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GREEK EMBRYOLOGICAL CALENDARS AND A FRAGMENT FROM THE LOST WORK OF DAMASTES, *ON THE CARE OF PREGNANT WOMEN AND OF INFANTS*

THE MANUSCRIPT

An eleventh-century manuscript in the Biblioteca Laurenziana in Florence preserves a short excerpt of a calendar outlining stages in the development of the foetus.[1] It is headed *Δαμναστοῦ ἐκ τοῦ Περὶ κυουσῶν καὶ βρεφῶν θεραπείας*, 'Damnastes, from *On the Care of Pregnant Women and of Infants*'. Though its existence has long been noted, it has not been previously edited or published.[2]

The text is as follows.

Δαμ{ν}άστου ἐκ τοῦ περὶ κυουσῶν καὶ βρεφῶν θεραπείας.
περὶ τῶν γονίμων καὶ τελειουμένων.
1. *τὸ ἑπταμηνιαῖον· ἀφροῦται μὲν ἐν ἡμέραις ἓξ, αἱματοῦται δὲ ἐν <ἄλλαις> η', σαρκοῦται δὲ ἐν ἄλλαις θ', μορφοῦται δὲ ἐν ἄλλαις ιβ'· αἵ τινες συντελεσθεῖσαι ποιοῦσιν ἀριθμὸν λε'. κινεῖται δὲ ἐν διπλασίοσιν ο'· τῶν τεθέντων ἀποκυΐσκεται δὲ ἐν τριπλασίοσιν σι'.*
2. *τὸ ὀκταμηνιαῖον· ἀφροῦται μὲν ἐν ἡμέραις ς', αἱματοῦται δὲ ἐν ἄλλαις δέκα, σαρκοῦται δὲ ἐν ἄλλαις θ', μορφοῦται δὲ ἐν ἄλλαις ιε'· αἵ τινες συντελεσθεῖσαι ποιοῦσιν ἀριθμὸν μ'. κινεῖται δὲ ἐν διπλασίαις π'· ἀποκυΐσκεται δὲ ἐν τριπλασίαις σμ'.*
3. *τὸ ἐνναμηνιαῖον· ἀφροῦται μὲν ἐν ἡμέραις ς', αἱματοῦται δὲ ἐν ἄλλαις θ', σαρκοῦται δὲ ἐν ἄλλαις ιβ', μορφοῦται δὲ ἐν ἄλλαις ιη'· αἵ τινες συντελεσθεῖσαι ποιοῦσιν φανερὸν ἀριθμὸν τὸν με'. κινεῖται δὲ ἐν ἄλλαις διπλασίαις τούτων ϙ'· ἀποκυΐσκεται δὲ ἐν τριπλασίοσιν σο'.*

[1] Laur. 74.2, fol. 381^{v}, lines 3–26; not fol. 281, as in A. M. Bandini, *Catalogus codicum manuscriptorum Bibliothecae Mediceae Laurentianae* (Florence, 1764–70; repr. Leipzig, 1961), vol. 3, col. 47, and all others subsequently. Bandini was misled by a later incorrect numeration which begins on fol. 379 with the number 279 (in brown ink at the top of the page); the continuous numeration is in red ink at the bottom. Laur. 74.2 contains a text of Paulus Aegineta (J in Heiberg's list of manuscripts), copied from Parisinus Graecus 2216–17 (E; eleventh century), when that manuscript was still intact; the end of Par. Gr. 2217 as it now stands was supplied by Par. Gr. 2047, itself copied from Par. Gr. 2208 (D; fourteenth century); see I. L. Heiberg (ed.), *Paulus Aegineta. CMG* IX.1 (Leipzig, 1921), v–vi, for details.

The text of Paulus in Laur. 74.2 is followed by Damastes and four other short excerpts to fill out the codex. Its apograph (not, I believe, previously noted) is Par. Gr. 2210, copied in 1357 by Manuel Pankratios, which contains the same series of extracts; see Henri Omont, *Inventaire sommaire des manuscrits grecs de la Bibliothèque nationale.* Vol. 2. *Ancien fonds grec. Droit. Histoire. Sciences* (Paris, 1888), pp. 214–15; id., *Fac-similés des manuscrits grecs datés, de la Bibliothèque nationale, du IXe au XIVe siecle* (Paris, 1891), 15 (pl. LXXVII.1).

