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THE TRADITION OF GREEK ARITHMOLOGY

BY FRANK EGGLESTON ROBBINS

The problem attacked in the following pages is the determination of the sources and relationships of the ancient arithmological writings, including principally those of Varro, Philo, Nicomachus, Theon of Smyrna, Anatolius, the compiler of the *Theologumena Arithmeticae*, Chalcidius, Macrobius, Martianus Capella, Favonius Eulogius, and Johannes Laurentius Lydus. The difficulty of the problem, the necessity of hypothetical reasoning, and the ease with which error may be committed are acknowledged at the outset.

The situation presented by the above-mentioned writings much resembles that seen in the Synoptic Gospels, and methods similar to those used by New Testament critics should be employed in its elucidation. Whole passages of one author are repeated in one or more others, and the topics of arithmology are so frequently paralleled that to determine the exact provenance of any one may be well-nigh impossible. The problem therefore has to be handled in a large way and the main currents of influence determined, a thing which the previous essays in this field¹ have not satisfactorily done. They have, moreover, without exception followed Schmekel in regarding

¹ The following are most frequently referred to: A. Schmekel, *Die Philosophie der mittleren Stoa in ihrer geschichtlichen Entwicklung*, Berlin, 1892; G. Borghorst, *De Anatolii fontibus*, Berlin, 1905; G. Altmann, *De Posidonio Timaei Platonis commentatore*, Berlin, 1906; B. W. Switalski, "Des Chalcidius Kommentar zu Platos Timaeus," *Beiträge z. Gesch. d. Phil. d. Mittelalters*, III (Münster, 1902), 6; F. Skutsch, "Zu Favonius Eulogius und Chalcidius," *Philologus*, LXI (1902), 193 ff.; C. Fries, "De M. Varrone a Favonio expresso," *Rheinisches Museum*, N.F., LXVIII (1903), 115 ff.

Posidonius as the universal source of arithmology—an error, as I have shown elsewhere.¹

The results won in the previous paper may serve as a starting-point for the present inquiry; namely, that Posidonius was not the author of the arithmology seen in Philo, Theon, and the rest, but quoted from an already existing arithmological work, the introduction of which Sextus Empiricus reproduces quite fully in *Adv. math.* iv. 2 ff., Anatolius and Theon in abridged form, and other parts of which were used by many authors. The existence of this work, at least, is proven, and if it be granted that Posidonius quoted it, it existed before his time, that is, by the last half of the second century B.C. For the reasons collected in the former article and for others that may appear later, the writer is ready to abandon the noncommittal attitude previously adopted and to believe that he actually did quote it, as Sextus Empiricus *Adv. math.* vii. 91 ff. shows. Since this document was so universal a source for later writers, it will for convenience be referred to as S (“source”).

Anatolius² and Theon³ give the best idea of the character of S, preserving as they do its introduction and a considerable part of its ten chapters on the numbers of the first decade. Since any reader can see in a moment that they ultimately come from a common ancestor,⁴ this will be assumed without argument. These two writers, in fact, may be used as a sort of standard for judging whether others have drawn upon S. It may safely be believed that material common to both of them is from S; if we find the same matter in other writers, they also derived it from S. If certain other writers,

¹ “Posidonius and the Sources of Pythagorean Arithmology,” *Classical Philology*, XV (1920), 309–22.

² Ed. J. L. Heiberg, *Annales internationales d'histoire, Congrès de Paris, 1900, 5^e section, Histoire des sciences*, Paris, 1901, pp. 27 ff. Anatolius is also extensively quoted in the *Theologumena Arithmeticae* (ed. Ast, 1817).

³ *Expositio rerum mathematicarum ad legendum Platonem utilium*, ed. E. Hiller, Leipzig, 1878.

⁴ Except in one place, to be discussed below, these two are never at variance in making different statements about the same topic; one of them, however, usually Anatolius, may present topics which the other omits. Anatolius' treatise is apparently a set of notes for the use of students, hence a mere outline, devoid of literary elaboration. Theon's too is greatly condensed but somewhat more elaborate rhetorically; he is apt to say more about a given topic than Anatolius, while the latter preserves many more topics than Theon. Some of Anatolius' material, not found in Theon, is perhaps not from S; but this forms no great part of the whole.

of whom it is thus known that they used S as a source, parallel material in Anatolius not attested by Theon, this too may be claimed for S, and so, when reasonable presumptions have thus been created, the circle of the influence of S may be enlarged and defined.

I do not, however, intend to point out all the S material that can be identified in ancient literature, but will turn to the real point at issue, the method of transmission of S material.

Very little inquiry shows that Theon and Anatolius both present S in an abridged form. Philo, who in the *De mundi opificio* certainly used S, has in cc. 30-42 of that work a treatment of the number 7 which in general agrees throughout with Anatolius, the latter here as usual being more voluminous than Theon. Philo's account, however, is far longer even than Anatolius', containing many more topics and saying more about each one; yet probably every one of these topics, whether or not paralleled by Anatolius, is from S; the exceptions are certainly very few. This is proved by the fact that practically all of them are found, in connection with S material, in still other writers, Lydus¹ in particular showing a close likeness to Philo. But though Philo's chapters give us our best idea of the original text of S, still even they are abridged, for they omit several topics which must certainly be referred to the anonymous source because of their occurrence in several of the writers of our group.² Evidently some had only abridged versions of S, while others used full or but slightly abridged texts.

Among the descendants of S, Philo, as far as the *De mundi opificio* is concerned, Anatolius, and Lydus give evidence of forming a closely related group. Theon, as far as he goes, generally agrees with them, but he differs from them radically in the insertion in the seventh chapter of a block of material, set in a context showing the closest agreement with Anatolius, but differing wholly from the pronouncements of the three first mentioned upon the same subject, the control exercised by the number 7 over birth and the "ages of man." It will later be seen that by agreeing here with Theon rather than with Anatolius, Philo, and Lydus, a group including Chalcidius,

¹ *De mensibus* ii. 12.

² E.g., the 7 numbers used in Plato's *Timaeus*, and the flow of *euripi*, both to be found in Theon, Anatolius, and Lydus.

Capella, Favonius, and others show that they belong to the subfamily of which Theon is an example; but we must first examine certain peculiarities shared by Philo and Lydus which prove that they are more closely related to each other than to Anatolius.

Most important for this purpose is the following passage¹ dealing with the number 7:

Philo *De mundi officio* c. 33:
 τοσοῦτο δὲ ἐν ἑβδομάδι πέφυκεν εἶναι τὸ ἱεροπρεπὲς ὥστε ἐξαιρετον ἔχειν λόγον παρὰ τοὺς ἐν δεκάδι πάντας ἀριθμούς· ἐκείνων γὰρ οἱ μὲν γεννώσι οὐ γεννώμενοι, οἱ δὲ γεννῶνται μὲν, οὐ γεννῶσι δε, οἱ δὲ ἀμφοτέρα καὶ γεννώσι καὶ γεννῶνται· μόνη δὲ ἑβδομάς ἐν οὐδενὶ μέρει θεωρεῖται. . . . δι' ἣν αἰτίαν οἱ μὲν ἄλλοι φιλόσοφοι τὸν ἀριθμὸν τοῦτον ἐξομοιοῦσι τῇ ἀμήτορι νίκη καὶ παρθένῳ, ἣν ἐκ τῆς τοῦ Διὸς κεφαλῆς ἀναφανῆναι λόγος ἔχει, οἱ δὲ Πυθαγόρειοι τῷ ἡγεμόνι τῶν συμπάντων. τὸ γὰρ μήτε γεννῶν μήτε γεννώμενον ἀκίνητον μένει· ἐν κινήσει γὰρ ἡ γένεσις, ἐπεὶ καὶ τὸ γεννώμενον οὐκ ἀνεκινήσεως, τὸ μὲν

Lydus *De mensuris* ii. 12
 (Wünsch):
 οἱ γε μὴν Πυθαγόρειοι τῷ ἡγεμόνι τοῦ παντός τὴν ἑβδομην ἀνατίθενται, τουτέστι τῷ ἐνί, καὶ μάρτυς Ὁρφεὺς λέγων οὕτως, Ἐβδόμη, ἣν ἐφίλησεν ἄναξ ἐκάεργος Ἀπόλλων ὀρθῶς οὖν ἀμήτορα τὸν ἑπτὰ ἀριθμὸν ὁ Φιλόλαος προσηγόρευσε· μόνος γὰρ οὐτε γεννᾶν οὐτε γεννᾶσθαι πέφυκε· τὸ δὲ μήτε γεννῶν μήτε γεννώμενον ἀκίνητον· ἐν κινήσει γὰρ ἡ γέννησις, τὸ μὲν ἵνα γεννήσῃ, τὸ δὲ ἵνα γεννηθῇ, τοιοῦτος δὲ ὁ θεός, ὡς καὶ αὐτὸς ὁ δῆτωρ ὁ Ταραντῖνος. φησὶ δὲ οὕτως· Ἔστι γὰρ ἡγεμὼν καὶ ἀρχὼν ἀπάντων κτλ.
 Philo *Leg. all.* i. 5:
 κατὰ τινα λόγον οἱ ἐντὸς δεκάδος ἀριθ-

