When is 'If the first, the second' true? An Epicurean contribution to the Hellenistic debate

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Philodemus' *De Signis* is a surprising text. If it had not been discovered in the ruins of Herculaneum, it might have been tempting to think that Epicurean philosophers were at best disinterested or at worst incompetent in logic.[1] But what survives of the treatise shows that some Epicurean philosophers of the 2nd and 1st centuries BCE had a great deal to say about broadly logical matters, and that they were more innovative in their thinking on these questions than one might otherwise have expected.

What we have is what is preserved in the final 38 columns of a single papyrus roll, *PHerc.* 1065. The main topic is sign-inference (σημείωσις), a kind of inference that enables one to obtain knowledge of non-evident matters on the basis of what is evident. The concern, then, is epistemological as much as it is logical, and the surviving portions of the treatise come across as a kind of source-book: Philodemus gives a number of accounts of how his teachers and colleagues defended their theory of sign-inference against various objections, rather than putting forward his own views. Central to the theory are two so-called 'modes' ('τρόποι') of sign-inference, the similarity mode and the elimination mode. The Epicureans themselves seem amenable to both modes, whereas their opponents—whose philosophical allegiance is never made explicit[2]—regard only the elimination mode as satisfactory. The main crux of disagreement, then, is the similarity mode.[3]

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[1] This is clearly Cicero's verdict: he describes Epicurus as 'unarmed and naked' ('*inermis ac nudus*', *Fin.* 1.22) in such matters.

[2] One, a certain Dionysius, is named at *Sign.* 7.6–7, but the name is too common for this to be of much help. The standard view among commentators is that the opponents are Stoics: this is accepted by all of Gomperz (1865: xiii), Bahnsch (1879: 5), Philippson (1881: 5), De Lacy and De Lacy (1978: 156), Allen (2001: 207–8), Boulogne et al. (2010: 1236–7), and Manetti (2012: 77). Barnes (1988: 93–5) is more cautious. Asmis (1996: 159–60, 172–9) argues that the opponents are Academic sceptics. See Manetti and Fausti (2022: 250–52) for a helpful review of the main options.

[3] There are also some secondary disagreements about the elimination mode: the Epicureans claim, and their opponents deny, that it depends somehow on the similarity mode (*Sign.* 8.21–9.8); and at least one Epicurean argues that because of this dependence, it does not count as a mode of *sign*-inference (*Sign.* 30.37–31.13).

Although, as I have said, sign-inference is the main subject of the *De Signis*, from time to time the focus turns to more narrowly logical questions about conditionals—or the 'so-called conditional' ('τὸ καλού[μ]ενον συνημμένον', *Sign.* 32.34) as one Epicurean puts it, perhaps with some degree of reservation.[4] My task in this paper is to investigate some aspects of what the *De Signis* reveals about Epicurean views on the truth conditions of conditionals. I begin, in section 1, by introducing the broader Hellenistic debate on this topic, as reported by Sextus Empiricus. In section 2, I provide a close analysis of one central passage from the *De Signis* with a view to giving an initial characterisation of the Epicurean theory. In section 3, I discuss the prospects of this theory in the light of the Hellenistic debate. I try to show that the Epicurean treatment can be regarded as a contribution to it: they are broadly sensitive to some of the same problems that occupied their contemporaries, and have a distinctive approach in trying to address them.

1 The Hellenistic debate

When is a conditional true? Under what conditions is it appropriate to assert something of the form 'If *p*, *q*'? These questions have much exercised logicians and philosophers of language in the 20th and 21st centuries. Just as fierce a debate seems to have taken place among certain logically-minded philosophers of the Hellenistic period, who prefer the schema 'If the first, the second' ('εἰ τὸ πρῶτον, τὸ δεύτερον') to my 'If *p*, *q*'. Our principal evidence for this debate comes from Sextus Empiricus. In two parallel passages in *Outlines of Pyrrhonism* (2.110–12) and *Against the Logicians* (*M* 8.112–17), he presents a number of different accounts of the truth conditions of conditionals. The moral he draws from the variety on offer is, of course, sceptical—his aim is to induce suspension of judgement on this question, due to the lack (he argues) of any principled way to decide between them.[5] Along the way, he gives fairly detailed explanations of what each account is and how they differ from each other.

Of the two presentations, it is *PH* 2.110–12 that contains the greatest variety. Here, Sextus reports four different accounts of the truth conditions of conditionals, which he presents in order of increasing strength, so that fewer conditionals turn out true on each account than on those that precede it. The first account, which is ascribed to Philo, captures what would today be called 'material implication': 'If *p*, *q*' is true just when it is not the case that *p* is true and *q* false. The second account is close to what we would now call 'strict implication': it is a modalised version of the previous account, according to which 'If *p*, *q*' is true just

[4] If the phrase is indeed intended to signal reservation, this might be due to the fact that there is no trace of Epicurus himself having written anything about conditionals—although it is clear that he did discuss sign-inference (see, e.g., DL 10.32). Perhaps later Epicureans regarded this as a novel area of research.

[5] See *PH* 2.113–15 and *M* 8.118–23.

if it is and always was impossible that *p* should be true and *q* false. This account is ascribed to Diodorus.[6] According to the third account, 'If *p*, *q*' is true just if a contradictory of *q* 'conflicts' ('μάχηται') with *p*. This account is ascribed to 'those who introduce *sunartēsis*' ('οἱ δὲ τὴν συνάρτησιν εἰσάγοντες'); it is usually thought to be due to Chrysippus.[7] Finally, according to the fourth account, 'If *p*, *q*' is true just when *q* is 'potentially contained' ('περιέχεται δυνάμει') in *p*. This account is associated with 'those who judge by *emphasis*' ('οἱ δὲ τῇ ἐμφάσει κρίνοντες'); there is no consensus as to who the *emphasis* people are.[8]

I do not wish to discuss these accounts in any detail, but simply to draw the following general moral about the Hellenistic debate: as many commentators have observed, it is likely that at least some of its participants were sensitive to what are now known as the paradoxes of material implication and of strict implication.[9] As is well known, one of the problems with Philo's proposal is that it is sufficient for the truth of a conditional, on this account, that its antecedent be true or its consequent false. This has consequences that are hard to swallow. As Sextus himself points out, the result is that 'If it is day, I am talking' turns out true whenever I am talking, even though whether or not it is day seems irrelevant to whether or not I am talking. The same conditional is false on Diodorus' account (since it is not impossible for it to be day and for me not to be talking), which may therefore be regarded as an improvement in this respect; but strict implication too has paradoxical consequences. It yields the result that any conditional that has a necessary falsehood as its antecedent or a necessary truth as its consequent turns out true (since in any such case, it is impossible for the antecedent to be true and consequent false). Sextus again seems aware of this difficulty, since he provides an example of a conditional that is problematic in both ways at once, namely 'If beings do not have indivisible elements, beings do have indivisible elements'. (The example is provided on the assumption that it is necessarily true that beings have indivisible elements.)[10]