[2] G.-A. Costomiris, 'Études sur les écrits inédits des anciens médecins grecs', *REG* 5 (1892), 71–2; I. Bloch, 'Byzantinische Medizin', in M. Neuberger and J. Pagel (edd.), *Handbuch der Geschichte der Medizin* (3 vols, Jena, 1902), 564; H. Diels, *Die Handschriften der antiken Ärzte* II (Berlin, 1906), 26; R. Devreesse, *Introduction à l'étude des manuscrits grecs* (Paris, 1954), 264; O. Temkin, *Soranus' Gynaecology* (Baltimore, 1956), 211–12; H. Hunger, *Die hochsprachliche profane Literatur der Byzantiner* (Munich, 1978), 310; H. Papadimitriu, s.v., *Lexicon des Mittelalters* III (Munich and Zürich, 1986), col. 475.

4. τὸ δεκαμηνιαῖον· ἀφροῦται μὲν ἐν ἡμέραις ϛ', αἱματοῦται δὲ ἐν ἄλλαις η', σαρκοῦται δὲ ἐν ἄλλαις ιβ', μορφοῦται δὲ ἐν ἄλλαις κδ'· αἵ τινες συντελεσθεῖσαι ποιοῦσιν φανερὸν ἀριθμὸν ν'. κινεῖται δὲ ἐν διπλασίαις ρ'· ἀποκυΐσκεται δὲ ἐν τριπλασίοσιν τ'.

διάγραμμα

ἀφρόν·	ϛ'	ϛ'	ϛ'	ϛ'	20
αἷμα·	η'	ι'	θ'	η'	
σάρξ·	θ'	θ'	ιβ'	ιβ'	
μόρφωσις·	ιβ'	ιε'	ιη'	κδ'	
κίνησις·	ο'	π'	ϙ'	ρ'	
ἀποκύησις·	σι'	σμ'	σο'	τ'	25

1 Δαμναστοῦ L πε(ρὶ) L θερα^{π} L 2 γονίμ(ων) L τελει^{ου}μ(ένων) L 3 ημ^{ερ}(αις) L : ἄλλαις correxi 7 ημ^{ερ}(αις) L 12 συντελεσθῆσαι L 15 ἑμ^{ερ}(αις) L 16 σαρκοῦ(ται) L 23 μόρφωσ(ις) L 25 ἀποκύησ(ις) L

TRANSLATION

Damastes: From *The Care of Pregnant Women and of Infants*.
'Concerning those who are able to conceive and carry to term'.

1. The seven-month child becomes foam in 6 days, becomes blood in <another> 8, becomes flesh in another 9, takes shape in another 12. Women who are brought to this point complete the number 35. It moves in twice the number, 70, and when this number of days is done, it is born in three times the number, 210.

2. The eight-month child becomes foam in 6 days, becomes blood in another 10, becomes flesh in another 9, takes shape in another 15. Women who are brought to this point complete the number 40. It moves in twice as many days, 80, and is born in three times the number, 240.

3. The nine-month child becomes foam in 6 days, becomes blood in another 9, becomes flesh in another 12, takes shape in another 18. Women who are brought to this point complete the manifest number of 45. It moves in twice as many days as these, 90, and is born in three times the number, 270.

4. The ten-month child becomes foam in 6 days, becomes blood in another 8, becomes flesh in another 12, takes shape in another 24. Women who are brought to this point complete the manifest number 50. It moves in twice as many days, 100, and is born in three times the number, 300.

Diagram

[months:	7	8	9	10]
foam:	6	6	6	6
blood:	8	10	9	8
flesh:	9	9	12	12
form:	12	15	18	24
[subtotal:	35	40	45	50]
motion:	70	80	90	100
birth:	210	240	270	300

COMMENTARY

Text

We have an excerpt from a complete work entitled *The Care of Pregnant Women and of Infants*, carrying the chapter title 'Concerning those who are able to conceive and carry to term'. The text of Damastes presents a simple mathematical calendar with

the events of gestation given a duration of days depending on how long after conception the child is born.

The title itself, *Περὶ κυουσῶν καὶ βρεφῶν θεραπείας*, points to a combination of obstetrics and childcare. Almost all the other ancient sources, e.g. the Hippocratic treatises, dealt with gynaecology and gynaecological pathology, and only included obstetrics under that topic. Their focus was on women as patients. Even normal childbirth was an infrequent topic outside of Soranus.[3] Damastes, on the other hand, did not include gynaecology as such in his subject matter. Instead his work appears to have been what we would now label obstetrics combined with paediatrics or childcare.

