
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- **Deliberate stippling of external wall surfaces**

This originally served the purpose of disguising the usual absence of joint concordance on the walls; the earliest examples are given quite a rough stippling although the façade is often given a smooth finish by way of contrast, along with certain wall-connected architectural elements, such as antae and wall architraves. Later occurrences are usually given a finer stipple. Significant Archaic examples of stippled walls come from both Ionic and Doric buildings:

Thasos, Alikí, North Building, mid 6th C.	finely stippled steps <u>ET</u> , IX, pp.33-34, fig.40
Naxos, Sangri, Demeter Temple, c.550	roughly stippled side/back walls Schuller, <u>Artemis-Tempel</u> , p.98, fig.4;p.105; earlier refs: p.99, n.312
Paros, 'Town Temple' A, c.525	finely stippled steps and walls <u>AA</u> , 1982, pp.203, 224
Paros, Temple of Artemis, c.490-480	finely stippled steps, side/back walls Schuller, <u>Artemis-Tempel</u> , p.105, fig.32
Delos, Heraion B, c. 500	roughly stippled side/back walls Schuller, <u>JdI</u> , p.342, fig.20; Schuller, <u>Artemis-Tempel</u> , p.105, fig.44

A survival of this feature can perhaps be seen in the following Cycladic cases from the Classical Period:

Delos, Great Tmp of Apollo, c.475-450	stippled first three wall courses (to give effect of a single orthostate course) <u>EAD</u> , XII, pp.63-64
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Paros, Apollo Pythios Tmp, c.400-350 stippled step panels AA, 1982, p.253, fig.8
 See also T. E. Kalpaxis, Hemiteles, (Mainz am Rhein, 1986).

• **Use of thin plaster to cover interior walls**

See page 115.

• **Use of 'Cycladic-type' dove-tail clamps**

The characteristic feature of this type of clamp on the Cyclades is that the cavity narrows strongly inwards at the waist. These specifically 'Cycladic-type' clamps are prevalent in all Archaic buildings on the islands: Gruben, MüJb, p.19; Artemis-Tempel, p.73, pl.74. The dove-tail clamp continued to a popular form of clamp on the Cyclades in the Classical and Hellenistic periods, being used alongside the other types of clamp ('Double-T' and Pi-shaped): cf. AHHD, II.ii, pp.550-562.

• **Hollowing-out of the back of certain architectural members to reduce weight**

Again, this is another constructional feature that is not solely found on the Cyclades, but it does occur on island buildings with unusual frequency, perhaps due to the stone-workers' habit of lightening the stone blocks for land and sea transport. Some examples:

Delphi, Col./ Naxian Sphinx, c.570	column drums	<u>FD, Colonne</u> , p.8, pl.7
Paros, 'Town Temple' A, c.525	orthostates	<u>AA</u> , 1982, pp.203, 206, fig.8.
Naxos, Temple of Apollo, c.525	door-posts, lintel	<u>AA</u> ,1968, p.708, fig.18.
Paros, Parikia, Doric bldg., c.520-480	interior architrave	Schuller, <u>Artemis-Tempel</u> , pp.92-94, fig.38
Delphi, Athenian Treasury, c. 490	architraves	<u>FD, TrAth</u> , p.34, fig.10.
Paros, Artemis Temple, c.490-480	orthostates, triglyphs	Schuller, <u>Artemis-Tempel</u> , pp.17, 26, 104, pls.17, 31.

Cf. Schuller, Artemis-Tempel, pp.88, 104-106 and *passim*.

• **Monolithic door-frame:**

Marble monolithic door-frames not only succinctly represent the desire of Cycladic builders to work in stone wherever possible, but also aptly testify to the originality, daring and skill of the Cycladic architect and stonemason: the huge, solitary doorway that stands over the

ruins of the Archaic Temple of Apollo at Naxos, composed of four monolithic beams each six metres in length, conveys the colossalness of particular door-frames, while the method of hinging the door panel to the post reveals the islanders' ingenious technical mastery (see below). Essentially, the monumental, Cycladic door-frame was composed of substantial, stone beams – nearly always monolithic – thus forming a kind of independent architectural motif; this contrasts with the door-frame elsewhere in Greece which consisted simply of wooden sheathing around the ends of the door wall.

The earliest examples of monolithic door-frames come from Ionic buildings, the posts often possessing fasciae and Ionic mouldings, the lintel capped by a decorative sill (the *hyperthyron*) which is supported by a pair of scrolled bracket, or consoles. Contrary to what one would thus perhaps expect, the origin of this door type may not have been in Asia Minor for, in fact, there are no known examples of this type of door-frame before the sixth century by which time the form was fully fledged in the Cyclades. Examples are known from:

References are the latest main treatments:

Naxos: Iria, Dionysos? Temple, c. 580-550	<u>AA</u> , 1987, pp.558-591, 595, figs.30-32.
Temple of Demeter at Sangri, c. 550	<u>AA</u> , 1982, p.194-195, figs 33-34.
Apollo Temple on Palati, c. 525	Büsing-Kolbe, 'Türen', pp.90-91.
Paros: 'Town Temple A', c. 525	<u>AA</u> , 1982, pp.204-205, 226-227, figs. 6-9, 14, 16.
Temple B, c. 530-520	<u>AA</u> , 1982, pp.174-177, figs.18-20.
? ['Cult Building C', late Archaic	<u>AA</u> , 1982, pp.179-183, figs.21, 23].
Delos: Naxian Oikos, west door, c.575	<u>EAD</u> , 33, pp.57-60, pls.50-51.
Naxian Oikos, east door, c. 546	<u>EAD</u> , 33, pp.95-98, pls.68-69.
Delphi: Knidian Treasury, c. 550	Büsing-Kolbe, 'Türen', pp.88-89.
Siphnian Treasury, c. 530-525	<u>FD</u> , <u>TrSiph</u> , pp.121-137, figs.93-94.
Thasos: Herakleion, Lesche, c. 500-480	Büsing-Kolbe, 'Türen', pp.98-99, fig.12.
Herakleion, Ionic temple, c. 500-460	Büsing-Kolbe, 'Türen', pp.96-98, figs.10-11.
-- [door-frame archaizing 2nd C.?	Roux, <u>Thasiaca</u> , pp.203-205].
Thermaï (Thassalonike): temple, late Archaic	Büsing-Kolbe, 'Türen', pp.103-104, fig.17
-- the town lay in the sphere of influence of Thasos and her mainland colony of Neapolis (Kavalla), and this example may be the most distant reach of the monolithic door-frame.	

In Doric buildings, the monolithic door-frame starts – devoid of the *hyperthyron* and consoles, and the posts being either undecorated or only given fasciae – to appear at the end of the sixth century:

Delos: Heraion B, c. 500	<u>EAD</u> , XI, p.204, figs.154-156.
? [Paros: Artemis Temple, c. 490-480	Schuller, <u>Artemis-Tempel</u> , p.23, pl.29].
Thasos: Alikî, South Building, c. 500	<u>ET</u> , IX, pp.65, figs.59-60, 85-87.

In the Classical period this type of door-frame continued to be used, as one notes from the few pieces of thresholds, posts and lintels that are extant on certain islands:

Paros: Building D, late Classical	<u>AA</u> , 1972, p.374.
Building E, c. 450-400	<u>AA</u> , 1972, p.375.
Tholos, c. 350-300	<u>AA</u> , 1982, p.663.
Delos: Treasury I, c. 480-450	<u>AHHD</u> , II.ii, p.445.
? [Treasury II. c. 480-450	Schuller, <u>JdI</u> , p.351, fig.25].
? [Temple of the Athenians, c. 425-417	<u>EAD</u> , XII, pp.173-185].
? [Great Temple of Apollo, c. 475-450	<u>EAD</u> , XII, p.228].

The monolithic-framed door, if not its associated hinge, also exerted its attractive influence on monuments on the mainland and in the eastern Aegean; the most notable examples being:

Athens, Erechtheion, North porch, c. 421-405	Büsing-Kolbe, 'Türen', pp.103-104, figs.17-19.
Athens, Temple of Athena Nike, c. 427-424	A. K. Orlandos, 'Nouvelles observations sur la construction du Temple d'Athéna Niké', <u>BCH</u> , 71-72, 1947-48, pp.12-16, fig.9, pl.1.

- although some believe that the central doorway of the Nike Temple was entirely open, it seems likely that there was a central raised threshold which may have had the sockets for a grille or a door.

Kos, Charmyleion, end 4th C.	Büsing-Kolbe, 'Türen', pp.114-115.
Xanthos, Nereid Monument, c. 410-390	Büsing-Kolbe, 'Türen', pp.112-114.
Didyma, Temple of Apollo, 313 <i>onwards</i>	<u>Didyma</u> , I, p.48 and <i>passim</i> , pls.94-98.

- the main, central doorway into the sacred chamber, framed by monolithic posts around 14 m. long and weighing 70 tonnes, never received any door panels.

For general descriptions and analysis of these types of doors, cf. Büsing-Kolbe, 'Türen', pp.82-142 (Ionic doors), pp.142-174 (Doric doors); Gruben, MüJb, p.22; AA, 1982, pp.174-195; Schuller, Artemis-Tempel, p.23.

• Continuous door-hinge

Apart from the usual 'post and socket' method of door-hinging (e.g. on Delos, cf. AHHD, II.ii, pp.437-450) a more complex technique was devised by Cycladic architects, and was specifically used for the monolithic door frames that are so much a feature of Cycladic door construction: a continuous hinge ran from the top to the bottom of the door, and consisted of a series of interlocking, wooden or metal cylinders which were attached by projecting pegs alternately to the door-post and the door-panel. The door-post had on its inner edge a quarter-circular groove with a chain of slots in it, into which half the tubular hinge-pegs were inserted and wedged tightly; the remaining half of the hinge-pegs being nailed or

dowelled onto the door panel. This continuous hinge gave greater strength and security to the doors than did the usual system. The distinctive hinge grooves with the peg holes have been found on Naxos, Paros, Thasos and Delphi; all are of Archaic date with the exception of that attributed to Building E on Paros which dates from the Classical period. The two great Archaic temples of Naxos and Paros do not have any such cuttings upon their door posts, but they were both unfinished buildings. It is likely that the doors would have been put on towards the end of construction work so that they would not be damaged, and the hinge grooves would probably have been chiselled out at that time.