Anatolius, p. 35, 6 ff.:
 ἑβδομάς μόνη τῶν ἐντὸς δεκάδος οὐ γεννᾶ οὐδὲ γεννᾶται ὑπ' ἄλλου ἀριθμοῦ· πλήν ὑπὸ μονάδος· τῶν Πυθαγορείων παρθένος ἀμήτωρ. τῶν δὲ ἄλλων τῶν ἐντὸς δεκάδος ὁ μὲν δ' ὑπὸ δυάδος γεννᾶται, γεννᾶ δὲ σὺν τῇ αὐτῇ τὸν ἧ', κτλ.

Theon, p. 103
 (Hiller):
 μόνος γὰρ τῶν ἐντὸς τῆς δεκάδος οὐτε γεννᾶ ἕτερον οὐτε γεννᾶται ὑφ' ἐτέρου· διὸ καὶ Ἀθηναῖοι ὑπὸ τῶν Πυθαγορείων ἐκαλείτο, οὐτε μητρός τιος οὐσα οὐτε μήτηρ. οὐτε γὰρ γίνεται ἐκ συνδυασμοῦ οὐτε συνδυάζεται τι. τῶν γὰρ ἀριθμῶν τῶν ἐν τῇ δεκάδι οἱ μὲν γεννώσι τε καὶ γεννῶνται, ὡς ὁ δ' ἡγεμὼν μὲν μετὰ δυάδος τὸν ἧ', γεννᾶται δὲ ὑπὸ δυάδος, κτλ.

Chalcidius, c. 36
 (p. 102, 6 ff., Wrobel):
 . . . itaque omnibus partim nascentibus, partim parientibus, partim et nascentibus et parientibus, solus septenarius numerus neque ex duplicatione aliterius nascitur

¹ Cf. also Hierocles *In carm. aur. ap. Mullach, FPG*, Vol. I, p. 465; schol. cod. Laur. in *Met.* 985 b 23; Alexander in *Met.* 985 b 26; Isidore, Capella, Favonius; *Theologiae Arithmeticae*, p. 44 Ast; Anon. *Prol. in introd. arith. Nicomachi ap. Tannery, Diophantus*, Vol. II, pp. 73 ff.

Philo:

ἵνα γεννήσῃ, τὸ δὲ
ἵνα γεννηῖται· μόνον
δὲ οὔτε κινοῦν οὔτε
κινούμενον ὁ πρεσβύ-
τερος ἄρχων καὶ
ἡγεμών, οὐ λέγεται
ἂν προσηκόντως εἰ-
κῶν ἑβδομάς. μαρ-
τυρεῖ δὲ μου τῷ
λόγῳ καὶ Φιλόλαος
ἐν τούτοις. Ἔστι
γάρ, φησὶν, ὁ ἡγε-
μῶν κτλ.

Lydus:

μοὶ γεννῶνται ἡ γεν-
νώσι τοὺς ἐντὸς
δεκάδος καὶ αὐτήν.
ἡ δὲ γε ἑβδομάς
οὔτε γεννᾷ τίνα τῶν
ἐντὸς δεκάδος ἀριθ-
μῶν οὔτε γεννᾶται
ὑπὸ τινος, παρ' ὃ
μιθεύοντες οἱ Πυθα-
γόρειοι τῇ ἀειπαρ-
θένῳ καὶ ἀμήτορι
αὐτῇ ἀπεικάζουσιν,
ὅτι οὔτε ἀπεκνήθη
οὔτε ἀποτέξεται.

Anatolius:

Theon:

nec infra decu-
manum limitem
parit quemquam.
propterea que
Minerua est a
ueteribus cogno-
minatus, item ut
illa sine matre
perpetuoque
uirgo.

It is evident that, however differently they present it, Philo and Lydus drew from the same source, and that this contained matter not available for the others cited; indeed this ascription of 7 to the "leader of the universe" is unparalleled among the arithmologists. Let us, however, observe three points on which Philo and Lydus disagree: (1) Philo says the "other philosophers" identified 7 with Athena, Lydus does not mention the "others"; (2) Lydus quotes "Orpheus,"¹ Philo does not; (3) Lydus says that Philolaus called 7 "motherless," Philo does not, but ascribes the epithet, if to anyone, to the "others," who called 7 "motherless, virgin Victory."

Since the contexts of both of these passages in Philo and Lydus so closely resemble Theon, Anatolius, and others that their derivation from S is unquestionable, it is hard to deny that, in some form, the identification with the "leader" occurred in the version of S used by them both; I am not sure, however, that either reports accurately what was there. On the first point, for instance, all the other arithmologists of the S family agree that the *Pythagoreans* called 7 Athena, thus flatly contradicting Philo. In fact, not even Lydus supports Philo in his assertion; he stands alone. As to the second point, the quotation of "Orpheus" may or may not be an interpolation

¹ Doubtless the ὕμνος εἰς ἀριθμὸν ascribed to him; cf. Delatte, "Études sur la littérature pythagoricienne," *Bibl. de l'école des hautes études*, fasc. 217, Paris, 1915, pp. 208 ff.

of Lydus or his immediate authorities; it is of little significance.¹ In the third disagreement Lydus is probably at fault; the epithet "motherless" has been taken from its true context, the reference to Athena, and applied to the "leader." If an explanation may be conjectured, the source probably did contain the quotation of Philolaus, associating 7 with the "leader," and the identification with Athena as well, with reference to which, indeed, the whole argument that 7 does not generate and is not generated must have been framed. Philo, a Hebrew and a monotheist, has preferred to give undue prominence to Philolaus' dictum as the Pythagorean teaching, because it suits his religious philosophy; in Lydus the vicissitudes of transmission have probably brought about the confusion of his report. The identification with Athena, however, has survived in the majority of S documents because it was the central identification of this chapter in the original.

The essential fact gained is that Philo and Lydus depend on sources closely allied and fuller than those of Anatolius and the others, and this leads to another problem. When the arithmologists are examined side by side it is found that Lydus frequently has topics verbally identical with passages in good representatives of S imbedded in contexts which cannot be paralleled in these authors, but which sometimes can be paralleled in parts of the Philonic corpus outside of the *De mundi opificio*, notably the *Quaestiones et solutiones in Genesim et Exodum*.² The chief anomaly lies in the fact that in

¹ Quotations, especially of the Pythagorean pseudepigrapha, are characteristic of Lydus; he cites among others Philolaus, ὁ Χαλδαῖος, μυστικὸς λόγος, τὰ λόγια, Homer, Parmenides, Ocellus, Pythagoras, Archytas, Pherecydes, Proclus, and Hippocrates. Some of these were evidently not in S, but S had some such quotations, e.g., the instances above; Hippocrates and Solon (Anatolius, p. 37, Philo *De mundi opificio* cc. 35, 36; Censorinus *De die nat.* 14. 3-4; Clem. Alex. *Strom.* vi. xvi. 144. 4 ff.); Philolaus and Archytas in Theon, p. 106, 7 ff. Since S must in the first place have been compiled from such sources, citations of them, preserved to varying degrees, must be expected among their descendants.