The author

The name Damastes (*Δαμάστης*, note accentuation), although not common, is well attested.[4] The two most famous bearers of the name were the historian Damastes of Sigeion and the brother of Democritus the philosopher. It is a regular formation in Greek: *Δαμάσ-της*, a deverbative from the root δαμασ- seen in δαμάζω 'tame'.[5]

Dam-n-astes (*Δαμναστοῦ* as if from a **Δαμναστής*), the name as given by the manuscript, on the other hand, is nowhere else attested, to the best of my knowledge; nor is it well formed in Greek.[6] The same root *dam-* with the thematic nasal suffix *-n(o)-* appears infrequently to build proper names[7] but **Δαμ-ν-αστής* (or **Δαμν-άστης*) is not a proper name in Greek, nor is *-άστης* a separable or productive formant.[8] It seems clear therefore that **Dam-n-astes* is a chimera. The proper reading for the name can only be *Δαμάστης*.

Further, we have a Damastes mentioned by Soranus as a medical writer on paediatrics. Soranus maintained that for the first twenty days after birth, the mother's milk is too thick and cheese-like to be wholesome food. He instead advised the use of a wet nurse and continued (2.18 = 65.2–7 Ilberg = *B*.7.70–7 [25–7] Burguière–Gourevitch–Malinas):

διὸ καὶ Δαμάστην ἐπιμεμπτέον κελεύοντα παραχρῆμα τῷ βρέφει τὴν μητέρα τὸν μαστὸν ὀρέγειν, ὡς διὰ τοῦτο καὶ τῆς φύσεως τὸ γάλα ποιῆσαι πρότερον ἐνοικονομησάσης, ἵν' εὐθέως καὶ τὴν τροφὴν τὸ βρέφος ἔξοι. μεμπτέον δὲ καὶ τοὺς ἀποδεξαμένους αὐτὸν ἐπὶ τούτων, καθάπερ καὶ τὸν Βιβλᾶν ὠνομασμένον Ἀπολλώνιον, πιθανῷ γὰρ λόγῳ σοφίσασθαι τὴν ἐνάργειαν θέλουσιν.

Therefore Damastes ought to be blamed for ordering the mother to offer the infant her breast immediately, maintaining that it is for this reason that nature has arranged for the mother to

[3] E.g. Hp. *Mul.* 8.78.16–30 L; see L. Dean-Jones, *Women's Bodies in Classical Greek Science* (Oxford, 1994), 34.

[4] E.g. Thasos: *c.* 400 B.C., *Ét. Thas.* 4 nos 4–11; and father, iv B.C., ibid. nos 518–31 (LGPN 1: 114); *SEG* 30 (1980) 1271, *SEG* 40 (1990) 1606, etc. Also in the Doric form *Δαμάστας*, e.g. *IG* 4^2.1485.

[5] Cf. *Δάμασ-ος*, *Δαμασ-ήνωρ*, *Δαμάσ-ιππος*; also *Δαμασί-στρατος*.

[6] It does not appear in any of the standard sources: W. Pape and G. Benseler (edd.), *Wörterbuch der griechischen Eigennamen* (3rd edn, Braunschweig, 1863–70); nor the three volumes so far published of P. M. Fraser and E. Matthews (edd.), *A Lexicon of Greek Personal Names*; nor any of the indexed volumes of *IG* or in *SEG*; nor in any indexed papyrological publication I have been able to examine; nor anywhere in the *TLG* index or in the Duke Databank of Documentary Papyri.

[7] *Δαμν-αγόρας*, *-αμενεύς*, *-εύς*; *Δάμν-ις*; *Δαμνο-δίκα*; *Δάμνιππος* (besides *Δάμιππος*).

[8] See F. Dornseiff and B. Hansen, *Reverse-lexicon of Greek Proper-names/Rückläufiges Wörterbuch der griechischen Eigennamen* (Berlin, 1957; repr. Chicago, 1978).

produce milk even before giving birth, so that the infant may have nourishment straightaway. Those who agree with him in these opinions, such as Apollonius Byblas, also ought to be blamed, for they want to explain away the obvious truth by a plausible argument.