The known marble posts with the continuous hinge are:

Naxos: Sangri, Temple of Demeter	<u>PAE</u> , 1977, pp.385-386, pl.201.
Naxos: Iria, Temple of Dionysos	<u>AA</u> , 1982, p.167, fig.9.
Paros: post attributed to Building E	<u>AA</u> , 1972, pp.375-377 (fig.34 is an erroneous reconstruction).
Paros: fragment of post in Ekatontapyliani Church (KA 207)	<u>AA</u> , 1982, p.186.
Thasos: fragment of post in museum	Büsing-Kolbe, 'Türen', pp.99.
[Delos: Naxian Oikos, East Door – cutting for lowest cylinder of hinge	<u>EAD</u> , XXXIII, pp.95-98.
[Delphi: Siphnian Treasury – cutting for lowest cylinder of hinge	<u>FD, TrSiph</u> , pp.121-137, fig.85
<i>In general, cf. <u>AA</u>, 1982, pp.193-195, figs.33-34.</i>	

• Use of Ionic forms on Doric buildings

In the Archaic period on the Cyclades one notes that on many Doric buildings – the earliest known being the Minoe Fountain and Treasury V on Delos (c. 550-525) – there are certain Ionic elements; the relatively recent introduction of the Doric architectural order into the largely Ionic-peopled archipelago would account for the hesitancies and amalgamations found in the newly-adopted Doric architecture. Apart from unusually slender columns which may be derived from Ionic architecture (see page 128) other notable instances of Ionicisms in 'Cycladic-Doric' architecture include:

Delos, Heraion B, c. 500	no anta thickening Ionic cornice kyma reversa on top edge of tympanum Schuller, <u>JdI</u> , pp.342-346, figs.20-21; Schuller, <u>Artemis-Tempel</u> , p.97-99, figs.31, 43-44.
Kea, Koressia, Apollo Tmp, c. 500-480	anta capital with kyma reversa, leaf-painted moulding Schuller, <u>JdI</u> , pp.364-367, figs.32-33.
Kea, Karthaia, Apollo Tmp, c. 500-480	kyma reversa moulded column plinths Schuller, <u>JdI</u> , p.370, fig.35.

Delphi, Athenian Treasury, c. 490	anta capital with beaded astragal crowning abacus anta capital with beaded astragal below hawksbeak <u>FD, TrAth</u> , p.18, pl.16.
Paros, Artemis Temple, c. 490-480	anta capital with beaded astragal below hawksbeak Schuller, <u>Artemis-Tempel</u> , p.16, 71-72, fig.31
Delos, Treasuries I-IV, 480-450	ionic cornices

~ APPENDIX 2 ~

THE EFFECTS OF COLUMN HEIGHT AND LOWER COLUMN DIAMETER UPON COLUMN SLENDERNESS

Appended here are two supplementary graphs:

Graph A1 shows the column slenderness (CH/D) of monuments plotted against their lower column diameter (D).

Graph A2 shows the column slenderness (CH/D) of monuments plotted against their column height (CH).

Both are an investigation into whether the slenderness of a column is affected in any way by the actual height of the column or its lower diameter.

For the symbols and monument identification numbers used on the Graphs, refer to the Legend in Volume II, p.31.

Graph A1: Column slenderness against lower column diameter (CH/D against D)

The pronounced inclination in the plotted values is striking and immediately suggests that the greater the diameter of a column, the less slender that column is likely to be. However, a closer examination of the results shows that this interpretation has to be modified and qualified.

It is noticeable that there are two main groups of plotted figures approximately divided either side of a lower column diameter of 1.10 m.; the group with diameters between 0.50 m - 1.10 pertains to what we may conveniently term here 'small-scale' buildings, while the group with diameters over 1.10 m. pertains to 'large-scale' buildings. The first *caveat* against the interpretation that smaller scale means more slender columns is that, in general, there are far fewer 'large-scale' buildings than 'small-scale' buildings, so one does not possess a representative sample; the second and related *caveat* is that there are only a few 'large-scale' buildings constructed after the fourth century during periods of increasing column slenderness (see Graph 1 in Volume II), so again altering the balance of the picture.

If one looks, however, merely at the smaller-scale buildings (*i.e.* with lower column diameters between 0.50 - 1.10 m.) it is hard not to admit that there is still an incline to the plotted values. One can infer from the figures that for every increase in 5 cms. of lower column diameter there is an increase in the CH/D proportion of 0.25 diameters; however, it

would be rash to believe that this was a 'rule' employed by ancient Greek architects for the following reason: the 'small-scale' group is composed of a wide chronological and geographical spread of buildings, and that if one were to look at the group century by century, the incline in the plot of values would not be so definite.

However, within a tightly defined chronological and regional group of monuments there is sometimes the suggestion of a deliberate 'slenderness' rule being in effect. For instance, the Periklean buildings in Attica (#44 - #49), dating to the second half of the fifth century, have similar CH/D ratios which increase slightly (from *c.* 5.5 - *c.* 5.75 diameters) in conjunction with the size of the lower column diameter (*c.* 0.70 m. - *c.* 2.00 m.). The relatively small intercolumnar spaces at small colonnades may have led the architects to widen them for aesthetic and practical reasons (for example, ease of access).

It is also important to note that the lower column diameter was not an immovable module in the design of a building and was dependent to a great extent on the financial and topographical limits imposed on the building's size. If, for instance, a large diameter is imposed and relatively slender columns are desired, the building would become extremely tall; to counteract this it would have to be given greater width (perhaps not possible in an enclosed environment) with the resulting problem that the interaxials would be limited by the span of the stone architraves which could only be of a certain length and mass before being liable to crack their own weight. Thus it would seem that there was also a general physical limitation to the use of slender columns in large-scale buildings.