² In Lydus *De mensibus* portions of the following deal with arithmology: i. 11, 15, 17; ii. 4-12; iii. 4, 9, 10, 14; iv. 7, 22, 64, 76, 88, 97, 111, 122, 125, 162. In Philo, outside of *De mundi opificio*, are *Leg. all.* i. 2, 4, 5; *De plant. Noe* 18, 29, 32; *De migr. Abr.* 36; *Quis rer. div. heres* 35, 44; *De cong. erud. grat.* 17 ff.; *De mut. nom.* 1; *De sept.* 1, 2, 6, 18, 19, 21; *De vit. cont.* 8; *Quaest. et sol in Gen.* i. 83, 91; ii. 5, 12, 14, 17, 32; iii. 38, 39, 49, 56, 61; iv. 8, 27, 71, 110, 151, 154, 164; *Quaest. et sol. in Exod.* i. 9; ii. 61, 78, 84, 87, 93, 94, 97, 99, 100; *De vit. Mos.* iii. 4, 5, 11; *De dec. orac.* 6, 7, 8, 21. Parallels with *Qu. in Gen.* iii. 38; ii. 12; iv. 110; iv. 8; iii. 61; and ii. 5 are given in

the *De mundi opificio* Philo's arithmology consistently agrees with known representatives of S, like Anatolius;¹ whereas in this series of passages he does not—at least not closely; at the same time they are so like Lydus that community of source is beyond question, and in Lydus the doubtful parts are knit closely into contexts undoubtedly influenced by S. Do these peculiar passages of Philo and Lydus, then, come from a second source common to both, or may they also be claimed for S? The following examples furnish some basis for argument:

Philo <i>De mundi opificio</i> 3:	Lydus <i>De mensibus</i> ii. 11, p. 32, 4 ff. (Wünsch):	Anatolius, p. 34, 6 ff.:	Theon, p. 102, 4 ff.:	Capella vii. 736, pp. 260, 21–261, 2 (Eysenhardt):
<p>ἐξ δὲ ἡμέραις δημιουργηθῆναι φησι τὸν κόσμον οὐκ ἐπειδὴ προσεδείτο τοῦ χρόνων μήκους ὁ ποιῶν . . . ἀλλ' ἐπειδὴ τοῖς γινόμενοις ἔδει τάξεως. τάξει δὲ ἀριθμὸς οἰκείον, ἀριθμῶν δὲ φύσεως νόμοις γεννητικώτατος ὁ ἐξ.</p>	<p>ὁ γὰρ ἐξ ἀριθμὸς γεννητικώτατος ἐστιν</p>			
Philo, <i>Qu. in Gen.</i> iii. 38: quia . . . sex . . .				

this paper, and are the closest literal parallels to be found; there are other parallels in sense. In Lydus' great arithmological passage, ii. 4–12, the following lines (Wünsch's edition) are most obviously from S: pp. 23, 7–8, 22–24, 14; 25, 15–16; 28, 8–10; 30, 8–16; 31, 8–9, 12–13; 32, 4–14; 33, 8–10, 14–34, 3; 34, 9–36, 9. Elsewhere there is certainly S material in iii. 4, p. 38, 17–22; iv. 64, p. 115, 3–9, 14–17, and probably more, as only passages showing literal agreement with Philo and Anatolius are here listed. A notable parallel not cited below is between Lydus iv. 111, p. 150, 11 ff., and Philo *Qu. in Gen.* iii. 49 *tertio compositio octavi*, etc.

¹ On the monad Philo says little in *De mundi opificio* but his remark in c. 9 that the first day was called "one," not "first," should be compared with Lydus ii. 4, p. 21, 9–10. The account of 4 agrees closely with Anatolius (cf. also Theon, and Lydus iv. 64); the short statement about 5, c. 20, agrees with Lydus ii. 10, p. 31, 12 f.; on 6 see c. 3 below; cc. 30–42, on 7, agree throughout with Anatolius, Theon, and Lydus; on 10 cf. part of c. 15 with Anatolius and Lydus iii. 4. The other numbers are not treated.

Philo:	Lydus:	Anatolius:	Theon:	Capella:
<p>primus est perfectus numerus, par suis partibus,¹ et primus par impar, acceptans aliquid etiam de causa effectiva secundum redundantem atque ex materiali et affectiva secundum parem: quare et inter maiores antiquissimos nonnulli matrimonium, alii harmoniam illum dixere.²</p>	<p>ὡς ἀρτιοπέριττος, μετ᾽ ἔχων καὶ τῆς δραστηκῆς οὐσίας κατὰ τὸν περιττὸν καὶ τῆς ὄλικῆς κατὰ τὸν ἄρτιον·</p> <p>ὅθεν καὶ οἱ ἀρχαῖοι γάμον καὶ ἀρμονίαν αὐτὸν ἐκάλεσαν.</p>			
<p><i>De mundi orificio</i> (continued):</p>				
<p>τῶν τε γὰρ ἀπὸ μονάδος πρῶτος τέλειός ἐστι, ἰσοῦμενος τοῖς ἑαυτοῦ μέρεσι καὶ συμπληρούμενος³ ἐξ αὐτῶν ἡμίσεως μὲν τριάδος, τρίτου δὲ δυνάδος, ἔκτου δὲ μονάδος. καὶ ὡς ἔπος εἰπεῖν ἄρρην τε καὶ θῆλυς εἶναι πέφυκε</p>	<p>τῶν γὰρ ἀπὸ μονάδος μόνος τέλειός ἐστι τοῖς αὐτοῦ μέρεσι, συμπληρούμενος ἐκ τῶν αὐτῶν, ἡμίσεως μὲν τριάδος, τρίτου δὲ δυνάδος, ἔκτου δὲ μονάδος. καὶ ἀπλῶς εἰπεῖν ἄρρην τε καὶ θῆλυς εἶναι πέφυκεν, ὡς καὶ αὐτῇ Ἀφροδίτῃ τὴν τοῦ ἄρρενος</p>	<p>ἐξὰς πρῶτος τέλειος ἀριθμὸς, τοῖς γὰρ αὐτῆς μέρεσιν ἀριθμεῖται, α' β' γ', ἃ ποιεῖ τὸν ζ'. ἀπαξ ζ' ζ' δις γ' ζ'. τρις β' ζ'. πρῶτος συγκείται ἐξ ἡμίσεως τρίτου ἔκτου τετραγωνιζόμενος περιέχει αὐτὸν . . .</p>	<p>ὁ δὲ ζ' τέλειος· (Cf. Censorinus <i>De die nat.</i> 11. 4: nec immerito senarius fundamentum gignendi est;⁴ nam eum teleion Graeci, nos autem perfectum uocamus, quod eius partes tres, sexta et tertia et dimidia, id est I et</p>	<p>senarius uero perfectum analogicumque esse quis dubitet, cum suis partibus impleatur? nam et sextam sui intra se continet quod est unus, et tertiam quod duo, et medietatem quod tres. . . . hic autem numerus</p>

¹ Cf. also Macrobius *Comm. in somn. Scip.* i. 6. 12-13; Favonius; Isidore; *Theol. Arith.*, p. 36, bottom; Philo *Leg. all.* i. 2.

² Philo *Qu. in Gen.* iii. 49: ". . . quod ueracissime quidam uocant harmoniam uel matrimonium."

³ Fries, *op. cit.*, regards it as important that both Capella and Favonius use forms of *-plere*. To judge from Philo, S originally had a double form (*ισοῦμενος . . . καὶ συμπληρούμενος*), the latter part being transmitted in the branch to which Capella and Favonius belong. Theon does not have it because he has only the second occurrence of this topic. Cf. also Lydus iv. 88, p. 136, 17 ff.

⁴ This shows that Censorinus' sources had *γεννητικώτατος* or something like it.

⁵ Nicomachus *ap. Photius cod.* 187 has this topic.

Philo:	Lydus:	Anatolius:	Theon:	Capella:
<p>καὶ ἐκ τῆς ἑκατέρας δυνάμεως ἤρμονται ἄρρεν μὲν γὰρ ἐν τοῖς οὖσι τὸ περιττόν, τὸ δὲ ἄρτιον θῆλυ. περιττῶν μὲν οὖν ἀριθμῶν ἀρχὴ τριάς, δυὰς δὲ ἀρτίων, ἡ δ' ἐπ' ἀμφοῖν δύναμις ἐξάς.</p>	<p>τὴν τε τοῦ θήλεος ἔχουσα φύσιν, καὶ διὰ τοῦτο παρὰ τοῖς θεολόγοις ἀρρενόθηλος καλουμένη. καὶ ἄλλος φησὶν ὁ ἐξ ἀριθμὸς ψυχογονικός ἐστίν, κτλ. (The rest bears no resemblance to the other authors quoted.)</p>	<p>ἐξ ἀρτίου καὶ περιττοῦ τῶν πρώτων ἄρρενος καὶ θήλεος, δυνάμει καὶ πολλαπλασιασμῷ γίνεται, διὸ καὶ ἀρρενόθηλος καὶ γάμος καὶ ἀρτιοπέρισσος καλεῖται. κέκληται δὲ γάμος διότι αὐτὸς μὲν τοῖς ἑαυτοῦ μέρεσιν ἐστὶν ἴσος, ὡς δέδεικται, καὶ γάμου ἔργον τὸ ὅμοια ποιεῖν τὰ ἔκγονα τοῖς γονεῦσι. (The remainder agrees closely with Theon.)</p>	<p>II et III, eundem ipsum perficiunt.) ἐπειδὴ τοῖς αὐτοῦ μέρεσιν ἐστὶν ἴσος, ὡς δέδεικται, διὸ καὶ γάμον ἐκάλουν αὐτὸν ἐπεὶ γάμου ἔργον ποιεῖ ὅμοια τὰ ἔκγονα τοῖς γονεῦσι. (The remainder agrees closely with Anatolius.)</p>	<p>Ueneri est attributus quod ex utriusque sexus commixtione conficitur, id est, ex triade qui mas quod impar est numerus habetur, et dyade quae femina paritate; nam bis terni sex facit.</p>