For once Soranus was on the wrong side of a controversy,[9] and his indirect testimony about Damastes' opinions seems to point to an Aristotelean type of teleological argument which Soranus finds unacceptable.[10]

The suggestion that the Dam(n)astes of the Florence MS and the Damastes mentioned by Soranus might be the same person was first put forward tentatively by Owsei Temkin in 1956, although he had not had a chance to examine the manuscript.[11] His suggestion is almost certainly correct. We have one of three situations: (1) two different authors, one named Damastes, the other with the otherwise unattested and impossible name of *Dam-n-astes, writing on the same subject; (2) two different authors, both named Damastes, writing on the same subject; or (3) one author named Damastes. Though the report from Soranus and the manuscript text do not overlap, it is clear that the Laurenziana manuscript has preserved a short section of the lost work of Damastes.

Soranus's mention of τοὺς ἀποδεξαμένους 'those who agree with him' does not necessarily imply the relation of pupil to teacher[12] but his citation does provide a *terminus ante quem*. Apollonius nicknamed the 'Bookworm' was a physician of the Empirical school from Antioch, almost certainly the son of Apollonius called the Elder, also of Antioch. Apollonius Byblas flourished *c.* 150 B.C.[13] Accordingly, a date in the second century B.C. or somewhat earlier will probably be correct for Damastes.

EMBRYOLOGICAL CALENDARS

Damastes' calendar can only be understood against a background of the many competing theories of conception and foetal development.[14] The Greeks began speculating very early about the growth and development of the embryo, including the amount of time gestation might take.[15] Most of this speculation is marked by 'a characteristically Greek combination of polarized thinking and inadequate attention

[9] For colostrum as the ideal starter food, see M. Pernoll and R. Benson (edd.), *Current Obstetrical and Gynaecological Diagnosis and Treatment* (Los Altos, 1987), 236. For various ancient opinions on the quality of mother's milk, see Dean-Jones (n. 3), 222–3.

[10] On the form of the argument, see G. E. R. Lloyd, *Science, Folklore and Ideology* (Cambridge, 1983), 187–8, 191.

[11] Temkin (n. 2), 211–12: 'This Damastes is otherwise unknown, although Diels, *Die Handschriften der antiken Ärzte* 2 (Berlin, 1906), 26, cites a Greek manuscript of the 11th century "On the Treatment of Pregnant Women and of Infants" by one Damnastes'.

[12] E.g. Xen. *Mem.* 4.1.1.

[13] K. Deichgräber, *Die griechische Empirikerschule* (2nd edn, Berlin, 1965), 171–2; H. von Staden, *Herophilus* (Cambridge, 1988), 501–3.

[14] For surveys, see E. Lesky, *Die Zeugungs- und Vererbundslehren der Antike und ihr Nachwirken* (Wiesbaden, 1951); A. E. Hanson, 'The eight month's child and the etiquette of birth: *obsit omen*!', *Bulletin of the History of Medicine* 61 (1987), 589–602 (later references are to this article); A. E. Hanson, '*Paidopoia*: metaphors for conception, abortion, and generation in the *Hippocratic Corpus*', in *Ancient Medicine in its Socio-cultural Context. Clio Medica* 27–28 (Amsterdam, 1995), 291–307; Dean-Jones (n. 3), 148–224.

[15] Collections were already made by Aul. Gell. 3.16 and the doxographer Aetius (first century A.D.) 5.21, 23. See Hanson (n. 14) for discussion.

to empirical evidence',[16] but there are several references to actual observation of premature children, miscarriages, or abortions.[17]

However, the Greeks did not share our view that there is a single common pattern to the child's growth in the womb, i.e. that normal human gestation takes nine months to complete. Instead, with only a few exceptions, from Homer onward[18] the Greeks held to the idea that children are born an exact number of days after conception.[19] Consequently then, the Greeks show only traces of our idea of 'prematurity'; children are not divided into 'premature' and 'full-term' but into 'lucky' and 'unlucky'.[20] Though different doctors gave different calculations (discussed below), the most common opinion—which lasted well into the Middle Ages in the west—held that children might be born seven months after conception or nine, but that eighth-month children were doomed.[21]

Pythagoreans and Presocratics

Damastes' calendar has no exact parallel in ancient medical literature. Its closest affinities, however, are with various texts associated with Pythagoras and his followers. These Pythagorean doctrines were in competition with many other theories

[16] P. Cartledge, *The Greeks: A Portrait of Self and Others* (Oxford, 1993), 67; but see G. E. R. Lloyd, 'Experiment in early Greek philosophy and science' and 'The early history of dissection', *Methods and Problems of Greek Science* (Cambridge, 1991), 70–99, 164–93.