Graph A2: Column slenderness against column height (CH/D against CH)

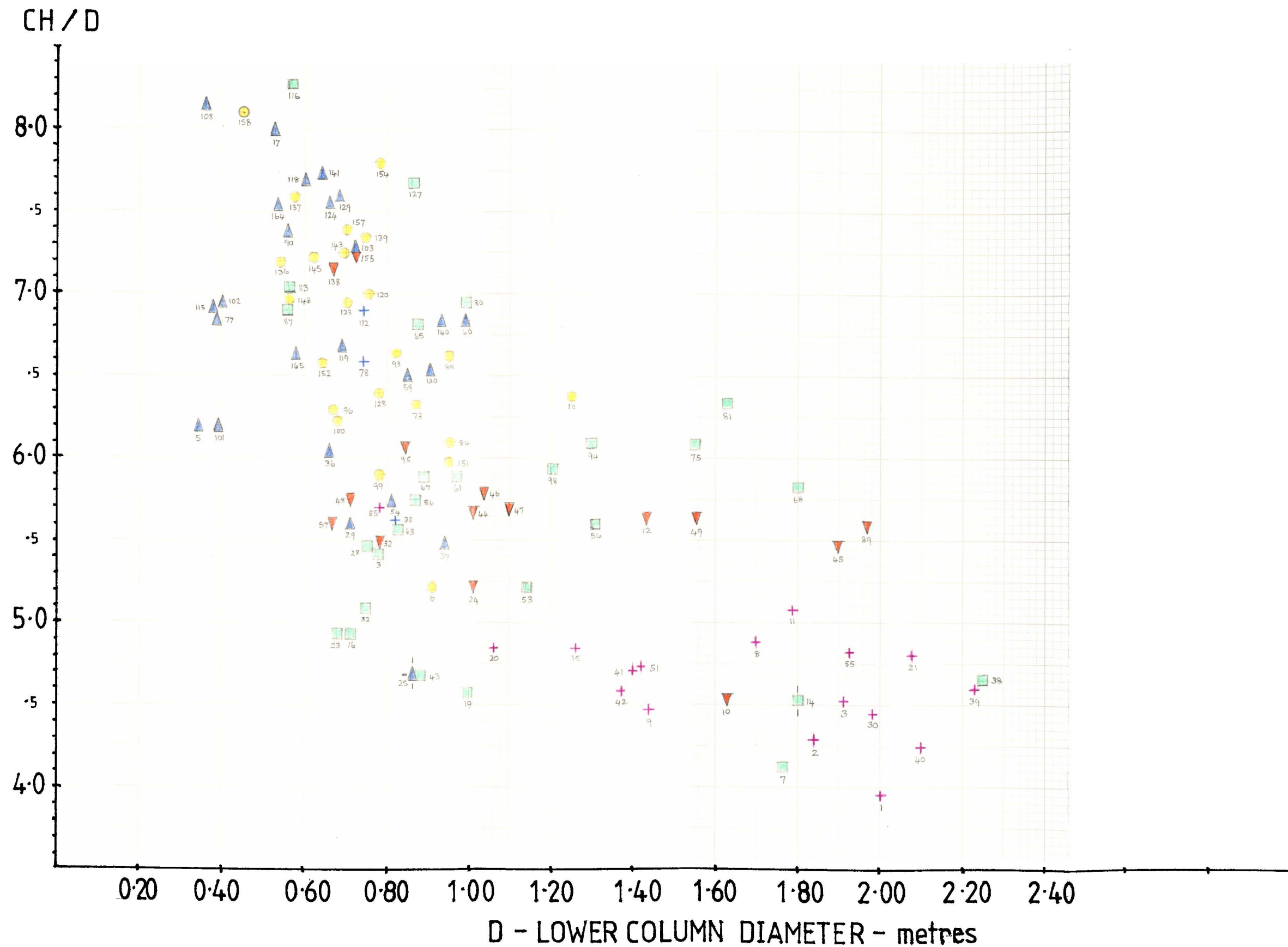
The pattern of the ratio plots is very similar to that of the previous graph, but that is to be expected given that one axis (CH/D) is common to both and that along the second axis runs one of the constituent parts (CH in this case) of the first axis. However, one notes here that the horizontal spread of the plots is much broader than on the previous graph (even though the scale is in fact much smaller: this graph 2 mm. = 10 cms, previous graph 2 mm. = 2 cms) indicating that the column heights vary to a far greater extent in relation to column slenderness, than do the lower column diameters. This is partly due to the physical nature of a column – longer than it is wide – so that any increase in its slenderness will naturally be reflected more in its length (height) than in its width (diameter).

As with the previous graph, the plots follow an inclination which suggests that small columns (in height) are generally more slender than tall columns; however, for exactly the same reasons mentioned in connection with the previous graph, one has to be aware of the limitations of this supposition.