It is plausible to imagine, then, that the third and fourth accounts in the sequence are at least partly aimed at avoiding these paradoxical results. Indeed,

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[6] Given Diodorus' treatment of modality, according to which for something to be impossible now is for it to be false now and never true in the future (cf. Boethius, *in Int.* 234.22–26), one might alternatively describe this as a temporalised version of Philo's account: a conditional is Diodorean-true now just if it is Philonian-true at all times. Cf. Denyer (1981) and Bobzien (1993).

[7] The identification is plausible, since Cicero seems to draw on just the same account when discussing Chrysippus' views on the truth values of certain conditionals at *Fat.* 12. Cf. Frede (1974: 82–3) and Barnes et al. (1999: 106–7). Note that some commentators, such as Mates (1953: 48–51), regard the *sunartēsis* account itself as equivalent to strict implication. See Castagnoli (2004) for a helpful overview of the main interpretations defended in the 20th century, and Castagnoli (2009) and Ruge (2022: 28–44) for some more recent contributions.

[8] This account is relatively under-studied. See White (1986) and Weiss (2019) for some important contributions.

[9] This was already remarked by Mates (1953: 48), and has since been acknowledged by many commentators.

[10] In this paragraph, I summarise much of *PH* 2.110–11.

on Sextus' presentation the problematic conditionals just mentioned come out as false on both. Those who introduce these accounts are presumably dissatisfied with the view that it is sufficient for the truth of 'If *p*, *q*' that it be impossible for *p* to be true and *q* false; a more stringent test is required, one that identifies some special relation that must obtain between antecedent and consequent for the conditional to be true. The competing candidates that they come up with for this special relation are given technical labels, '*sunartēsis*' and '*emphasis*' respectively. In what follows, I intend to show that the Epicurean philosophers whose views Philodemus reports in the *De Signis* can fairly be regarded as making a contribution to just the same debate, and that they too are engaged in attempting to identify relations that could foster more stringent accounts of the truth conditions of conditionals than those of Philo and Diodorus.

2 Zeno of Sidon on 'If the first, the second'

The key passage is found at the beginning of a sequence in which Philodemus reports how his teacher, Zeno of Sidon, responded to various objections made by his opponents. Here, Zeno responds to the first two of the opponents' objections, which he takes to have a common weakness. The columns in which Philodemus presumably presented these objections have not survived, so there is no way of telling whether Zeno's diagnosis is accurate. The response runs as follows (I divide the passage into numbered paragraphs for ease of reference).[11]

T1 (i) [οἱ μ]ὲν | γ[ὰ]ρ πρῶτοι δύο τὴν [αὐ]τὴν δύ|ναμιν ἔχοντες ὡσ[αύ]τως δι|ακόπτονται. τιθεμ[έ]νου γὰρ | τοῦτό τε ἀληθεύ[εσθα]ι, τὸ εἰ τὸ | πρῶτον τὸ δεύτε[ρο]ν, ὅταν ἀ|ληθὲς ᾖι τὸ εἰ μὴ τ[ὸ δ]εύτερον | [οὐ]δὲ τὸ πρῶτον, οὐ [κα]τὰ τοῦτο | [συν]άγεται τὸ μόνον εἶναι τὸν [κατὰ τ]ὴν ἀνασκευὴν τρό‖πον ἀναγκαστικόν.

(ii) τὸ γὰρ εἰ μὴ | τὸ δεύτερον, οὐδὲ τὸ πρῶτον[12] ἀ|ληθὲς [γ]ίνεται ποτὲ μὲν παρό|σον τοῦ δευτέρου καθ' ὑπόθεσιν {σθ} | ἀνασκευασθέντος, παρ' αὐτὴν | τὴν ἀνασκευὴν αὐτοῦ καὶ τὸ πρῶ|τον ἀναιρεῖται, καθάπερ [ἔ]χει | καὶ ἐπὶ τοῦ εἰ ἔστι κίνησ[ις] ἔστιν | κενόν· ἀναιρεθέντος γὰ[ρ] καθ' ὑ|πόθεσιν τοῦ κενοῦ, παρὰ ψιλὴν | τὴν ἀναίρεσιν [αὐτ]οῦ καὶ ἡ κί|νησις ἀναιρεθή[σεθ'], ὥστ' εἰς τὸ | κατ' ἀνασκευὴ[ν γέν]ος ἐναρμότ|τειν τὸ τοιοῦτ[ο·]

[11] I use the text of De Lacy and De Lacy (1978), except where otherwise indicated.

[12] The papyrus roll reads 'εἰ μὴ | τὸ πρῶτον, οὐδὲ τὸ δεύτερον' ('If not the first, neither the second'); this makes poor sense in the context. I follow Bahnsch (1879: 9) and De Lacy and De Lacy (1978) in emending this to 'εἰ μὴ | τὸ δεύτερον, οὐδὲ τὸ πρῶτον' ('If not the second, not the first'). An alternative emendation that would also yield good sense is to 'εἰ | τὸ πρῶτον, τὸ δεύτερον' ('If the first, the second'): cf. Manetti (2010: 192, n. 60) and Manetti and Fausti (2022: 164). The only scholars to retain the papyrus text are Boulogne et al. (2010: 1240, n. 31), on the erroneous grounds that the choice between 'If not the first, neither the second' and 'If not the second, neither the first' makes no difference.