[17] *Nat. Puer.* 13 (7.488.22–492.6 L), 18 (7.504.16–20 L); *Carn.* 19 (8.610.2–10 L); *Epid.* 2.2.13 (5.90.1–2 L): at 60 days (cf. Galen's commentary, *CMG* X.1.222.1–9: noting that the genitalia must have been complete); 2.2.19 (5.92.2–7 L) a full description (but nevertheless misunderstood in antiquity: Galen, *CMG* X.1.229.3–37); 5.12 (5.212.1–2 L); 7.97 (5.450.24–452.3 L); cf. *Epid.* 4.20g (5.160.6–7 L): at 30 days, patient claims 40; Arist. *H.A.* 583b3–24. See below.

[18] *Il.* 19.117–18 is illustrative: Eurystheus, born at seven months, is ἡλιτό-μηνον 'missing the month' (cf. Archil. 196a.38: ἡλιτ-ήμερα), but still viable, while the birth of Herakles, also in the seventh month, has to be held back by Hera.

[19] The various durations of pregnancy are most often measured in months. However, the sources make it clear that they are not talking about vague units of time, but precise numbers of days after conception. Three notable exceptions, Hippon (fifth century B.C.), Alcmaeon of Croton (fifth century B.C.), and Aristotle, did not hold to the idea of normative schedules. Hippon maintained that the foetus could be born any time from the seventh to the tenth month: 38 A 16 DK (Censor. 7.2–4 and 9.2), see below; Censorinus also attributed to Hippon a system of sevens and tens determining the child's first steps, growth and loss of teeth, puberty, etc., which goes back at least as far as Solon's division of the ages of man into sevens. Alcmaeon wisely maintained that no one could know what parts of the embryo formed first: 24 A 13 DK (I.213.37–38; Censor. 5.3). Even Aristotle (discussed below) held that although children could be born at times in between, seven months and ten months were the norm (*G.A.* 772b7–11).

[20] Note that both the seven- and nine-month babies are fully formed and viable in most accounts. The author of Hp. *Septim./Oct.* is a case in point: Hermann Grensemann (ed.), *Hippokrates. Über Achtmonatskind, Über das Siebenmonatskind. CMG* I 2,1 (Berlin, 1968); and Robert Joly, *Hippocrate. Tome XI: De la génération, De la nature de l'enfant, Des malades IV, Du foetus de huit mois* (Paris, 1970). Babies born in the seventh month, at half a year or 182+ days (see below for the calculations), are smaller and weaker, but the majority will perish not because of incomplete development but because they did not ride out day 200, the next multiple of the deadly number forty, in the womb (7.436.15–438.8 L, 90.12–16 Grenseman, 165.2–12 Joly). Both seven-month babies who survive day 200 and nine-month babies who survive day 240 (the eighth-month crisis) are equally likely to survive (7.444.16–21 L, 96.1–5 Grensemann, 169.10–15 Joly). The author maintained at one point that the majority of babies born in the tenth month (i.e. after 270 days) will be carried off by the deadly day 280 (7.438.3, 10–11; 90.11–12, 19 Grenseman; 165.6–7, 16 Joly); elsewhere, that they are less likely to perish because they are stronger and further from the dangers of the day 240 (7.444.22–446.5 L; 96.5–11 Grensemann; 169.16–170.3 Joly). Hanson, (n. 14), 599, gives a somewhat different explanation.

[21] Hanson (n. 14) provides a full survey.

about what happens in the womb and a review of them is a necessary background for understanding Damastes' contribution.