Doric Order Proportions

COLUMN SLENDERNESS (CH/D) AGAINST LOWER COLUMN DIAMETER (D)

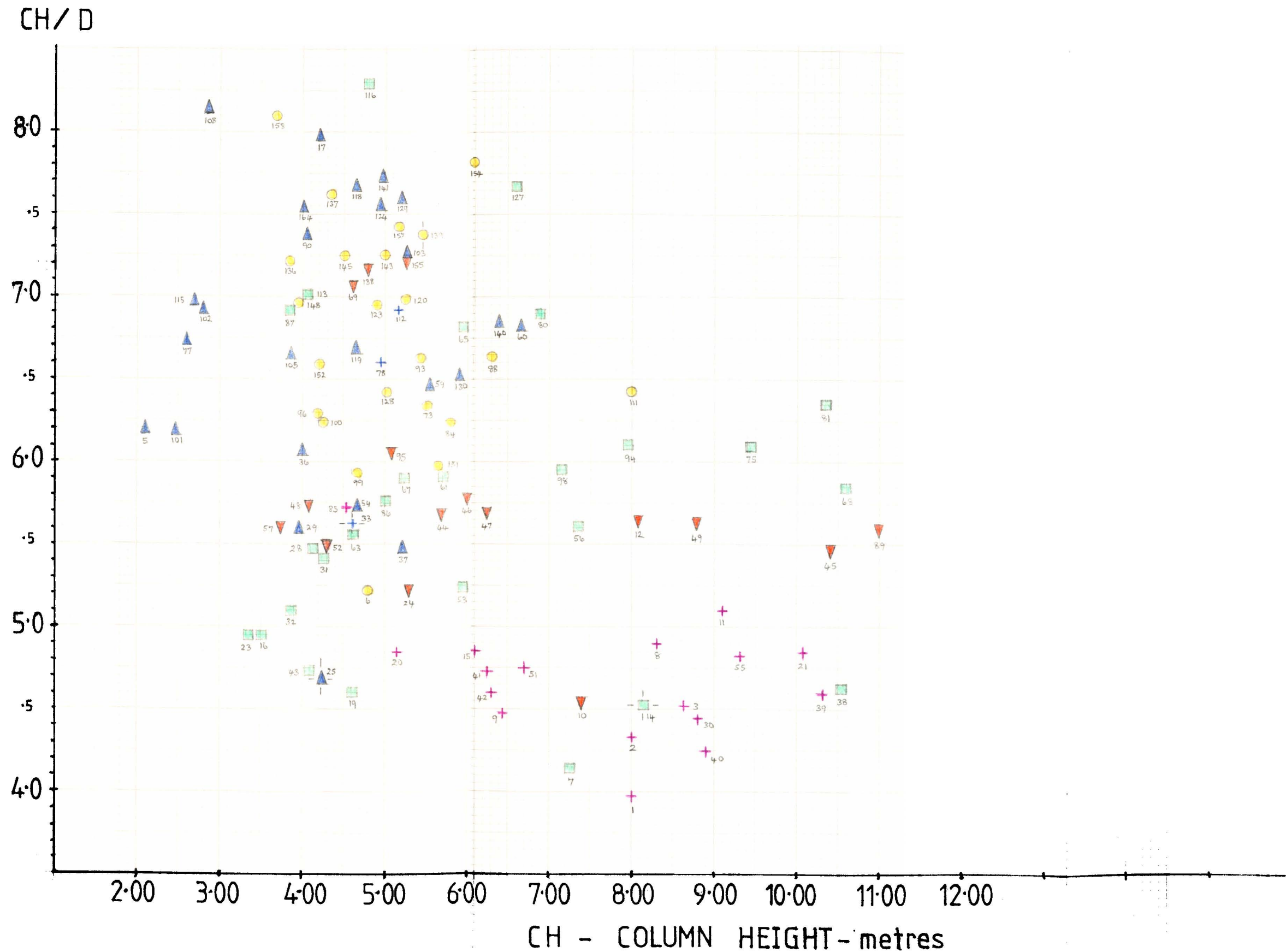
GRAPH A1



Doric Order Proportions

COLUMN SLENDERNESS (CH/D) AGAINST COLUMN HEIGHT (CH)

GRAPH A2



CATALOGUE AND BIBLIOGRAPHY OF CLASSICAL AND HELLENISTIC MONUMENTS ON THE CYCLADES AND THASOS

(‘Island Towers’ are not included)

AMORGOS

Minoa, Temple of Athena
early Hellenistic

Ergon, 1981, pp.59-61; Ergon, 1982, pp.47-48.

Minoa, Gymnasium
late 4th C.

Ergon, 1986, pp.116-125; Ergon, 1987, pp.115-116.

ANAPHE

Sanctuary of Apollo, Temple
4th - 3rd C.?

Thera, I, pp.353-357.

ANDROS

Palaiopolis, Stoa
late 4th C. ?

BCH, 81, 1957, Chron., pp.610-612; N. M. Kontoleon, 'Ανασκαφαί', AE, 1964, pp.2-4.

DELOS

References: The first reference is the Guide de Délos³ (GD) Monument Number. GD lists most major references up to its publication in 1983; other important references, including those in EAD volumes, are subsequently given. Specific architectural details for nearly all Delian monuments are to be found in AHHD, the index of which is at the end of AHHD, II.ii.

Agora of the Delians, L-shaped Stoa
c. 187-173

GD 84; R. Vallois, 'Attiques déliens', CRAI, 1912, pp.106-107; BCH, 90, 1966, Chron., pp.998-1003.

Agora of the Delians, Oblique Stoa
c. 300-250

GD 84; BCH, 90, 1966, Chron., p.999.

Agora of the Italians
c. 110-88

GD 52; EAD, XIX; Rauh, Sacred Bonds, pp.291-338.

Agora of the Italians, Propylon
c. 100

GD 52; EAD, XIX, pp.65-75.