Here, the statement that 6 is *γεννητικώτατος*, in Philo and Lydus but not in the others,¹ is associated, in Philo directly with S material paralleled by Anatolius *et al.*, in Lydus with the same material, but after the intervention of a passage the agreement of which with *Quaest. in Gen.* iii. 38 could not be closer. In view of the occurrence of *γεννητικώτατος* in both Philo and Lydus, in an S context, and because of the difficulty of wrenching away what follows in Lydus, confirmed as it is by *Quaest. in Gen.* iii. 38 (itself somewhat resembling S material), the best judgment, I think, will decide that the whole passage of Lydus and *Quaest. in Gen.* iii. 38 both come from S, and

¹ Except, perhaps, Censorinus.

show again that Philo and Lydus possessed a particularly voluminous source.

Note also the evidences of special relationships. The parallel *ὡς ἔπος εἰπεῖν—ἀπλῶς εἰπεῖν* in Philo and Lydus is most remarkable; that in the words *ὡς δέδεικται* used by both Anatolius and Theon equally so. In Anatolius they refer to the first occurrence of the topic at the beginning of the chapter; Theon, however, has omitted this mention of the topic and has given only its second occurrence, unnecessarily including *ὡς δέδεικται*, unless this is regarded as a reference to another part of his book.¹ To me, however, it seems to be another example of agreement between these two upon the merest matters of detail, comparable to the use by both of the words "as the diagram shows" in the fifth chapter.² However else they differ, such things show Theon and Anatolius to be extremely closely related.

The passage above may also be used to show that Philo is not the source of Lydus; the detail about Aphrodite, not in Philo, but in Lydus, is also seen in its proper connection in Capella, which testifies to its presence in the original source. Philo, as a Jew, would have none of it, and Lydus cannot have taken it from him. There is no reason to believe that Philo would have included it in his lost *Περὶ ἀριθμῶν*,³ and that this was Lydus' source.

The following series of passages shows a similar situation:

Lydus ii. 7:	Philo, <i>Quaest. in Gen.</i> ii. 12:	Anatolius, p. 30, 23 ff.:	Theon, p. 100, 10 ff.:
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. . . ἀπὸ τοῦ
ἀρτίου καὶ ἑλικοῦ
ἀριθμοῦ· τὸ γὰρ
ἄρτιον μέσον δι-
ασπᾶται διαιρούμε-
νον τοῦ ἑνός· μόνος
δὲ ἀδιαίρετος ὁ
περιττός. ὁ μὲν
γὰρ ἄρρη ἀριθμὸς
τετράγωνος, αὐτῆ
καὶ φῶς, ἐξ ἰσότητος
πλευρῶν συνεστῶς·

¹ It could refer to the incidental remark at p. 101, 7, or to p. 45, 11 ff.

² Theon, p. 101, 19, *ὡς δηλοῖ τὸ διάγραμμα* = Anatolius, p. 34, 4. Perhaps the most notable agreement is in the introduction to their arithmologies.

³ Cf. *Classical Philology*, XV, 320, n. 4.

Lydus:

ὁ δὲ θῆλυς ἑτερομήκης, νύκτα καὶ σκότον ἔχων διὰ τὴν ἀνισότητα· ὁ δὲ ἑτερομήκης τὴν μὲν ἐλάττονα πλευρὰν ἐλάττονα ἔχει ἐνί, τὴν δὲ μείζω περιτοτέραν ἐνί. ὥστε ὁ δύο ἀριθμὸς οὐ καθαρὸς, πρῶτον μὲν ὅτι κενὸς ἐστὶ καὶ οὐ ναστός,¹ τὸ δὲ μὴ πλήρες οὐ καθαρὸν, ἀρχὴ δὲ ἀπειρίας καὶ ἀνισότητος· ἀπειρίας μὲν διὰ τὴν ὕλην, ἀνισότητος δὲ διὰ τοὺς ἑτερομήκεις· ὅθεν οἱ παλαιοὶ ὡς ὕλην καὶ ἑτερότητα τὴν δυάδα παραλαμβάνουσι. τόλμαν δὲ καὶ οἱ περὶ Φερεκύδην ἐκάλεσαν τὴν δυάδα, καὶ ὄρμην καὶ δόξαν καλοῦσιν, ὅτι τὸ ἀληθὲς καὶ ψευδὲς ἐν δόξῃ ἐστὶ. πανσόβητος γὰρ ἡ ὕλη κτλ.

Philo:

numerus autem binus non mundus; primum quia vacuus est, non densus; quod autem non est plenum neque mundum est. praeterea quod est etiam initium infinitae immensitatis propter materiam. necnon inaequalitate laborat ob ceteros longos (numeros). nam qui a duobus in duplicem augentur omnes alii longi sunt. atqui inaequale non est mundum, sicut neque materiale, sed quod ab illo est fallibile est et incomptum. . . .

Anatolius:

ἔχει τὸ ἀνάλογον τῇ ὕλη καὶ παντὶ αἰσθητῷ. εἰκαζον αὐτὴν ἐν ἀρεταῖς ἀνδρείᾳ· προβέβηκε γὰρ ἤδη· διὸ καὶ τόλμαν ἐκάλουν καὶ ὄρμην καὶ δόξαν δὲ ὠνόμαζον, ὅτι τάληθες καὶ ψεῦδος ἐν δόξῃ. . . .

Theon:

καθ' ἣν ὕλη καὶ πᾶν τὸ αἰσθητόν. . . .

In the beginning of the chapter on 2 Anatolius has several topics not represented by anything that Lydus says. The latter, then, if he is using material from S, begins at some point in the middle of the chapter. Now we have seen in a previous instance how Anatolius summarized in one or two words all that Philo and Lydus said about the topics *ἀρτιοπέριττος* and *ἀρσενόθελυς*, where

¹ Philo *Qu. in Exod.* ii. 100: “. . . ternio est condensus plenusque numerus, nullam habens uacuitatem, sed quicquid in dualitate discerptum erat adimplens.” This passage is so similar in character that there need be no hesitation in pronouncing it based on something in S. Cf. Favonius’ remark on 5, “constat hic ex pleno et non pleno, tribus uidelicet et duobus.”

they were drawing upon a version of S fuller than his; it is a tempting conjecture that he has done the same with the topic $\epsilon\lambda\eta$ here, which Lydus and Philo have preserved more nearly in full; and again, the use by Lydus of unquestionable S material in the context, and the support of Philo, lend color to the assumption. Perhaps—but this is not so certain—Lydus represents S even in what follows the quotation given and Anatolius, supported by Theon, gives a rough summary. For the portions quoted, at any rate, we probably rightly assert that their source was S.

From the material quoted or cited above it is clear that Lydus utilized an S source of a form closely resembling that of Philo's, and more voluminous than the source of Anatolius and Theon, and finally, since we see that Philo and Lydus, when they agree in material not found in Theon and Anatolius, are often merely following their more comprehensive source, it becomes probable that even when the fact cannot be proved by Philonian parallels Lydus may sometimes be quoting S. For many passages, of course, this cannot be claimed, but for a considerable part of that section into which the bulk of his arithmology is collected, *De mensibus* ii. 4–12, the statement should hold. For there are, in the first place, close verbal agreements throughout this section with the best representatives of S, Philo, Theon, and Anatolius,¹ as well as others, only slightly less significant, with Philo outside the *De mundi officio* and with the *Theologumena Arithmeticae*,² furthermore, it is hardly questionable that if S was the source of part of this section—as we know it was—its influence extended over the whole. Most important of all, in the one place where Lydus can be compared with a practically unabridged S text, that is, in the discussion of 7, where Philo can be used,³ it is seen that Lydus employed very little other than S material.⁴ In

¹ These are cited above, p. 102, n. 2.