Diogenes Laertius gave a general report on the opinions of Pythagoras (8.29): 'Solidifying first in forty days, the foetus has form, then according to the ratios of harmony, it is completed in seven, nine, or ten months at most, and is born'. However, our earliest detailed account of Pythagorean embryology is in fact quite late and comes from M. Terentius Varro's lost work *Tubero de origine humana*, as recounted in Censorinus (*De die natali*, 9 and 11).[22] Censorinus is usually a faithful witness but how much of his account is accurate reporting of Varro we cannot be sure. According to Varro ap. Censorinum, Pythagoras recognized only two calendars, one for the seven-month child and one for the ten-month child (9.3):[23]

Pythagoras autem, quod erat credibilius, dixit partus esse genera duo, alterum septem mensum, alterum decem, sed priorem aliis dierum numeris conformari, aliis posteriorem. Eos vero numeros, qui in uno quoque partu aliquid adferunt mutationis, dum aut semen in sanguinem aut sanguis in carnem aut caro in hominis figuram convertitur, inter se conlatos rationem habere eam, quam voces habent, quae in musice σύμφωνοι vocantur.

Pythagoras said something more believable [than Diogenes and Hippon], that there are two types of pregnancy, one of seven months, the other of ten, and the first corresponds to one set of numbers, the latter to a different set. These numbers, which cause change in each foetus, determining when semen changes into blood, blood into flesh, and flesh into human form, when compared to each other have the ratios called 'voices', which in music are known as 'harmonies'.

Censorinus then explained the various types of ratios and harmonies. He continued (11.2–10):

Primum, ut supra memoravi generaliter, duos esse partus omnino dixit, alterum minorem, quem vocant septemmestrem, qui decimetducentesimo die post conceptionem exeat ab utero, alterum maiorem decemmestrem, qui edatur die ducentesimo septuagensimo quarto. Quorum prior ac minor senario maxime continetur numero. 3. Nam quod ex semine conceptum est, sex, ut ait, primis diebus umor est lacteus, deinde proximis octo sanguineus: qui octo cum ad primos sex accesserunt, faciunt primam symphonian διὰ τεσσαρῶν. Tertio gradu novem dies accedunt iam carnem facientes: hi cum sex illis primis conlati sescuplam faciunt rationem et secundam symphonian διὰ πέντε. Tum deinceps sequentibus duodecim diebus fit corpus iam formatum: horum quoque ad eosdem sex conlatio tertiam διὰ πασῶν reddit symphonian duplici rationi subiectam. 4. Hi quattuor numeri VI VIII VIIII XII coniuncti faciunt dies XXXV. Nec inmerito senarius fundamentum gignendi est: nam eum τέλειον Graeci, nos autem perfectum vocamus, quod eius partes tres, sexta et tertia et dimidia, id est unus et duo et tres, eundem ipsum perficiunt. 5. Sed ut initia seminis et lacteum illud conceptionis fundamentum primitus hoc numero absolvitur, sic hoc initium formati hominis et velut alterum maturescendi fundamentum, quod est quinque et triginta dierum, sexies ductum, cum ad diem ducentesimum decimum per venit, maturum procreatur. 6. Alter autem ille partus, qui maior est, maiori numero continetur, septenario scilicet, quo tota vita humana finitur, ut et Solon scribit et Iudaei in dierum omnium numeris secuntur Etruscorumque libri rituales videntur indicare. Hippocrates quoque aliique medici in corporum valitudinibus non aliud ostendunt; nam septimum quemque diem κρίσιμον observant. 7. Itaque ut alterius partus origo in sex est

[22] J. Mansfeld has argued, in 'Doxography and dialectic. The *Sitz in Leben* of the "Placita"', *ANRW* II.36.4, 3179–83, and 'Chrysippus and the Placita', *Phronesis* 34 (1989), 311–42, that Varro in turn drew on not on the lost *Vetusta Placida* of the first century B.C. as reconstructed by Diels (*Doxographi Graeci* [Berlin, 1879], 188–92) but an older work, known to Chrysippus and with origins in the Skeptical Academy, which Mansfeld labels the '*Vetustissima placita*'; for his earlier views, see his *The Pseudo-Hippocratic Tract* περὶ ἑβδομάδων *Ch. 1–11 and Greek Philosophy* (Assen, 1971), 159, 190, n. 198.

[23] The 'ten months' in this account, as the calculations make clear, are nine months counted inclusively.

diebus, post quos semen in sanguinem vertitur, ita huius in septem; et ut ibi quinque et triginta diebus infans membratur, ita hic pro portione diebus fere quadraginta . . . 8. Hi igitur dies quadraginta per septem illos initiales multiplicati fiunt dies ducenti octoginta, id est hebdomadae quadraginta; sed quoniam ultimae illius hebdomadis primo die editur partus, sex dies decedunt et ducentesimus septuagensimus quartus observatur. . . . [10] Haec enim frequens medicorum experientia pervidit, qui cum multas animadverterent semen non retinere conceptum, conpertum habuerunt id, quod intra sex dies septemve eiciebatur, esse lacteum, et vocaverunt ἔκρυσιν, quod postea autem, sanguineum, idque ἐκτρωσμός appellatur.