Agora of Theophrastus, Temple G c. 125-100	<u>GD</u> 49; <u>EAD</u> , II.i, pp.72-74; <u>EAD</u> , II.ii, pp.27-36.
Apsidal Building lower courses: 5th C.; wall crown: c. 350-300	<u>GD</u> 39
Aphrodision, Temple c. 310-300	<u>GD</u> 88
Aphrodision, Oikoi c. 310-300	<u>GD</u> 88
Archegesion, court wall and stoa c. 480-470	<u>GD</u> 74
Artemision, Temple of Artemis (Temple D) c. 179-?166	<u>GD</u> 46; F. Courby, 'Le Sanctuaire d'Apollon délien', <u>BCH</u> , 45, 1921, pp.209-210.
Artemision, L-shaped Stoa c. 110	<u>GD</u> 46; F. Courby, 'Le Sanctuaire d'Apollon délien', <u>BCH</u> , 45, 1921, pp.217-218, 226-227; Vallois, 'TopDél', pp.289-290.
Asklepieion, Temple ... <i>see Temple of Asklepios</i>	
Asklepieion, North Peristyle 4th C. ?	<u>GD</u> 125; <u>EAD</u> , XX, pp.52-64 <i>passim</i> ; G. Roux, 'Problèmes déliens', <u>BCH</u> , 105, 1981, pp.58-61.
Asklepieion, Oikos-Hestiatorion c. 323-302	<u>GD</u> 125; <u>EAD</u> , XX, p.69; G. Roux, 'Problèmes déliens', <u>BCH</u> , 105, 1981, pp.57-58.
Asklepieion, Propylon c. 323-302	<u>GD</u> 125; <u>EAD</u> , XX, pp.65-68; G. Roux, 'Problèmes déliens', <u>BCH</u> , 105, 1981, p.59.
Asklepieion, South Peristyle mid 3rd C.	<u>GD</u> 125; <u>EAD</u> , XX, pp.52-64 <i>passim</i> ; G. Roux, 'Problèmes déliens', <u>BCH</u> , 105, 1981, pp.59-61; <u>Ténos</u> , pp.168-169, n.354
'Building <u>GD</u> 42' c. 360-340	<u>GD</u> 42. <i>Referred to as the 'Keraton' by Vallois.</i>
'Chapel' at Fourni c. 323-300	<u>GD</u> 127
'Chapel' of Dionysos platform: end 4th - start 3rd C.; walls: c. 166-88	<u>GD</u> 81

Dioskourion, Temple A c. 303	<u>GD</u> 123; <u>EAD</u> , XX, pp.5-50; G. Roux, 'Problèmes déliens', <u>BCH</u> , 105, 1981, pp.41-55.
Dodekatheon c. 290	<u>GD</u> 51; <u>EAD</u> , XXII
Ekklesiasterion stage II: 4th C. - start 3rd C. ?; stage IIIa: mid 3rd C.; stage IIIb (lantern): c.200-190; stage IV: c. 192-?166	<u>GD</u> 47
Great Temple of Apollo stage I: c. 475-450 (constructed to frieze level) stage II: c.314-280 (completed)	<u>GD</u> 13; <u>EAD</u> , XII, pp.1-106; Coulton, <u>ParthKong</u> , pp.43-44; Schuller, <u>Artemis-Tempel</u> , p.112.
Gymnasium c. 300-275 (exterior walls) c. 150-100 (present interior arrangement)	<u>GD</u> 76; <u>EAD</u> , XXVIII
Hostelry Hellenistic	<u>GD</u> 113
Hypostyle Hall c. 210-200	<u>GD</u> 50; <u>EAD</u> , II.i; <u>EAD</u> , II.ii.
Inopos Lower Reservoir 3rd C.	<u>GD</u> 97
Kynthion, Oikoi of Zeus and Athena 285-c.225	<u>GD</u> 105; <u>EAD</u> , XI, pp.83-91.
Kynthion, Propylon c. 125-100	<u>GD</u> 105; <u>EAD</u> , XI, pp.97-100.
Monument of the Bulls c. 306-290	<u>GD</u> 24; <i>Referred to as the 'Pythion' by Vallois.</i> J.Tréheux, 'Un Document nouveau sur le Néôrion et le Thesmophorion à Délos', <u>REG</u> , 99, 1986, pp.301-309; J.Tréheux, 'Sur le Néôrion à Délos', <u>CRAI</u> , 1987, pp.168-184; G. Roux, 'L'Inventaire <i>ID</i> 1403 du Néôrion délien', <u>BCH</u> , 113, 1989, pp.261-275; Hellmann, <u>InscripDél</u> , pp.135, 165 + n.18, 186, 311-312; <u>Samothrace</u> , VII, pp.142-143.
Monument of Granite c. 150-100	<u>GD</u> 54; <u>EAD</u> , XXIV, pp.73-107.
Monument of Mithridates VI Eupator 102/1	<u>GD</u> 94; <u>EAD</u> , XVI, pp.13-43.
North Building (Graphe) end 5th C.- start 4th C. Colonnade in front, probably in 3rd C.	<u>GD</u> 35; <u>EAD</u> , V, pp.56-60.