(iii) [ποτὲ] δ᾽ οὐχ οὕ|τως ἀλλὰ παρ᾽ [αὐτὸ τὸ μὴ] δύνασ|[θα]ι[13] τὸ μὲν π̣[ρῶτο]ν ὑπά̣[ρχ]ον <ν>ο|[εῖν] ἢ τοιοῦτον [ὑπάρ]χον τὸ δὲ | [δ]εύτε̣ρ[ον] μὴ [ὑπά]ρχον ἢ μ[ὴ] το[ι]|οῦτον, ο[ἷο]ν̣ ε[ἰ] Π[λά]των ἐστὶν ἄν|[θρωπος], καὶ Σω̣κ[ράτ]ης ἐστὶν ἄν|[θρ]ωπ̣[ος]· τούτου γὰρ ἀληθοῦς | ὄντ[ος ἀλη]θὲς [γ]ίνεται[ι] καὶ τὸ | εἰ Σω̣κρά̣τ[η]ς οὐκ ἔστιν ἄνθρωπος, | οὐδὲ Π[λάτ]ων ἐστὶν ἄνθρωπος, | οὐχι [τ]ῶι τ[ῆι] Σωκράτους ἀναιρέ|σει συναναση̣κευ[ά]ζεσθα[ι] τὸν Πλά|τωνα̣, ἀλλὰ τῶι μ̣ὴ δυν[α]τ[ὸν] | εἶναι τὸν μὲν Σω[κ]ράτη[ν νοεῖν][14] | οὐκ ἄ̣ῤθρω[πον, τ]ὸν δὲ Π̣[λάτω]|να ἄνθρωπον, [ὃ] δὴ τοῦ κ[αθ᾽] ὁμοι|ότητ[α] ἔχεται τ[ρό]που.

(iv) [δι]όπερ | οὔ[θ᾽ ὁ π]ρῶτος οὔθ᾽ ὁ δεύτ[ερ]ος̣ λό|γος συνάγει τὸ τὸν καθ᾽ [ὁ]μοιότη|τα τρόπον τῆς σημει[ώ]σ[ε]ως | μὴ προσφέρεσθαι τὴν ἀ̣νάγ|κην.

(i) For the first two [of the opponents' arguments], having the same force, are refuted in the same way. For, granted that 'If the first, the second' is true whenever 'If not the second, neither the first' is true, it does not follow from this that only the elimination mode is necessitative.

(ii) For sometimes 'If not the second, neither the first' turns out true inasmuch as when the second is eliminated by hypothesis, due to its very elimination the first too is removed, as holds in particular in the case of 'If there is motion, there is void': for when void is removed by hypothesis, due to its mere removal motion too will be removed, so that this sort of thing fits into the elimination class.

(iii) But at other times, [it turns out true] not in this way but rather due simply to its not being possible to think of the first being or being such-and-such and the second not being or not [being] such-and-such, as in the case of 'If Plato is a human, also Socrates is a human'. For, if this is true then 'If Socrates is not a human, neither is Plato a human' also turns out true, not through Plato being co-eliminated by the removal of Socrates, but rather through its not being possible to think of Socrates as not a human but Plato as a human, which depends on the similarity mode.

(iv) For this reason, neither the first nor the second argument proves that the similarity mode of sign-inference does not grant necessity.

(*Sign.* 11.29–12.36)[15]

Zeno begins, in paragraph (i), by presenting what he takes to be the kernel of the opponents' first two objections. He describes them as appealing to what is now known as the law of contraposition, according to which a conditional (an instance

[13] De Lacy and De Lacy (1978) print 'δύνα|[σ]θαι' instead of 'δύνασ|[θα]ι'. Inspection of the papyrus roll supports the latter, which is also found in Gomperz (1865) and De Lacy and De Lacy (1941).

[14] I follow Long and Sedley (1987b: 96–97) in supplying 'νοεῖν' rather than 'εἶναι', as found in De Lacy and De Lacy (1978) and Gomperz (1865).

[15] Translations are mine, unless otherwise noted.

of 'If *p*, *q*', where '*p*' and '*q*' are to be replaced by declarative sentences) is true when and only when its contrapositive is also true (its contrapositive being the corresponding instance of 'If not-*q*, not-*p*').[16] According to Zeno, the opponents claim that it follows from this law that only the elimination mode is 'necessitative' ('ἀναγκαστικόν'), or—as he puts it at the end of the passage—that the similarity mode 'does not grant necessity' ('μὴ προσφέρεσθαι τὴν ἀνάγ|κην'). It is taken for granted that if the similarity mode fails to be necessitative or grant necessity, then it is inadequate—so this amounts to an attack on that mode.

The law of contraposition is attractive. Someone who asserts 'If *p*, *q*' is not yet taking a stand on the question whether either *p* or *q* is true, but they do seem at least to be ruling out the scenario in which *p* is true and *q* false. This being so, they seem also to be committed to the truth of 'If not-*q*, not-*p*': for if they learn that not-*q* is true (i.e. that *q* is false), they then seem to be entitled to infer that not-*p* is true too (i.e. that *p* is false), since if it were false, then *p* would be true and *q* false, which is a scenario that they have ruled out in asserting 'If *p*, *q*'. Hence, the opponents might have identified a real problem if it turns out that the law of contraposition provides some reason to reject the similarity mode.

In his response, Zeno does not raise any doubts about the law of contraposition.[17] Rather, his strategy in T1 is to argue that it poses no problems for the Epicurean theory. In rough outline, each of the modes seems to be associated with some central test or condition that is presented as relevant to the truth of a conditional: if one wants to explain why some conditional is true, one can do so by mentioning the fact that it passes one of these two tests or satisfies one of these two conditions.[18] Zeno's main concern here is to try to show that in both cases, it follows from the fact that some conditional satisfies the relecant condition that not just it but also its contrapositive is true. He does this by first, in paragraph (ii), discussing the elimination mode and the test associated with it: he agrees with his opponents that any conditional that belongs to this mode has a true contrapositive. In paragraph (iii), he turns to the similarity mode, and argues that exactly the same results hold here: likewise, if a conditional belongs to this mode

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[16] I use 'not-*p*' as short-hand for 'it is not the case that *p*'.

[17] Aristotle briefly articulates and appeals to contraposition at *APr.* 2.4, 57^{b}9–11; the law does not seem to have been regarded as controversial in antiquity. Some natural-language conditionals do, however, provide apparent counter-examples (and the brief argument for the law that I provided above is far from decisive). Difficult cases include so-called 'concessive conditionals', often formulated with 'even if'. For example, '(Even) if it's raining, it's not pouring' is surely not equivalent to '(Even) if it's pouring, it isn't raining', since the former might be asserted truly in some circumstances but the latter seems always false. For these and other reasons, many philosophers of language now favour accounts of the conditional on which the law of contraposition fails. For some classic treatments, see Adams (1965), Stalnaker (1968), and Lewis (1973: esp. 31–6). It is unclear whether the Epicureans or their opponents ever considered these difficulties.