[2] First, as I mentioned before in general terms, he said that there are only two types of pregnancy, one shorter called the seven-month, which comes forth from the womb on the two hundred and tenth day after conception; the other is longer, the ten-month, and it is born on the two hundred and seventieth day. Both of these, the shorter and the longer, are based on the number six. [3] For what is conceived from the seed is for the first six days, he said, a milky humour, then bloody for the next eight; when these eight days are compared to the first six, they form the first harmony, known as the 'fourth' [3:4]. In the third stage nine days are added, now making flesh; these compared to the first six make the ratio 2/3: in terms of harmonies, the 'fifth'. Then finally, after a following twelve days, it becomes a fully formed body; the comparison of these with the same six makes the harmony called the 'octave', in the ratio 1/2. [4] These four numbers—six, eight, nine, twelve, when added produce thirty-five. And so not undeservedly six is the basis of conception. The Greeks call it *teleion* (we say 'perfect'),[24] since it has three parts: a sixth, a third, and a half, that is, one, two, and three, making the very same thing [i.e. 1/6 + 1/3 (2/6) + 1/2 (3/6) = 1; 1 + 2 + 3 = 6]. [5] But just as the beginning of the seed and that milky basis of conception is set free at the start by this number, so also this the beginning for the fully-formed human being and as it were the other basis for growth, that is, thirty-five days, when multiplied by six, when it comes to the two hundred and tenth day, brings forth the fully-grown child.[25]

[6] The other pregnancy, the longer, is contained by the larger number, i.e. seven, which completes all of human life, as Solon writes and the Jews follow in numbering all their days, and the ritual books of the Etruscans seem to indicate. Hippocrates and the other doctors point to nothing else in the bodies of the sick, for they consider each seventh day to be a 'crisis' [a critical day].[26] [7] So just as the origin of the other pregnancy is in six days, after which the seed turns into blood, so the origins of this one lies in seven. And as there the infant became articulated in thirty-five days, so here following the ratios in about forty days . . . [8] So these forty days multiplied by the initial seven gives two hundred and eighty days, that is, forty weeks; but since the child is actually born on the first day of the last week, six days are subtracted and the result is two hundred and seventy-four days. . . . [10][27] The experience of the doctors has frequently observed these things, for they have observed many women who have not retained the seed which was received, and know for a fact that what is ejected within six or seven days is milky, and they called it *ekrusis* [efflux, flowing out] and what is ejected later is bloody and called *ektrosmos* [miscarriage].[28]

[24] Cf. Plut. *De anim. pro.* 1017f–18c; this does not seem to be quite the same as the fully developed system of perfect numbers that we find in Euclid; see T. Heath, *A History of Greek Mathematics* I (Oxford, 1921), 74–5.

[25] Cf. Macrob. *Som.* 1.6, a repository of much of this numerical mysticism. Plut. *De anim. pro.* 1017f–18c and Macrobius (1.6.14–16), following Nicomachus of Gerasa (ap. Ps.-Iamblichus 51, 64 [De Falco]), give similar calculations: 2^3 (= 8, masculine) + 3^3 (= 27, feminine) = 35; 35 × 6 = 210 = 7 months of 30 days.

[26] Cf. Hp. *Septim./Oct.* 7.448.11–21 L (80.3 Grensemann, 171.17–9 Joly).

[27] Aul. Gell. 3.10.7–8, supposedly reporting the opinion of Varro himself, gave the same account: 7 days for the seed to coagulate, 7 × 7 = 49 days for the foetus to be completed, and birth in 273 days (7 × 39, the first day of the fortieth week); see also Mansfeld (n. 22 [1971]), 167, n. 59.