² E.g., cf. Lydus, p. 23, 7 ff., with Philo *Qu. in Gen.* iv. 110, and with both cf. the statements of Capella and Favonius about the monad; p. 25, 12 ff., with Philo *ibid.* iv. 8 and *Theol. Arith.*, p. 16; p. 28, 8 ff., with Philo *loc. cit.* and *Theol. Arith.*, p. 8; p. 26, 13 ff., with *Theol. Arith.*, p. 15; p. 26, 18 ff., with *Theol. Arith.*, p. 16; p. 27, 1 ff., with *Theol. Arith.*, p. 13; p. 31, 8, with Anatolius and Favonius on the pentad, Macrobius i. 6, 18, Capella vii. 735, [Plut.] *Epit.* iii. 14. 1, Philo *De mundi opif.* 20.

³ *De mensibus* ii. 12 and *De mundi opif.* 30–42.

⁴ Generally there is close correspondence throughout these passages, but Lydus does not preserve as many topics as does Philo, nor at such length. In some places, however, by giving something lost by the others, even Philo, but yet undoubtedly from S, he gives further proof that his source was most comprehensive. Cf. Lydus, p. 35, 2 ff., with Philo *De mundi opif.* 41 and Anatolius, p. 36, 15; Lydus, p. 36, 5 ff., with Anatolius, p. 36, 24.

addition to the many parallels which can only be referred to here, it can be shown that very probably the arithmological block, ii. 4–12, preserves one characteristic feature of arrangement from the original S. The argument is based on comparing such expressions as ἡ κατ' αἴσθησιν τριάς, ἡ νοητὴ τριάς in pages 25, 12 ff., 27, 1 ff., and 17 ff. and others similar in pages 29, 7–8, and 30, 7–9, with certain phrases of Philo.

In Philo's long discussion of 7¹ the narrative falls roughly into this scheme:

I. Introductory—to describe the hebdomad properly is impossible.

II. The two hebdomads, "inside" and "outside" the decade. The latter described.

III. Transition to the hebdomad "within" the decade, and its powers ἐν νοητοῖς (cf. c. 34); followed by a group of topics.

IV. Transition again, and the powers of 7 ἐν αἰσθητοῖς, with topics.

V. Transition, "though it shows so many forms in both bodiless and conceptual things, the nature of 7 extends also over all visible creation. For what is not φιλέβδομον?" Topics follow.

VI. Etymology—ἐπτὰ, σεβασμός, septem.

Thus groups of topics are made and the transitions supply the headings. In most cases the topics themselves are all that can be paralleled in other writers, but in a few instances the transitions themselves are paralleled; for example, the fifth heading indicated above:

Philo *De mundi opificio* 38
 τοσαύτας ιδέας καὶ ἔτι πλείονας ἢ ἑβδο-
 μὰς ἐν ἀσωμάτοις καὶ νοητοῖς ἐπιδείκνυ-
 ται. διατείνει δὲ αὐτῆς ἡ φύσις καὶ
 ἐπὶ τὴν ὄρατὴν πᾶσαν οὐσίαν, οὐρανὸν
 καὶ γῆν, τὰ πέρατα τοῦ παντὸς φθάσασα.
 τί γὰρ οὐ φιλέβδομον; . . . αὐτίκα
 τὸν οὐρανὸν φασιν ἑπτὰ διεζῶσθαι κύ-
 κλοις, κτλ.

Lydus ii. 12, p. 34, 16 (Wünsch)
 διατείνει δὲ αὐτῆς ἡ φύσις καὶ ἐπὶ τὴν
 ὄρατὴν ἅπασαν οὐσίαν, οὐρανὸν καὶ γῆν·
 αὐτίκα γοῦν οὐρανὸν φασιν ἑπτὰ διε-
 ζῶσθαι κύκλοις, κτλ.

Anatolius, p. 36, 25

πάντα φιλέβδομα.

Philo *Leg. all.* i. 4

χαίρει δὲ ἡ φύσις ἑβδομάδι· πλάνητές
 τε γὰρ ἑπτὰ γεγόνασιν, κτλ.

This shows that at least one Philonic transition was in Lydus' source, and the use of the coined word φιλέβδομος is strong evidence

¹ *De mundi opif.* cc. 30–42.

of the same thing for the family of Anatolius. Lydus uses phrases, cited above, that appear to be of the same character, and even in the other writers¹ here and there may be found what seem to be introductions or transitions surviving from their literary ancestors. A scheme of grouping topics under heads seems clearly enough to have characterized S, though what the groups were, and whether they were always the same, is not clear. Traces of such a scheme in Lydus form additional evidence of the great influence of S upon his arithmology.

Outside of Lydus' great arithmological block there are two sections, iii. 4 and iv. 64, which certainly contain material from S. With the first should be compared the nearly identical passages in Anatolius (p. 39, 5 ff.) and Philo (*De mundi opificio* 15);² to the second I have referred elsewhere.³ The source of the rest of his arithmology, scattered here and there,⁴ is harder to determine; it cannot be argued with such probability that the same sources were used for all or that S played such a large part. In one case Lydus probably used the lost *Theologumena Arithmeticae* of Nicomachus,⁵ perhaps in others as well; twice Philo is a possible source. One of the latter passages, iii. 14, connects the number 30 with the length of a generation, and is directly paralleled by Philo *Quaest. in Gen.* ii. 5; but this is a topic probably used in S, for Censorinus *De die natali* 17, 2 has it and in the *Theologumena Arithmeticae* it appears in the discussion of the control of human life by the number 7; 30 might also appear as an analogue of 3. Hence in this case both Philo and Lydus could have derived the topic from their common source. But though the other of the two passages, *De mensibus*

¹ E.g., Chalcidius c. 37 *ad init.* (quoted below); Capella vii. 733, p. 265, 5: "quid quod omnium natura nonne huic probatur numero (sc. 7) deseruire?" (Cf. with this the passages quoted above.)

² The citations are undoubtedly based on the tenth chapter of the original S, but the topic is closely paralleled in the introduction as well; cf. Anatolius, p. 29, 6-8; Theon, p. 99, 17-20; Sextus Empiricus *Adv. math.* iv. 2 ff. It is found also in Chalcidius c. 35; Hierocles *In carm. aur. ap. Mullach, FPG*, Vol. I, p. 464; Capella vii. 742; Isidore *Liber numerorum*, Migne, *PL*, Vol. LXXXIII, 190BC; [Plut.] *Epit.* i. 3. 8; Stobaeus *Ecl.* i. 10. 12.

³ *Classical Philology*, XV, 315, n. 2, for Lydus, p. 115, 14-17; for Lydus, p. 115, 4-9, cf. Theon and Anatolius on the triad.

⁴ The passages concerned are enumerated in p. 102, n. 2.

⁵ *De mensibus* iv. 162; this passage mentions Nicomachus by name but is not at all like *Theol. Arith.*, p. 55 Ast; hence the reference is without doubt to the lost work of Nicomachus.

iii. 10, which is practically identical with *Quaest. in Gen.* iii. 61, might conceivably occur in the discussion of 2 or 3, 4 or 9, of an S document, it obviously refers to Lev. 23:18-19, and was doubtless from the first most at home in an Old Testament commentary. Since there is otherwise no proof that Lydus and Philo shared any common source except S, we may, I think, admit that in this, and perhaps even in other isolated instances, Lydus drew from Philo himself, without prejudicing the general conclusion that elsewhere, certainly in *De mensibus* ii. 4-12, he did not use Philo directly but a document similar to Philo's authority.

One other important detail with regard to Lydus is that he quotes Proclus in his arithmology;¹ this, together with the signs of confusion and disjointedness in his book, indicates that his S material comes to him through other hands and was not his own compilation, and furthermore that one of his authorities, perhaps his immediate source, wrote after the time of Proclus. But the version of S involved in Lydus' ancestry was a full one, at least as far as *De mensibus* ii. 4-12 is concerned, though some of the scattered arithmological passages may be derived from an abridgment of the style of Anatolius.²

The discussion of Lydus helps in elucidating the problems raised by Philo. There can be no doubt that all the arithmology in the *De mundi opificio* comes from S, and now, through Lydus, we see that those passages elsewhere which do not resemble Theon and Anatolius, but are paralleled in Lydus, come probably from an unabridged S. The passages of Philo's Old Testament commentaries which contain arithmology are listed above, but in the interests of space I shall not examine them all, but make only a few general observations about them.