[18] It is not obvious whether the intended role of these modes is primarily logical or semantic—contributing to an account of the truth conditions of conditionals—or rather epistemological—providing tests that will in practice allow us to establish whether some conditional is true. The Epicureans may not have explicitly distinguished between these two questions.

then its contrapositive must be true. Hence, he concludes in paragraph (iv), the opponents' first two objections fail.

What do these two conditions consist in? In each case, Zeno gives a general, abstract description of the circumstances under which a conditional belongs to the relevant mode, then illustrates with an example. I discuss each mode in turn.

2.1 The elimination mode

First, the elimination mode, covered in paragraph (ii). Here, the example given is 'If there is motion, there is void', which is in fact the standard example used in relation to the elimination mode throughout the *De Signis*.[19] This 'fits into the elimination class', according to Zeno, because 'when void is removed by hypothesis, due to its mere removal motion too will be removed'. This is alleged to hold more generally—any conditional of the form 'If the first, the second' satisfies the relevant condition just if 'when the second is eliminated by hypothesis, due to its very elimination the first too is removed'. And in any such case, Zeno accepts, the contrapositive ('If not the second, not the first') must be true too.

How should one understand the language of elimination and removal? The key verbs, 'to eliminate' ('ἀνασκευάζειν') and 'to remove' ('ἀναῖρειν'), seem to be used interchangeably here and elsewhere in the *De Signis*, as are the two corresponding families of cognate expressions, which include the nouns 'elimination' ('ἀνασκευή'), on the one hand, and 'removal' ('ἀναίρεσις'), on the other.[20] They can be used in relation either to worldly items, such as motion and void, or to propositional items, such as the antecedent and consequent of a conditional ('the first' and 'the second' respectively). For motion or void to count as removed or eliminated is presumably for it not to exist; conversely, for the proposition that there is motion or the proposition that there is void to be removed or eliminated is presumably for it to be false. The elimination mode seems, then, to correspond to a kind of thought experiment: one can show that 'If *p*, *q*' is true by supposing that *q* is false and finding that, due to the falsehood of *q*, also *p* would be false.

Exactly what does this test amount to? At first glance, one might have thought that it simply involves considering whether the falsehood of *q* implies that of *p*—which could be taken to be equivalent to considering whether 'If not-*q*, not-*p*' is true. Along these lines, a number of commentators have taken the elimination

[19] The example has impeccable Epicurean pedigree: Epicurus himself argues for the existence of void on the basis of that of motion at *Ep. Hdt.* 40. Lucretius gives much the same reasoning at *DRN* 1.335–9. See also SE, *M* 7.213–14. The argument derives from earlier atomist philosophers, whose reasoning Aristotle presents and challenges at *Ph.* 4.7, 214^{a}29–32.

[20] Similar uses of many of these expressions can be found in Aristotle, but a few—such as 'to co-eliminate' ('συνανασκευάζειν'), as used in T1—may be Epicurean neologisms. See Sedley (1982: 246) and Barnes (1988: 99, 131–2) for discussion.

mode to be based on contraposition: they have thought that for a conditional to pass this test is just for its contrapositive to be true.[21]

There are, however, insurmountable problems with this interpretation, as most commentators now agree.[22] I mention two that seem decisive. First, on this account Zeno's reply in T1 is unintelligible. For its core consists in his claims, in paragraph (iii), that there are some conditionals which true because they satisfy the condition characteristic of the similarity mode, and that these conditionals all have true contrapositives. But he states explicitly that these conditionals *do not* satisfy the condition characteristic of the elimination mode: for instance, 'If Plato is a human, also Socrates is a human' is said to be true, to have a true contrapositive, but not to pass the elimination test.[23] On Bahnsch's interpretation, according to which having a true contrapositive just is what it is to pass the elimination test, this collection of statements would turn out to be flatly inconsistent.

A second problem is philosophical: if Bahnsch's interpretation were correct, the elimination mode would be hopeless as an account of why some conditional is true. If one wants to explain why some conditional of the form 'If *p*, *q*' is true, or indeed to find out whether it is true, it is of little help to consult its contrapositive, 'If not-*q*, not-*p*'. The two conditionals are logically equivalent (assuming the law of contraposition), so if we do not know whether or why the former is true, we are unlikely to know whether or why the latter is. What would explain why 'If not-*q*, not-*p*' is true? Presumably the fact that *its* contrapositive, 'If *p*, *q*' is true—but this is precisely what was at issue in the first place. Circularity threatens.

Bahnsch's interpretation, therefore, will not do. Fortunately, there is an alternative. When describing the condition satisfied by 'If there is motion, there is void' in paragraph (ii), Zeno does not merely describe the non-existence of motion as following from that of void. Rather, he claims that it is '*due to* the mere removal of [void]' ('παρὰ ψιλὴν | τὴν ἀναίρεσιν [αὐτ]οῦ') that motion is 'removed'. Similarly, when describing the general case earlier in the paragraph, he describes it as being '*due to* the very elimination of [the second]' ('παρ᾽ αὐτὴν | τὴν ἀνασκευὴν αὐτοῦ') that 'the first' is 'removed'. Similar formulations are found in presentations of the elimination mode elsewhere in the *De Signis*.[24] This emphatic turn of phrase should be taken seriously. With this prominent use of 'due to' ('παρά'), Zeno seems to be bringing additional considerations to bear: specifically, he seems to be

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[21] This interpretation was first proposed by Bahnsch (1879: 8). Commentators who take this line often translate 'ἀνασκευή' as 'contraposition' rather than 'elimination': this is the policy, for instance, of De Lacy and De Lacy (1978) and Croissant (1984: 105–6).

[22] Sedley (1982: 245) raises several powerful objections against Bahnsch, and is followed by Barnes (1988: 99), Asmis (1996: 161), and Allen (2001: 211–12), *inter alia*.

[23] Zeno (or Philodemus, on his behalf) expresses this a little carelessly: he writes 'not through the removal of Socrates co-eliminating Plato' when one would have expected something like 'not through the removal of Socrates-being-a-human co-eliminating Plato-being-a-human'. See Sedley (1982: 245), Dumont (1982: 288), and Allen (2001: 218–19).