Palaestra of Granite c. 150-125	<u>GD</u> 66; <u>EAD</u> , XXV, pp.1-73.
Palaestra of the Lake stage I: 5th - 4th C.; stage II: c.285-275; stage III: c.150-125.	<u>GD</u> 67; <u>EAD</u> , XXV, pp.77-153.
Poseidoniasts of Berytos Complex c. 200-150	<u>GD</u> 57; <u>EAD</u> , VI.
Propylaia stage I: c. 600-550; stage II: c.475-450; stage III: mid 2nd C.	<u>GD</u> 5
Prytaneion c. 500-450; west wall rebuilt 2nd C. or later; Colonnade probably added c. 314-290.	<u>GD</u> 22; S. G. Miller, <u>The Prytaneion. Its Function and Architectural Form</u> , (Berkeley, 1978), pp.66-78; H. Lauter, 'Struktur statt Typus', <u>AA</u> , 1982, pp.710-717; <u>BCH</u> , 111, 1987, Rapports, pp.628-629; <u>BCH</u> , 112, 1988, Rapports, pp.746-752.
Samothrakeion, 'Temple of the Dioskouroi' stage I: c. 350-300; stage II: mid 2nd C.	<u>GD</u> 93; <u>EAD</u> , XVI, pp.57-71.
Sanctuary of Agathe Tyche end 3rd C.?	<u>GD</u> 103; <u>EAD</u> , XI, pp.222-228.
Sanctuary of Artemis Lochia, Temple end 5th C.?	<u>GD</u> 108; <u>EAD</u> , XI, pp.293-308.
Sanctuary of the Bastion, Temple end 2nd C.	<u>GD</u> 72
Sanctuary of the Foreign Gods (Syrian Gods) c. 113-105	<u>GD</u> 98; <u>EAD</u> , XXXV.
Sanctuary of the Gods of Ascalon c. 100	<u>GD</u> 107; <u>EAD</u> , XI, pp.285-289.
Sarapieion A, Temple c. 220	<u>GD</u> 91
Sarapieion B, Temple end 3rd C.	<u>GD</u> 96
Sarapieion C, Temple of Sarapis (Temple F) stage I: c. 200-175; stage II: c. 175-150	<u>GD</u> 100
Sarapieion C, Temple of Isis (Temple I) c. 130	<u>GD</u> 100
South Stoa c. 270-230	<u>GD</u> 3; F. Dürbach, 'Fouilles de Délos', <u>BCH</u> , 26, 1902, pp.544-553; (<u>EAD</u> , VII.i, pl.9).

Stadium 3rd C.	<u>GD</u> 78; Hellmann, <u>InscripDél</u> , pp.378-380.
Stoa of Antigonos Gonatas c. 246-239	<u>GD</u> 29; <u>EAD</u> , V, pp.13-45;
Stoa to N.E. of the Artemision mid 2nd C.	<u>GD</u> 45; F. Courby, 'Le Sanctuaire d'Apollon délien', <u>BCH</u> , 45, 1921, pp.218.
Stoa of Philip V c. 216-200	<u>GD</u> 3; <u>EAD</u> , VII.i, pp.27-110; Miller, <u>MacedArch</u> , pp.207-212.
Temple of Artemis (Temple D) ... <i>see Artemision, Temple of Artemis</i>	
Temple of Aphrodite ... <i>see Aphrodision, Temple</i>	
Temple of Apollo ... <i>see Great Temple of Apollo</i>	
Temple of Asklepios c. 297	<u>GD</u> 125; <u>EAD</u> , XX, pp.71-96; for date <i>cf.</i> E. Will, 'La Date du temple des Douze Dieux de Délos' in <u>Recueil Plassart</u> , (Paris, 1976), pp.227-229; G. Roux, 'Problèmes déliens', <u>BCH</u> , 105, 1981, p.57.
Temple of the Athenians c. 425-417	<u>GD</u> 12; <u>EAD</u> , XII, pp.107-225; J. F. Bommelaer, 'Temples doriques prostyles d'époque classique', in <u>Bauplanung und Bautheorie der Antike</u> , (Berlin, 1985), pp.146-153; D. Mertens, <u>Der Tempel von Segesta</u> , (Mainz am Rhein, 1984), pp.220-227.
'Temple of the Dioskouroi' ... <i>see Samothrakeion, Temple</i>	
'Temples of Replat'	<u>GD</u> 73
Temple of the Twelve Gods ... <i>see Dodekatheon</i>	
Theatre Sanctuary A (Artemis Hekate?) c. 150-69	<u>GD</u> 116a
Theatre Sanctuary B (Apollo) 110/109	<u>GD</u> 116b
Theatre Sanctuary C (Dionysos, Hermes, Pan) c. 250-166	<u>GD</u> 116c
Theatre, Skene Building Skene: c.300-275; Proskenion: c.300-250	<u>GD</u> 114; Hellmann, <u>InscripDél</u> , p.375.
'Thesmophorion' (Hestiatorion of the Keans?) c. 480-450	<u>GD</u> 48.

Treasury I c. 480-450	<u>GD</u> 20; Schuller, <u>JdI</u> , pp.349-350, 352.
Treasury II c. 480-450	<u>GD</u> 19; Schuller, <u>JdI</u> , pp.349-352.
Treasury III c. 480-450	<u>GD</u> 18; Schuller, <u>JdI</u> , pp.349, 351-352.
Treasury IV c. 480-450	<u>GD</u> 17; Schuller, <u>JdI</u> , pp.349, 352.
West Stoa c. 175-150	<u>GD</u> 3; <u>EAD</u> , VII.i, pp.149-168

KEA

Karthaia, Athena Sanctuary, Propylon 3rd C.	Schuller, <u>JdI</u> , pp.380 + n.146.
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NAXOS

Agora, East Stoa early Hellenistic	<u>Ergon</u> , 1965, pp.122-123; N. Kontoleon, ' 'Ανασκαφή', <u>PAE</u> , 1965, pp.176-179; <u>Ergon</u> , 1967, pp.86-89; <u>Ergon</u> , 1969, pp.148-149.
Agora, North Stoa early Hellenistic	<u>Ergon</u> , 1967, pp.86-89; N. Kontoleon, ' 'Ανασκαφή', <u>PAE</u> , 1967, pp.120-121.
Agora, South-West Stoa early Hellenistic	<u>Ergon</u> , 1969, pp.148-150, 179-182; N. Kontoleon, ' 'Ανασκαφή', <u>PAE</u> , 1970, pp.153-155; <u>Ergon</u> , 1991, pp.84-89.