The chief reason why these Philonic passages look unlike the ordinary S type of arithmology is because they are concerned with the higher numbers which figure in Scripture narratives—the dimensions of the ark, for instance. Per se, such numbers probably were not discussed in S, but their arithmological interpretation usually involves the lower numbers as well, and here Philo might, and in fact seems to, use S.

¹ *De mensibus* ii. 6, p. 23, 11; ii. 8, p. 27, 19. Proclus' dates were 410-85 A.D.

² E.g., in iv. 64, p. 115, 4-9 and 14-17.

Again, Philo's method of writing in these commentaries is very different from what is seen in the *De mundi opificio*. Take as an example the discussion of 8 in *Quaest. in Gen.* iii. 49; the qualities of 8 are enumerated, one after another, with *primo, secundo*, and so on. The arrangement, certainly, is quite foreign to the S tradition, but in the details some agreement may be found both in this case and in others.

In dealing with the higher numbers, too, Philo probably supplied much of the material himself, but employing recognized Pythagorean devices, such as the summations of numbers, triangular and other polygonal numbers, and the like. One might almost say that he himself expanded S to fit his special needs, using its own material and its own methods. In general, however, we are justified in concluding that among other sources Philo used a very comprehensive version of S, which he sometimes quoted literally and sometimes recast in his own way.

Up to this point we have been concerned primarily with Philo, Lydus, and Anatolius, who represent what is probably the older strain of the S family. Now we turn to Theon and the others.

There is but one divergence of primary importance to be noted in the comparison of Theon and Anatolius; the rest may be accounted for on the ground that either Theon or Anatolius has omitted something, originally in S, which the other happens to preserve, and such variants have but little significance for the history of the transmission. But in the chapter on 7, at page 103, 18 ff., after several sentences agreeing fully with Anatolius, Theon suddenly interjects a passage beginning with a quotation from Posidonius. This section commences with the statement that the lunar month is made up of four hebdomads, continues with various topics showing the control exercised by 7 over childbirth and the ages of man, and extends nearly, or quite, to the end of the chapter. The portion dealing with childbirth and the ages is wholly unlike anything in Philo or Anatolius—Lydus neglects the subject entirely—for they say only that seven months' children are viable, and on the ages of man simply quote the elegy of Solon and a passage of Hippocrates. On the other hand, a whole series of arithmologists, Chalcidius, Varro, Capella, Favonius, Macrobius, and the *Theologumena*, agree with

Theon in putting at this point something much like his account. In other words, this is a test passage upon which the S family as a whole divides into two camps.

Now since Theon otherwise agrees with Anatolius very closely, sometimes in the minutest detail, I can see no escape from the conclusion that here there has been some interpolation into, or modification of, the original S, and it is perfectly clear that Theon, and not Anatolius, has admitted the interpolation. For it is Theon who mentions Posidonius' name; Posidonius is later than the compiler of S; hence the original S could not have mentioned him, and liberty has been taken with the original text in that line of arithmologies which does.

This quotation, furthermore, adds further proof to the contention of the writer's previous essay. If Theon (or his authority) quotes Posidonius, it is implied that the material contained in this citation was not in the original document used as a general source; consequently Posidonius was not the author of that document. Nor is Theon's arithmology Posidonian, save in so far as Posidonius is interpolated into it.

The quotation of Posidonius, in Theon, extends probably at least over page 103, lines 18–23, and whether or not it goes farther, the characteristic unlikeness to Anatolius persists practically to the chapter's end.¹ The part dealing with birth and the ages (p. 103, ll. 1–9) is wholly unlike; at 104, 15–16 comes a list of seven vital organs headed, in Theon, by *γλώσσα*, in Anatolius and Philo by *στόμαχος*; and in page 104, lines 16–18, Theon says upon the authority of Herophilos that the length of the intestine is twenty-eight cubits, while Anatolius gives it as twenty-one on the same authority. The writers mentioned above as siding with Theon against Philo and Anatolius agree with Theon also regarding the names of the vital organs. There is, however, a general agreement between the two groups, save on the matter of birth and the ages; they use the same topics and much the same wording. This must be due to the fact that S is ultimately back of each strain, but the peculiar features

¹ Verbal likeness between the two, which ceases at pp. 103, 18–104, 12, begins again at p. 104, 12, but though their language from here to the end of the chapter is similar the two curious discrepancies in detail noted above occur in this portion.

found in Theon and the others must have been derived from something outside of the family from which Philo and Anatolius descend.

If we compare the passages¹ in which the various arithmologists enumerate the "ages of man," one group, consisting of Philo, Anatolius, and Clement of Alexandria, are seen to be characterized by the quotation of Solon and Hippocrates; the rest, omitting this, make the statement, not found in the first group, that the teeth appear at the seventh month. It is probable that the Solonian and Hippocratic passages are the basis upon which are founded all the accounts of the second group, which, it may be remarked, have many things in common. Among them, the *Theologumena Arithmeticae* and Macrobius are practically identical;² they go into the greatest detail, and because the tendency in arithmological transmission is in general to abbreviate rather than amplify, what they say is doubtless closest to the original source. All the rest seem to have concise statements derived from the longer form preserved by these two.

Now this longer version, in connection with the seventh and fourteenth years,³ makes prominent the fact that the *προφορικὸς λόγος* then develops, and from this we must deduce that a Stoic had something to do with the formulation of the original of this account, for this is a distinctively Stoic doctrine.⁴ Again, Chalcidius, Capella, and Favonius agree exactly upon the details of the "ages," and state that at twenty-one years the beard grows and that increase in height comes at twenty-eight; Theon, however, who otherwise agrees with them, says that the beard and increase in height come at twenty-one and increase in breadth at twenty-eight, herein agreeing exactly with Macrobius and substantially with the *Theologumena*, which fails to mention the beard. Deviation under such circumstances cannot be mere chance.

¹ Philo *De mundi opif.* 35-36; Anatolius, p. 36, 25 ff.; *Theol. Arith.*, pp. 48-50; Macrobi. i. 6. 67 ff.; Theon, p. 104, 5 ff.; Chalcidius c. 37; Capella vii. 739; Favonius; Varro *ap.* Gellius iii. 10; Clem. Alex. *Strom.* vi. xvi. 144. 4 f.

² Macrobius has preserved more of the original of both; cf. p. 116, nn. 2 and 3.

³ Their statements are similar, but there is a slight disagreement in arrangement.

⁴ There is no reason why S may not from the first have contained Stoic doctrines, irrespective of special Stoic influences or interpolations later, as the S material was in the course of transmission. The neo-Pythagoreans were eclectics. This, however, is a particularly striking case and the surrounding circumstances unusual.

If now we put together all the evidence—Posidonius knew and used S; some Stoic has modified S by inserting the account of the ages seen in Macrobius and the *Theologumena*, and more briefly in the rest of the group; Theon, immediately after citing Posidonius' name, significantly parallels Macrobius and the *Theologumena* against Chalcidius, Favonius, and Capella—the probability becomes high that Posidonius himself is the original source of the account of the ages seen in Macrobius and the *Theologumena*, and in fact of the whole block of material wherein the Theonian and Philonic groups differ, and which we know came by interpolation into the S family.

Furthermore, Theon and Chalcidius cannot have taken their respective accounts from the same authority; and therefore if Chalcidius, as is generally believed, here follows Adrastus, Theon, certainly here and probably in the whole of his arithmological passage, cannot be following Adrastus.¹ His source, rather, seems to have drawn directly upon Posidonius, because it agrees so closely with the *Theologumena Arithmeticae* and Macrobius.

On the other hand, if, as seems probable, all of this group alike depend ultimately upon Posidonius in this passage, it must be taken as a sign that all had as a common ancestor an S document thus modified from Posidonius' *Commentary on the Timaeus*, for surely such similar deviations from the Philonic norm cannot have been made independently; and Adrastus and the undetermined source of Theon must be included in this related group. It is far more likely that the common ancestor was an S document with such

¹ At present no other conclusion seems possible; yet as the writer pointed out in *Classical Philology*, XV, 318 (with n. 2) Chalcidius and Theon are closely related. The explanation must be that the source of Theon used a source practically the same as that of Adrastus. Note, however, that the important agreement with regard to the harmonic ratios mentioned in *Class. Phil.*, XV, 318, lies between Chalcidius and Theon, p. 58, 13 ff., a passage not in Theon's formal arithmology, but referred to Adrastus by Altmann, *op. cit.*, pp. 22 ff. (though not by Schmekel and Borghorst). Altmann alone thinks Theon's source, in p. 99, 8 ff., Adrastus; Schmekel, *op. cit.*, p. 409, n. 3, names Thrasyllus, and Borghorst Moderatus; Hiller, *Rhein. Mus.*, XXVI, 584, n. 1, says it cannot be Adrastus. The evidence above makes for the prevailing view, but the question cannot yet be called settled. The analysis of Theon's text to show the different sources involves extremely nice judgments and too much that is subjective; hence the results cannot be fully satisfactory. E. Hiller in *Rhein. Mus.*, XXVI, 582 ff., is chiefly responsible for the belief that Chalcidius follows Adrastus, but Chalcidius' text has not been studied as carefully as Theon's. It is not impossible that Theon follows Adrastus, while Chalcidius, in his arithmology, has some other authority.

modification than an S arithmology incorporated by Posidonius in his commentary, both because all the modifications seem to have been made in one place, in the seventh chapter, and because Posidonius apparently made a different use of the introduction to S from what is seen in Theon.¹ This may indicate that his arithmology was not formally arranged as such, or was even incomplete. Though it is by no means certain, even Macrobius and the *Theologumena* are perhaps to be traced to an S document of this type rather than to Posidonius himself.