[24] See, for instance, *Sign.* 14.11–12 and 28.18–20.

raising the question whether, in the hypothetical situation in which there is no void and consequently no motion, the absence of motion would turn out to be *precisely because* of the absence of void. The test, then, is not whether the falsehood of the consequent merely implies that of the antecedent, but rather whether the former both implies and can appropriately be identified as somehow *explaining* the latter.[25]

This interpretation does not encounter the difficulties of Bahnsch's: it neither renders Zeno's response in T1 unintelligible nor produces a circular account. One could reasonably propose an account of the truth conditions of conditionals that respects the law of contraposition but verifies some conditionals the antecedents and consequents of which do not enjoy the explanatory relation that is required for belonging to the elimination mode. Indeed, it is quite plausible to think that the example discussed in paragraph (iii) is just such a case: one might accept that 'If Plato is a human, also Socrates is a human' is true and that its contrapositive is too, while denying that in the hypothetical situation in which Socrates is not a human, it would be *precisely because* of Socrates not being a human that Plato would not be a human either. The question whether Socrates is or is not a human does not seem to be explanatorily prior to the question whether Plato is. I conclude that this must be the correct way to understand the elimination mode.

2.2 The similarity mode

So why are 'If Plato is a human, also Socrates is a human' and its contrapositive supposed to be true? Allegedly, because the condition characteristic of the similarity mode is satisfied. Zeno discusses this in paragraph (iii) of T1; as in paragraph (ii), he both gives an abstract description of the test that determines whether some conditional belongs to the similarity mode and applies it to the example at hand. Conditionals that belong to this mode are true because of 'its not being possible to think of the first being or being such-and-such and the second not being or not [being] such-and-such'. This condition is, supposedly, satisfied in the case of the example: it is 'not […] possible to think of Socrates as not a human but Plato as a human'.

One immediate difficulty must be cleared up: what do 'the first' and 'the second' stand for in the general description of the similarity mode? Earlier in the passage, these expressions were used as placeholders for the antecedent and consequent respectively of a conditional, as standard in logical works of the

[25] Cf. Barnes (1988: 100). Sedley (1982: 245) recognises that the traditional interpretation of elimination as contraposition cannot be right, but places less emphasis on the use of 'due to' or 'because' ('παρά'); instead, he immediately identifies the criterion used by the elimination mode as Chrysippean *sunartēsis*. This identification seems hasty, although the view that the elimination mode and the *sunartēsis* account are likely to yield similar results is not implausible. Allen (2001: 208–26) argues that the opponents are Stoics and adherents of the *sunartēsis* account, but that in his presentation of the elimination mode, Philodemus substantially misrepresents their position. See also Manetti and Fausti (2022: 260–64).

Hellenistic period.[26] But here, they seem instead to correspond to 'Plato' and 'Socrates' in the example, with 'being or being such-and-such' ('ὑπά̣[ρχ]ον [...] ἢ τοιοῦτον [ὑπάρ]χον') doing duty for 'is a human'. These propositions are, therefore, either existential or predicative in character, with 'the first' and 'the second' acting as placeholders for the subject terms and 'such-and-such' for the predicate in the case in which the proposition is predicative. What Zeno seems to be claiming, in his presentation of the similarity mode, is that for any individuals *x* and *y*, a sufficient condition for the truth of 'If *x* exists, *y* exists' is its not being possible to think of *x* existing but *y* not existing; and for any individuals *x* and *y*, and any predicate *F*, a sufficient condition for the truth of 'If *x* is *F*, *y* is *F*' is its not being possible to think of *x* being *F* but *y* not being *F*.

The condition characteristic of the similarity mode, then, relies on appeal to some notion of unthinkability or inconceivability. What Zeno does not explain is *why* it should be impossible to think of Plato being a human but Socrates not being a human. He does at least provide a hint, however, in saying that this fact 'depends on the similarity mode' ('τοῦ κ[αθ'] ὁμοι|ότητ[α] ἔχεται τ[ρό]που'): this suggests that it is specifically considerations about similarity that ground the inconceivability-condition. Presumably, the relevant similarity would be between Plato and Socrates. Perhaps the idea is that the features that Plato and Socrates have in common are such that nobody who is aware of them can entertain the possibility that they should belong to two different species: one could, perhaps, doubt that Socrates is in fact a human (perhaps he is a god; perhaps he is an automaton), but if one did so, one would have to doubt that Plato is a human too, since one has no grounds on which to class them differently. (On this line of thought, Zeno would in fact be entitled to assert the biconditional 'Plato is a human if and only if Socrates is a human', rather than just the conditional.)

The interpretation that I have just presented is tentative and provisional: it is a natural way of making sense of the example given in T1, but in order to fully develop and defend an account of the Epicurean similarity mode one would need to solve a number of difficulties. Some concern this passage: exactly what are the relevant points of similarity between Plato and Socrates, and why should they yield the result that it is impossible to think of Plato and Socrates belonging to different species? Others arise in the broader context of the *De Signis*. The example given in T1 is an outsider; elsewhere in the treatise, the key example associated with the similarity mode is not a conditional at all, but rather the sign-inference 'Since the humans familiar to us are mortal, also wherever there are humans, they are mortal'.[27] Further problems that remain outstanding, therefore,

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[26] This use of numerals as placeholders for propositions is especially characteristic of the Stoics: see Apuleius, *De Int.,* p. 192,30–193,20 [Thomas]. For discussion, see Łukasiewicz (1935: 111–12), Mates (1953: 2, n. 4), Kneale and Kneale (1962: 158–9), Barnes, Bobzien, and Mignucci (1999: 129–30), and Barnes (2007: 322–30).

[27] This is specifically a quotation of *Sign.* 3.27–9: '[ἐπε]ὶ οἱ παρ' ἡμ[ῖν] ἄν[θρ]ωποι | [θν]ητοί εἰσιν, καὶ ε[ἴ πού εἰσιν ἄ]νθρω|[πο]ι θνητοὺς ε[ἶναι]'. Various formulations of this example appear on numerous occasions throughout the treatise.

concern how this sign-inference relates to the conditional discussed in T1, and how the similarity mode could cover them both. I cannot address these difficulties here.

Something that can be said, however, is that Zeno is probably correct to think that *if* this inconceivability-condition is sufficient for the truth of some conditional, *then* it also guarantees the truth of its contrapositive. For suppose that 'If *x* is *F*, *y* is *F*' satisfies this condition. Then it is impossible to think that *x* should be *F* but *y* not be *F*. But then it is presumably also impossible to think that *y* should not be *F* and that *x* should not not be *F* (since it is unlikely that either the order of the conjuncts or the introduction of a double negation should make a difference to questions of conceivability). And this is exactly the condition that, on this account, is sufficient for the truth of 'If *y* is not *F*, *x* is not *F*', the contrapositive of the original conditional. In fact, Zeno could plausibly go so far as to maintain that the *very same fact* that grounds the truth of 'If Plato is a human, also Socrates is a human' also grounds the truth of its contrapositive, 'If Socrates is not a human, neither is Plato a human': for its being impossible to think that Plato should be a human but Socrates not a human could plausibly be regarded as just equivalent to its being impossible to think that Socrates should (not not) be a human but Plato be a human.[28] Hence, Zeno's response to the opponents is promising: far from being incompatible with the similarity mode, it looks as if the law of contraposition is partially confirmed by it, in that whenever the inconceivability-condition that is central to that mode grounds the truth of some conditional, it also grounds that of its contrapositive.