PAROS

Archilocheion c. 325-300	<u>AA</u> , 1982, pp.271-290; Schuller, <u>Artemis-Tempel</u> , p.119.
Asklepieion 4th C.?	O. Rubensohn, 'Paros III', <u>AM</u> , 1902, pp.205-220.
Ionic Peristyle Building early 4th C.	<u>AA</u> , 1982, pp.621-656, 666-683.

Marmara, Temple c. 400-350	<u>AA</u> , 1982, pp.265-270; Schuller, <u>Artemis-Tempel</u> , pp.116-117.
Stoa c. 220-200	<u>AA</u> , 1978, pp.375-384.
Temple of Apollo Pythios c.400-350	<u>AA</u> , 1982, pp.245-264; Schuller, <u>Artemis-Tempel</u> , pp.114-116.
Tholos c. 350-300	<u>AA</u> , 1972, pp.421-430; <u>AA</u> , 1982, pp.661-666; Schuller, <u>Artemis-Tempel</u> , pp.117-119.

TENOS

Sanctuary of Poseidon and Amphitrite

-- Building B c. 320-280	<u>Ténos</u> , pp.19-21, 24.
-- Building D c. 120-80	<u>Ténos</u> , pp.32-36.
-- Building M c. 250-200;	<u>Ténos</u> , pp.57-59.
-- Fountain-Exedra stage I: c. 320-280; stage II: mid 3rd C.; stage III: mid 2nd C.; stage IV: mid 2nd C. A.D.	<u>Ténos</u> , pp.11-19, 73-91, 159-162.
-- Hestiatorion Q stage I: c. 320-280; stage II: c. 260-220; stage III: 1st C. A.D.	<u>Ténos</u> , pp.47-50, 165-170.
-- Stoa L c. 140-110	<u>Ténos</u> , pp.63-64, 127-140, 176-177.
-- Temple of Poseidon (E1) c. 320-270	<u>Ténos</u> , pp.93-95, 101, 105-106.
-- Temple of Poseidon (E2) c. 200-150	<u>Ténos</u> , pp.93-106, 162-165.

THASOS

Agora, 'Galerie aux Piliers' 2nd - 1st C.	<u>GT</u> , p.30 (refs: p.194).
Agora, Oblique (N.E.) Stoa 1st C.?	<u>GT</u> , p.27 referred to 'Portique V' (refs: p.194).

Agora, N.W. Stoa c. 300-280	<u>GT</u> , pp.24-25; <u>ET</u> , VI, pp.9-54.
Agora, Temple of Zeus start 4th C.	<u>GT</u> , p.34 (refs: p.194).
Agora, Paraskenia Building c. 350-300	<u>GT</u> , pp.25-27; <u>ET</u> , VI, pp.59-91.
Agora, Poros Building 3rd-2nd C.	<u>GT</u> , p.25; <u>BCH</u> , 74, 1950, Chron., pp.342-346.
Alikí, North Building (mid 6th C.); Doric colonnade: c.480-450	<u>GT</u> , pp.85-87; <u>ET</u> , IX, pp.33-45.
Dionysion, Monument I start 3rd C.	<u>GT</u> , pp.41-42 (refs: p.195).
Evraïokastro, Stoa c.300-250	<u>GT</u> , p.50 (refs: p.195).
Gate of Zeus and Hera c.325-300	<u>GT</u> , pp.65-67 (refs: p.196); R. Martin, 'Sculpture et peinture dans les façades monumentales au IV ^e siècle av.J.-C.', <u>RA</u> , 1968, p.172-176.
Herakleion, Building with Oikoi (Hestiatorion) 3rd C.	<u>GT</u> , p.72; <u>ET</u> , I, pp.77-85; Roux, <u>Thasiaca</u> , pp.208-209.
Herakleion, Ionic Temple (cella: end 6th C.); peristyle: 2nd C.	<u>GT</u> , p.72; <u>ET</u> , I, pp.67-76; Roux, <u>Thasiaca</u> , pp.202-205; <u>BCH</u> , 110, 1986, Chron., pp.802-806.
Monument of Thersilochos end 4th C.	<u>GT</u> , p.70 (refs: p.196); <u>BCH</u> , 104, 1980, Chron., pp.739-740; <u>BCH</u> , 105, 1981, Chron., pp.924-926.
Theatre Proskenion early 3rd C.	<u>GT</u> , pp.50-54 (refs: p.195).

THERA

Royal ('Basilike') Stoa Hellenistic	<u>Thera</u> , I, pp.217-234; <u>Thera</u> , III, pp.57, 112; <u>BCH</u> , 117, 1993, Chron., p.881.
Ptolemaic Garrison c. 275	<u>Thera</u> , I, pp.204-216.
Temple of Dionysos 3rd C.?	<u>Thera</u> , I, pp.237-242; <u>Thera</u> , III, pp.107-110.