The *Theologumena Arithmeticae*, generally ascribed to Iamblichus, deserves more study than can be given here. It is without doubt in very large part Nicomachean, based on the *Theologumena Arithmeticae* of Nicomachus. Its connection with S is obvious, for dozens of the topics of the S tradition appear in its pages; probably Nicomachus himself used S. The theory also has been advanced that Posidonius influenced it; but it would be hard to say whether all the S topics employed came to Nicomachus through Posidonius or not.

It would be rash also to pass final judgment on Macrobius without extended study. It seems probable, however, that Macrobius made use, probably indirectly, of the lost *Theologumena Arithmeticae* of Nicomachus, and through this is influenced by Posidonius and S. This statement is prompted by the fact that in a number of passages, one a very long one, Macrobius agrees very closely with the *Theologumena* as printed by Ast,² but sometimes offers a fuller version than the latter,³ which seems to point to a use of Nicomachus, the chief source of Iamblichus. It has been argued that Macrobius had a neo-Platonic source; if so, this without doubt was influenced by Nicomachus.⁴

¹ See Sextus Empiricus *Adv. math.* vii. 91 ff., and *Class. Phil.*, XV, 310, 321.

² Cf. Macrobius i. 6. 11 with *Theol. Arith.*, p. 53; *ibid.*, 14-18 with pp. 47-48; 24-40 (especially secs. 33, 36, 39) with p. 50; 45 with p. 43; 44 with p. 44; 61-80 with pp. 45 ff.; the last is the strongest instance.

³ E.g., sections 68, 74, 78 and others in Macrobius contain matter not in *Theol. Arith.* but very closely knit into the common account and obviously from the common source.

⁴ So Borghorst, *op. cit.*, pp. 43 f.; Altmann, *op. cit.*, pp. 51 ff., especially pp. 69-70. The latter thinks the neo-Platonic source of Macrobius, as well as Nicomachus, Theon, and Chalcidius, used Adrastus. But this promiscuous grouping does not permit an explanation of the extreme closeness of Theon to Anatolius, Philo, and Lydus, whom he believes to depend upon Posidonius—an impossibility, as has been argued in this paper.

Varro, too, apparently drew some material from the S tradition, and is an important figure in it because he has long been regarded as the chief source of Capella, Favonius, and Macrobius; in fact, the position ascribed to him is second only to that of Posidonius.

The two books of Varro known positively to have contained arithmology are the *Tubero* or *De origine humana*, quoted by Censorinus *De die natali*, 9 ff.,¹ and the first of the fifteen books of *Imagines*, or *Hebdomades*, cited by Aulus Gellius iii. 10. The former dealt with numbers only in so far as they govern birth, and the latter devoted itself to the number 7 alone. Our positive knowledge, therefore, does not permit it to be stated that Varro wrote a complete arithmology, or that a complete arithmology could have been based on anything that he wrote.

A noteworthy characteristic of Varro's arithmology is its independence. While others usually reproduced the traditional topics, he seems to have drawn other pertinent material from the great number of Greek and Latin authors that he had read, and to have added much on his own account.²

In the *Tubero* Varro can have taken only details from the S tradition; his main account of the control of childbirth by the number 7 differs radically from what is found in the *Theologumena* or in any other of the authors we have considered,³ and he has an

¹ Of the passage cited cc. 9. 1—14, 2 are obviously drawn from Varro mainly, but it may be doubted whether cc. 14. 3 ff. are; for 14. 2 gives Varro's doctrine of the ages of man, and in the following sections are presented the opinions of others, in a similar fashion and with no mark of being taken through Varro. As Hippocrates and Solon are among those cited, without much doubt an S document of the type of Philo and Anatolius was consulted—the only place where the two would be likely to be found together. If this came through Varro, he himself must have used S in its Philonic-Anatolian form.

² E.g., *ap. Gellius loc. cit.* he speaks of the seven "halcyon days," of the limit of human height as 7 ft., and adds a detail about the number of teeth that appear in infants. These are not elsewhere paralleled, nor is his account of childbirth exactly like any other.

³ Censorinus c. 11. Using the Pythagorean "plinthion in double ratio" 6, 8, 9, 12 (cf. Philo *De mundi opif.* c. 37, *Qu. in Gen.* i. 91, iii. 38, iv. 27; *Theol. Arith.*, p. 39), Varro says that in the first 6 days a *humor lacteus* is formed, in the next 8 a *humor sanguineus*, in the next 9 flesh, and in the next 12 the formation of the fetus is completed; the period of formation is 35 days, and the whole gestation period 6×35, or 210 days for seven months' children. Something similar is found in Augustine *De div. quaest. lxxiii*, *quaest. lvi*; but Augustine uses stages of 6, 9, 12, and 18 days, 45 in all, for the formation of nine months' children doubtless (the "plinthion in the triple

apparently original account of the ages.¹ In the *Hebdomades* far more that is derived from S can be traced, with the admixture, however, of certain topics probably original with him. The fact that he mentions the growth of the teeth at seven months, and that his account of the numerical control of gestation bears some resemblance to what Theon says, suggest that he may have taken his material by way of Posidonius.²

To the writer's mind the arguments which have been made to show that Varro was the source of Capella, Favonius, and even of Macrobius, lack force. Since these writers, in arithmology, were all members of the S family, the same topics naturally occur in all of them, and to point out a simple parallel is of small significance, for it might be derived almost anywhere. To prove that a given writer followed Varro and no other, one must show parallels to some of the distinctive things in Varro; yet, though Varro was one of the most independent of arithmologists and made many statements wholly unlike those of Philo, Theon, Anatolius, and the rest, in no case has a parallel between his peculiar topics and Capella, Favonius, or Macrobius been pointed out.

Eyssenhardt's contention³ that Varro was Capella's source is regarded by Fries as successfully maintained and is used by the latter as the basis of his declaration that Varro was the source of Favonius. Eyssenhardt begins with the comparison of Capella's statements about the monad and a citation of Varro about God

ratio"), regarding which Varro does not, as one would expect, give a similar account. In the *Theol. Arith.*, p. 39, 6×35 and 6×45 are stated to be the gestation periods; the two plinthia are mentioned but not these stages of fetal development, and *ibid.*, pp. 46-47, the stages are reckoned by weeks. In fact, none of the arithmologists parallels this Varronian account, not even Varro himself *op. cit.* Gellius iii. 10.

¹ Censorinus c. 14, 2.

² Varro states that the seed coagulates the first week; the head and spine of males is formed in the fifth; formation is completed in the seventh, and birth takes place usually after 273 days. Theon, p. 104, 2 ff., says that the formation is completed in seven weeks according to Empedocles; some say males are formed in five. In the *Theol. Arith.*, p. 47 ff., five weeks are given as the period of formation for a seven months' child, for the nine months' children six for females and seven for males; the 273 days' period is not paralleled. Varro's account possibly has the same origin as these others, but in any case he has considerably modified it.

³ In his edition of Capella, Leipzig, 1866, pp. liii ff., Borghorst, *op. cit.*, p. 45, accepts the view, and also thinks Favonius based upon Varro.

containing no reference whatever to numbers, a decidedly fantastic parallel. He then cites their accounts of childbirth, but can show only that they both have the portions common to nearly all arithmologists, none of the peculiarly Varronian traits; the same, too, can be said of the only other citations he makes, regarding 7 and the moon. The argument really shows only that Capella belongs to the S family, and is far from proving him Varronian.