3 Prospects of the Epicurean account

It is time to take stock. What should be made of these claims about the truth conditions of conditionals in the context of the broader Hellenistic debate?

First, it is worth noting that although Sextus does not himself make any mention of Epicurean involvement in the controversies over the truth conditions of conditionals, the accounts on offer in the *De Signis* can straightforwardly be read as contributing to the same debate. In particular, there are clear indications that these Epicureans are aware of the view that for a conditional to be true, it must be impossible for its antecedent to be true and consequent false. Call this 'the modal condition'. Indeed, it looks as if they accept the modal condition. This is already suggested by the framing of the debate in T1, where it is taken for granted that the similarity mode's treatment of conditionals is inadequate unless that mode is 'necessitative' ('ἀναγκαστικόν') and 'grants necessity' ('προσφέρεσθαι τὴν ἀνάγ|κην'). One might reasonably take this to amount to the requirement that

[28] Note that what Zeno writes in T1 corresponds to the latter rather than the former, even though the former is what one would have expected from the general description of the similarity mode: he deliberately selects the order of the conjuncts that would be appropriate for the contrapositive rather than the original conditional. This suggests that he has in mind something like the line of thought that I just presented.

any conditional covered by that mode be such that the truth of its antecedent necessitate that of its consequent—which would be equivalent to the modal condition.

This interpretation is confirmed by another of the responses given by Zeno to his opponents. In this case, the objection to which he is responding survives, reported at *Sign.* 1.1–19. It relies on a distinction between 'common' ('κοινά') and 'peculiar' ('ἴδια') signs that appears to have been widespread in ancient discussions of sign-inference. A common sign is some object, phenomenon, or state of affairs that could be taken to indicate any of a number of things: for instance, someone's fall from wealth to poverty can be said to be a sign of their having lived in a profligate fashion, or their having undergone a disaster at sea, or their having been excessively generous to friends, or of something else sufficient to explain it—the possibilities are numerous. Conversely, a peculiar sign is such that the relevant object, phenomenon, or state of affairs indicates just *one* thing—there is only one possible explanation to be found. Sweat on the surface of the skin, for example, might be taken to be a peculiar sign of the existence of invisible pores.[29]

The opponents use explicitly modal language in capturing the notion of a peculiar sign: they describe it as something such that 'it is impossible for it to exist without the thing that we say is necessarily associated with it, the non-evident item of which it is the sign'.[30] In other words, *A* counts as a peculiar sign of *B* only if it is impossible for *A* to exist without *B*. Plainly, in the context of sign-inference, this is the analogue of the view that a conditional of the form 'If *p*, *q*' is true only if it is impossible for *p* to be true and *q* false, i.e. only if the modal condition is satisfied.[31] The opponents argue that the sign-inferences that belong to the elimination mode pass this test, but those that belong to the similarity mode fail it—they can at best count as common signs, rather than peculiar signs. But, they say, the common sign is 'unsound' ('μοχθηρόν', *Sign.* 1.1)—so the similarity mode must be rejected.

In his response, at *Sign.* 14.2–27, Zeno does not defend the common sign. Rather, he seems to accept the view that only peculiar signs have any value, and argues that the sign-inferences that belong to the similarity mode satisfy the relevant requirement just as much as those that belong to the elimination mode. The bulk of his reply runs as follows.

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[29] I borrow both examples from Sextus Empiricus. See *M* 8.200–202 for the former. The latter is a standard example associated with the Stoics: see, e.g., *PH* 2.98 and *M* 8.146. For further discussion of the distinction, see Burnyeat (1982: 231–4) and Sedley (1982: 243–4).

[30] *Sign.* 1.14–16: 'ἀδυνατεῖν ἄλ|[λ]ως ὑπάρχειν ἢ σὺν τῶι ὃ λέγο|[μ]εν αὐτοῦ κατ' ἀνάγκην εἶνα[ι, | τ]ὰφανές, οὗ σ[η]μεῖόν ἐ[σ]τι.'

[31] Indeed, throughout the *De Signis* there seems to be a tacit assumption that the conditions under which a sign-inference ('Since *p*, *q*') is valid are just the same as those under which the corresponding conditional ('If *p*, *q*') is true. These Epicureans appear to be sympathetic to the Stoic view according to which an argument is valid if and only if the conditional that has the conjunction of its premises as antecedent and conclusion as its consequent is true (see SE, *PH* 2.113, 137, 249; *M* 8.415; DL 7.77).

T2 ἀλλ᾽ ἐὰν μὲν παρ᾽ αὐτὴν <τὴν> τἀφα|νοῦς ἄρσιν α<ἴ>ρηται τὸ ἐναργές, | κατ᾽ ἀνασκευὴν εἶναι τὴν σημεί|ωσιν, ἐὰν δὲ μὴ παρὰ τοῦτο κ[α|τ᾽ ἄλλο]ν δὲ τρόπον μὴ δ[ύν]η||[ται τὸ] μὲν [ὑπ]άρχειν τὸ δὲ [μὴ | ὑπάρχ]ει[ν, οἷ]ον ὅταν ἀδιανόητο[ν | ἧι τὸ μὲν ἐ]ναργ[ὲς] εἶναι ἢ τοιοῦτ᾽ [εἶ|ναι τὸ δ᾽ ἄδ]ηλον μὴ ὑπάρχειν, | [οὐχὶ κατ᾽] ἀνασκευήν ἐστιν τ[ὸ τοι]|ο[ῦτ᾽ ἀλ]λὰ καθ᾽ ὁμοιότητα, | καθ᾽ [ἣν οὐ δύ]ναται τὸ μὲν ἐνα[ρ]|γὲς ὑπ[ά]ρ[χει]ν νοεῖσθ᾽ ἢ τοιοῦτο νο|εῖσθαι τὸ [δ᾽ ἄδ]ηλον μὴ ὑπάρχειν | ἢ μὴ τοιο[ῦ]τον, ὥσπερ οὐ δύν[ατ]αι | νοεῖσθ᾽ Ἐπίκουρος μὲν ἄνθρω[π]ος | Μητρόδωρος δ᾽ οὐκ ἄνθρωπ[ος].