Fries's view about Favonius is open to precisely the same objections. The parallels which he claims are parallels with half a dozen others besides Varro, and there is nothing distinctively Varronian about them; furthermore, to prove Favonius Varronian through parallels with Capella is simply to pyramid hypotheses, and is based on false theory if it cannot be established that Capella drew on Varro. Favonius does, to be sure, once cite Varro by name in a passage in which 27, the cube of 3, is connected with the length of the moon's course; but neither is it sure that this is a direct citation of Varro, nor is it necessarily derived from any Varronian arithmology, for in the only Varronian arithmological text which we have Varro adheres to the usual view of the writers of this school and says that the moon's course is finished in 28 (4×7) days.¹ Incidentally, Fries errs in saying that Macrobius i. 6. 53 agrees *fere simillimis verbis* with Favonius; for in the passage cited Macrobius mentions only the 28-day month of the moon. The only other passage which can possibly be connected with Varro is that in which Favonius translates *κίβος quadrantal*, a Varronian word,² as Fries says, relying on Gellius i. 20. But Gellius in this passage does not directly quote this word from Varro; he cites him once, to be sure, but the whole passage is not necessarily derived from him.

If, then, special Varronian influence upon Capella and Favonius cannot be shown, what is the probable line of their descent? It is at least clear that both belong to the S family, and Capella, though his style is unique, is closer to the other members of the group than

¹ I.e., *ap.* Gellius iii. 10.

² Cf. Cassiodorus *Exp. in. Psalt.*, Migne, *PL*, Vol. LXX, p. 79B: "iste autem numerus (sc. 8) est quem arithmetici actu primum quadrantal appellant, quem Philolaus Pythagoricus harmoniam geometricam uocat." The citation of Philolaus is found in Nicomachus *Introd. arith.* ii. 26. 2 (but not in Boethius *Inst. arith.* ii. 49). The word *quadrantal* here hardly indicates Varronian influence.

Favonius in that he presents more of the usual topics. In one significant passage, vii. 739, in which the ages, vital organs, sensory openings, and parts of the body are dealt with, Capella parallels Chalcidius, c. 37, very closely.¹ But though many words and phrases are identical, Capella cannot have copied from Chalcidius, for he must have taken his account of the parts of the body, for example, from the same source as the rest of the passage, and this is wholly omitted by Chalcidius. The possibility remains, however, that Adrastus, the supposed authority of Chalcidius, can have either directly or indirectly influenced Capella here; if so, there must have been a Latin translation of Adrastus in the ancestry of both Chalcidius and Capella, for their agreements are in the Latin terms. In the rest of his arithmology there is no especial likeness between Chalcidius and Capella, beyond the use of topics employed by many others, and parallels of this sort, as has already been remarked, are useless in the present investigation.

Both Capella and Favonius, however, have a rather unusual treatment of the monad. They make the distinction between *numerus* and the *numerabile*, and hence between unity and one.² In Chalcidius and Macrobius this notion does not occur, and the monad is identified with the immutable, timeless God, or his mind, containing the forms of all numbers and things, whence also these emanate. This is also the conception of Nicomachus.³ It is neo-Platonic, obviously; the former Aristotelian, particularly as Capella gives it. The former conception, too, underlies two passages in which Philo and Lydus show a surprising verbal identity—*Quaest. in Gen.* iv. 110 and *De mensibus*, page 23, 7 ff.—and may be traced

¹ E.g., Capella: "item secunda hebdomas pubertatem mouet gignendique possibilitatem, tertia florem genarum, quarta incrementa staturae finiuntur, quinta iuuenilis aetatis plena perfectio est," etc. Chalcidius: "idem quoque secunda hebdomade pubertatem adfert utrique sexui gignendique et pariendi maturitatem, tertia uero hebdomade ostentat se flos et lanugo circa genas. quarta uero hebdomade definiuntur incrementa staturae. quinta plenam iuuenilis aetatis adfert perfectionem."

² Capella vii. 731: ". . . sacra monas . . . quae si species est accidens cuilibet exstantium primo, priusque est quod numerat quam illud numerandum, rite eam . . . ueneramur." Favonius makes the distinction between *unum* and *unum solum*; e.g., "nullumque corpus unum solum corpus. unum solum recte dicitur quod in partes sui diuisione non discedat. . . . illud igitur numerus, hoc quod numerabile est recte dicitur."

³ Chalcidius cc. 38–39; Macrobius i. 6. 7 ff.; Nicomachus *ap. Theol. Arith.*, p. 4.

in certain passages of Theon (pp. 19, 18 ff., 20, 12 ff.), not in his formal arithmology, perhaps derived from the Pythagorean Moderatus. Besides, the version of Capella and Favonius bears enough resemblance to the account of the monad in S, represented by Anatolius, to be regarded as a derivative of the original S in which more has been preserved than in most others of its descendants. The identification of the monad with God, or Zeus, was in S, as Anatolius shows, and also in Capella and Favonius, without the neo-Platonic dressing given the topic by Macrobius and Chalcidius; it may also be noted that Anatolius, page 29, 12, calls it γονή, ἕλη οὐσα τῶν ἀριθμῶν, which matches Capella's *omniumque numerorum solam seminarium esse*, and that in all three occurs the notion expressed by Favonius *pereuntibus aliis quae id recipere possunt immutabile perseverat*. In this passage Chalcidius cannot be following Adrastus, for the latter, as a Peripatetic, would be likely to state the theme about as Capella has done; in fact, the Aristotelian form adopted here by Capella is quite as much an argument for Adrastean influence as the likeness with Chalcidius noted above.

A further characteristic of Capella is to identify each number with some divinity, just as Nicomachus is known to have done, judging from Photius, cod. 187, and the *Theologumena Arithmeticae* of Iamblichus. Perhaps Capella owes this trait to Nicomachus, for some of the instances are quite remarkable; for example, his identification of the triad with the Fates, Graces, and *quaedam uirgo, quam dicunt caeloque ereboque potentem* is matched, as far as the Fates are concerned, by *Theol. Arith.*, page 16, and Ἐκάρη is one of the epithets applied by Nicomachus according to Photius. But these agreements, after all, may be due only to the influence of S, for we have seen above that Capella's identification of 6 with Aphrodite, which might otherwise be regarded as Nicomachean, is proved by the agreement of Lydus to have been part of S. Though Capella himself or his Latin sources have modified them somewhat, more of these identifications may have been in the original S than are generally preserved outside of Capella's own line.

Capella, then, seems to be descended from an S document of the Theonian group, more voluminous than Theon, and probably influenced by a Latin translation of Adrastus. It cannot be positively

shown that Adrastean influence affected more than the parts mentioned above, and furthermore it is impossible, from Chalcidius, to tell whether Adrastus' commentary on the *Timaeus* contained a whole arithmology, such as the source of Capella must have been; I am inclined, therefore, to explain the situation by Adrastean influence rather than actual copying of Adrastus.

Favonius, too, has the marks of the Theonian branch of the family, but to judge from his account of the birth and ages of man, which is unlike Capella and Chalcidius in phrasing but adds some details to which the name of Hippocrates is affixed, he did not come under Adrastean influence, though his original authority must have been fairly comprehensive. In spite of this some of his chapters are decidedly thin, and seem to have been padded with arithmetical detail, as in the fourth and sixth, or astronomical matter, as in the fourth, fifth, and eighth, foreign to the original S. It is probable, too, that in some details he was influenced by Capella, but further about his sources can hardly be ventured here.

I do not intend at this time to add anything about the slighter arithmological sources, such as Plutarch, Vindicianus, and scattered references in the Aristotelian commentaries; but a word may be added concerning Isidore's *Liber numerorum*. The Scriptural arithmology which forms a large part of this work is of course outside the field of this discussion; some of it was original, but much more modeled after the quasi-Philonic attempts to apply numerical symbolism to the Bible which were attractive to many early churchmen.¹ The non-scriptural part seems to come either from Capella or the latter's source, for sometimes Isidore adds to the topics of Capella. This, however, is outweighed by the fact that Isidore employs whole sentences in the very words of Capella, and the latter's style is unmistakable. To make clearer the general conclusions of this investigation a diagram showing the descent of the most important members of the S family is appended.

¹ Examples are the *Expositio in Psalterum* of Cassiodorius; Augustine in parts of *De civ. Dei*, *De div. quaest. lxxxiii*, and *De musica*; Ambrose in *De Noe et arca* 12. 39, *De Abr.* 2. 9. 65, 2. 11. 80, *Exp. in Ev. sec. Luc.* vii. 95, 139, 173, and *Exp. in Psal. cxviii*, pp. 1198A, 1280B Migne.