Rather, if due to the very removal of the non-evident the evident is removed, the sign-inference is according to elimination; but if it is not due to this but in another way that it is not possible for the one to obtain and the other not to obtain, as for example whenever it is inconceivable that the evident be or be such-and-such and the non-evident not, something of this type is not according to elimination but rather according to similarity, according to which it is not possible for the evident to be thought of as existing, or to be thought of as such-and-such, and the non-evident as not existing, or not as such-and-such, just as it is not possible for Epicurus to be thought of as a human but Metrodorus not as a human.

(*Sign.* 14.11–27)

In T2, Zeno acknowledges the modal condition and claims that there are (at least) two ways of satisfying it: one 'way' ('τρόπον') in which it can turn out to be impossible for one thing to obtain and the other not to obtain is when the condition characteristic of the elimination mode is satisfied ('[…] if due to the very removal of the non-evident the evident is removed […]'); but another way is when the condition characteristic of the similarity mode is satisfied instead ('[…] whenever it is inconceivable that the evident be or be such-and-such and the non-evident not […]'). The example he uses concerns the relation between Epicurus being a human and Metrodorus being a human—a variant of the example used in T1. Although this passage, strictly speaking, concerns sign-inferences rather than conditionals (with 'the evident' and 'the non-evident' in T2 corresponding to 'the first' and 'the second' in T1), it is fair to assume that Zeno would say just the same about the conditionals that belong to the two modes: each kind satisfies the modal condition, but does so in a different way.[32]

[32] In taking Zeno to accept the view that for a conditional to be true (or a sign-inference valid) it must be impossible for its antecedent to be true and consequent false (or for its premises to be true and conclusion false), I side with Barnes (1988: 107–11, 133–4) against Long (1988: 137–40). The latter argues that Zeno and other Epicureans reject this requirement, and that in using unusual expressions such as 'necessitative' ('ἀναγκαστικός') in relation to the similarity mode, they mean to pick out some weaker notion than that of necessitation, e.g. a notion of cogency. My impression is that passages such as T2 tell against this interpretation—although it may well be true that the Epicureans' conception of necessity is substantially different from that of their opponents.

In the context of the Hellenistic debate, then, it looks as if Zeno agrees with the proponents of the *sunartēsis* and *emphasis* accounts in taking Diodorus' account of the truth conditions of conditionals to be inadequate: the modal condition that Diodorus identifies is necessary but not sufficient for the truth of a conditional. As I observed in section 1, one of the obvious weaknesses of the Diodorean account is that it yields the result that a conditional may turn out to be true even when the antecedent is irrelevant to the consequent. For instance, 'If two and two are five, then there is mist on lake Geneva' will turn out to be true, since its antecedent is necessarily false (and hence it is impossible for the antecedent to be true and consequent false); similarly, 'If there is mist on lake Geneva, then two and two are four' will turn out to be true, since its consequent is necessarily true.[33] It would be natural for someone trying to improve on this account to try to identify some relation that rules out such cases of irrelevance; and this is just what the proponents of *sunartēsis* and *emphasis* seem, in part, to have been attempting to do.[34] How do the conditions associated with the Epicurean similarity and elimination modes fare in comparison?

In some respects, these modes are promising. Specifically, each provides a test that seems well suited to ruling out cases of irrelevance. For some conditional to satisfy the condition associated with the similarity mode, the item referred to in its antecedent must be sufficiently similar to that referred to in its consequent that it is unthinkable that the former should have the relevant property and the latter lack it: Plato is sufficiently similar to Socrates that it is unthinkable (allegedly) that Plato should be human and Socrates not. Cases in which the antecedent is irrelevant to the consequent are unlikely to be cases in which the appropriate degree of similarity is to be found. The elimination mode fares well too: for a conditional to satisfy the condition associated with this mode is for, on the hypothesis that its consequent is false, the falsehood of its consequent to imply and explain that of its antecedent. Just like appeal to similarity, appeal to a relation of explanatory priority could plausibly be taken to guarantee relevance. 'If two and two are five, then there is mist on lake Geneva' will surely not satisfy either condition: it is neither the case that there is any appropriate similarity between two and two being five and there being mist on lake Geneva, nor the case that if there were no mist on lake Geneva, this would explain why two and two are not five. So an account that relies on one or other of these conditions might provide a principled basis on which to reject some of the paradoxical conditionals that turn out true on Diodorus' account.

On the other hand, neither mode would look at all promising as a *complete* account of the truth conditions of conditionals. This is obvious in the case of the similarity mode: while there might be some attraction to the idea that the truth of

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[33] Here, I assume that mathematical truths are necessary. The Epicureans of the *De Signis* seem to share this view—cf. *Sign.* 15.13–16.1.

[34] See Barnes (1980: 171–3) and Castagnoli (2009) for the view that *sunartēsis* amounts to a kind of relevance condition, and Weiss (2019) for the view that *emphasis* does.

some conditionals is grounded in facts about similarity, a moment's reflection suffices to show that there are plenty of true conditionals that have nothing to do with similarity. The same is true in the case of the elimination mode: while the fact that the falsehood (by hypothesis) of their consequents would imply and explain that of their antecedents might plausibly be taken to ground the truth of *some* conditionals, it could hardly ground that of all true conditionals. In fact, the law of contraposition itself, the main topic of T1, would already be problematic for such an account. It is plausible to think that 'If there is motion, there is void' satisfies the condition associated with the elimination mode, since—as discussed—it is plausible to think that in the hypothetical scenario in which there is no void, this fact would not just guarantee but also explain why there is no motion. But matters are different when it comes to the contrapositive of this conditional, 'If there is no void, there is no motion'. Suppose that the consequent is false: suppose that it is not the case that there is no motion—suppose, in other words, that there *is* motion.[35] Of course, it follows from this that the antecedent is false too—after all, the existence of void is taken to follow from that of motion. But it is surely not the case that the existence of motion could be appropriately identified as *explaining* the existence of void. Rather, void seems to be better regarded as a precondition for motion: if there is motion, it is *partly because* there is void, rather than vice versa. So any account according to which all and only the conditionals that belong to the elimination mode are true would be one on which the law of contraposition fails: 'If there is motion, there is void' would be true but 'If there is no void, there is no motion' false.

The latter result is surprising, given the dialectical context of T1. After all, the opponents seem to think that the elimination mode is the only acceptable mode of sign-inference, and regard the law of contraposition as providing support for their view—this is the whole basis of the objection to which Zeno is responding.[36] The line of reasoning just presented suggests that the law of contraposition would instead undermine their view. The debate must, therefore, be more complex than I have so far given reason to believe: on this interpretation of the elimination mode, it is hard to make any sense of the opponents' position.[37] But, as I showed in section 2.1, on competing interpretations it is hard to make any sense of Zeno's position. One might suspect that the two sides in the debate are talking past each other and that their apparent agreement on the acceptability of the elimination

[35] For the sake of simplicity, I assume that double negations can be dropped.

[36] This is already apparent from paragraph (i) of T1, where the opponents' argument is presented as purporting to show that 'only' ('μόνον') the elimination mode is 'necessitative' ('ἀναγκαστικόν'). Elsewhere, the association between the opponents and the elimination mode is very close. For instance, at *Sign.* 12.8–11 they are labelled as 'those who philosophize using the mode and way of elimination' ('τ[ῶν] δὲ κατὰ | τὴν ἀνασκε[υ]ὴν τρό[π]ωι [τε καὶ] | ὁδῶι φιλοσοφούντων').

[37] This is not a problem for Zeno, however: he might well think that 'If there is no void, there is no motion' is true for other reasons, since he is not committed to the view that all true conditionals satisfy the condition associated with the elimination mode.

mode masks a deeper disagreement—such as a disagreement as to exactly how the mode should be understood. I cannot resolve these difficulties here.[38]

Instead, I conclude with some general remarks about the Epicurean theory. I have tried to show that there is reason to think that the Epicureans of the *De Signis* are aware of and sympathetic to the view that it is necessary for the truth of a conditional that it be impossible for its antecedent to be true and consequent false, and that like the proponents of *sunartēsis* and *emphasis*, they regard this as not yet sufficient. Broadly speaking, they are engaged in the same task of trying to identify relations stricter than that of mere incompossibility that are to hold between the antecedent and consequent of a true conditional. But there are some respects in which their strategy is quite different. Specifically, they seem to have a piecemeal approach: rather than proposing some single condition that aims to capture all and only true conditionals, they appear to be content to offer a number of different conditions, corresponding to importantly different cases. What emerges from the *De Signis*, then, is a distinctively non-unified theory: some conditionals are true for the reasons specified by the elimination mode; others for those specified by the similarity mode; and in principle, yet further conditionals might be true for yet further reasons.[39]

It is hard to know what to make of this. One possibility is that it is simply the result of the poor state of our evidence: perhaps there *is* a unified Epicurean theory in the background, and perhaps it was even discussed in the *De Signis*—but it just happens not to have come up in the surviving 38 columns. Alternatively, perhaps this is indicative of the Epicureans' instrumental and pragmatic approach to epistemology and logic, an approach encapsulated by their use of the term 'canonic' (since the Greek word 'κανών' would otherwise standardly be used of a carpenter's straightedge or rule). Perhaps they simply had no interest in giving a complete account of the truth conditions of conditionals, but were content to identify certain kinds of conditionals that they could rely on in certain contexts,

[38] This line of thought raises questions about the origin and status of the elimination mode: whose mode is it originally, and why do both sides in the debate seem to regard it as acceptable? One popular view among commentators is that the opponents are Stoics and the elimination mode simply Chrysippean *sunartēsis* in disguise (possibly misunderstood to some degree by the Epicureans): see, e.g., Sedley (1982: 240–56) and Allen (2001: 201–26). On this interpretation, the Epicurean endorsement of the elimination mode is a substantial concession. An alternative view is that the elimination mode is a genuine part of the Epicurean theory; on this interpretation, the opponents might be endorsing it merely as the aspect of the Epicurean position that strikes them as more or less on the right lines (although their own account would have been formulated differently). My impression is that the general tenor of passages such as T1 and T2 speaks in favour of the second interpretation, as does the use of the classically Epicurean 'If there is motion, there is void' as the key example associated with the elimination mode, but more argument would be needed to settle the issue. See Manetti and Fausti (2022: 260–79) for helpful discussion.

[39] Here, I disagree with Allen (2001: 214–20), who takes the Epicureans to be committed to the view that all and only true conditionals satisfy the inconceivability condition associated with the similarity mode. I cannot do justice to his interpretation here—but simply remark that it sits uneasily with T1 and T2, where Zeno seems to describe conditions characteristic of the two modes as capturing *different* sets of conditionals.

taking deeper questions about semantics to be idle and the preserve of dialecticians.[40] On this interpretation, Cicero's view that they are not to be regarded as serious logicians would not be too far off the mark.

There is a third possibility, the most philosophically interesting. Perhaps neither of the above options is correct: perhaps the theory that emerges from this passage *is* representative of their considered view, and perhaps it *is* intended as a substantive contribution to the controversy about the truth conditions of conditionals. On this line of thought, these Epicureans would have had some principled reason for thinking that a unified account would be inappropriate in this context: they would have been able to defend the view that different explanations for the truth of a conditional are appropriate in different cases, and that it would be a mistake to try to give a single criterion to cover all. Methodologically, this stance would be reminiscent of their approach in physics, where Epicurus is associated with the so-called 'method of multiple explanations', according to which it is often inappropriate to decide between competing accounts of some natural phenomenon.[41] The Epicureans would turn out to have an unusual and distinctive position in the context of the Hellenistic debates about the truth conditions of conditionals, as proponents of a kind of logical pluralism. Sadly, the remnants of the *De Signis* provide few clues as to how they might have defended such a position.[42]

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[40] Diogenes Laertius reports that Epicureans regarded dialectic as 'superfluous' ('παρέλκουσαν'): see DL 10.31 and, for discussion, Sedley (2018).

[41] The idea is that a number of different explanations might simultaneously be true of a certain kind of phenomenon—or perhaps that each of them is true in at least one of the infinitely many worlds (κόσμοι) in the universe. The method is presented by Epicurus at *Ep. Hdt.* 78–80 and *Ep. Pyth.* 85–88, and can then be seen at work for much of the *Letter to Pythocles*. For discussion, see Striker (1996: 45–8), Hankinson (2013), Verde (2013), Masi (2014), and Bakker (2016: ch. 2), *inter alia*.

[42] Predecessors of this paper were presented to audiences in London and Oxford. I am grateful to those present for their helpful questions, suggestions, and criticisms.

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