[28] For the distinction, cf. Hp. *Septim./Oct.* 7.448.2–4 L (78.12–15 Grenseman, 171.5–7 Joly); cf. *Mul.* 1.10 (8.42.1–4 L), 1.11 (46.19–21), 1.12 (50.3), 1.16 (54.1); *Carn.* 19 (608.22–610.6 = 200.25–201.10 Joly); Arist. *G.A.* 758b5–6, *H.A.* 583a25–27, 83b10–15; Sor. 3.47 (125.21–26.1 IIb. = *Γ*.15.10–16 BMG; cf. 1.15 = 11.5 IIb. = *A*.4.148; 1.46 = 33.4 = *A*.16.22), Gal. 4.542–43, 17A.445, 799. It is also found in the text of Metrodora, *Gynaecology* (Florence, Laur. 75.3), which I am currently editing. There is no general agreement on the date separating the two stages.

The sequence of days (six, eight, nine, twelve) and stages (humour, blood, flesh, body) for the seven-month child are those given by Damastes, if we allow Varro-Censorinus' *lacteus humor* to correspond to Damastes' 'foam'. This account of Pythagoras, however, lacks Damastes' stage of 'motion'. The seven-month child is calculated at a full seven months of thirty days, for 210 days. The greatest discrepancy—besides the presence of the eight- and nine-month child—is the calendar given for the ten-month child, which is associated with the number seven. Censorinus did not specify the intervening stages, but keeping, as he said, to the same harmonies, we have 7 + 9 1/3 (3:4, a musical fourth) + 10 1/2 (2:3, a musical fifth) + 14 (1:2, an octave), giving a total of 40 5/6, which Censorinus called *fere quadraginta* 'about forty'. He then rounded down to an even forty and multiplied by seven to get the total of 280 days, which equals forty weeks.[29] But because the child is actually born on the *first* day of the final week (i.e. really nine months counted inclusively), he subtracts six days, to arrive at the grand total of 274 days to birth for the ten-month child, which equals three-quarters of the year (less a quarter of a day). This is close to Damastes' total of 270 days for the birth of the nine-month child, but the mathematical basis, from the first number of seven (vs. Damastes' six), is totally different. These calculations appear to be an attempt to reconcile three different calendars, one based on Pythagorean harmonics, one based on groups of forty, and one based on a strict solar year.[30]

We find already attributed to Empedocles the statement that women could give birth (that is, to viable children) in the seventh month.[31] The doxographical tradition records Empedocles' doctrine that the embryo begins its articulation (διάρθρωσις), that is, begins to have identifiable limbs, on the thirty-sixth day and the parts are complete by the forty-ninth.[32] This account has a clear mathematical basis ($36 = 6^2$; $49 = 7^2$) but differs completely from the doctrine ascribed to Empedocles by Proclus in his *Commentary on Plato's Republic* (13.32 and 34). Proclus treated Empedocles as a Pythagorean.[33] He began by citing Herophilus' doubts that viable seven-month children can be born[34] and marked the contrast:

Varro-Censorinus followed Hp. *Mul.* 1.0, 1.11, 1.16 in saying six or seven; Damastes and the account in Proclus agreed on six days for the seed to 'take' (so too Gal. 4.542.8–14 K citing Hippocrates as an authority); Hp. *Septim./Oct.*, *Carn.* and Arist. (op. cit.) said seven; while Hp. *Mul.* 1.12 and Sor. 3.47 said two to three days.

[29] Where we might have expected 285 (40 5/6 × 6).

[30] The author appears to be operating with a solar year of exactly 365 days; then 9 months = 273 days, 18 hours. Contrast the solar year of 365 days, 6 hours used in the Hippocratic *Septim./Oct* (below, n. 49). For the calculations in groups of forty, cf. *Septim./Oct. passim*, esp. 7.448.21–450.6 L (80.13–20 Grensemann, 172.10–19 Joly).

[31] 31 A 83 DK (Censor. 7.5), followed in this by the astrologer Epigenes of Byzantium (PW 17; probably second century B.C.). Cf. Empedocles 31 A 75 DK = Aetius, *De Plac.* 5.18 (427.15–28 Diehls) = [Plut.] *Mor.* 907f (178 Lachenaud), where both seven- and ten-month children are viable in a sort of remembrance of the cosmos' original ten and seven month long 'days' (rather than 'a range of seven to ten months', Hanson [n. 14], 589, n. 1). See G. Lachenard (ed.), *Plutarque: Oeuvres morales. Tome XII.2. Opinions de Philosophes* (Paris, 1993).

[32] 31 A 83 DK (Aetius 5.21.1; [Plut.] *Mor.* 909b [183 Lachenard]); repeated by Athenaeus Medicus ap. Orib. *Lib. Inc.* 16 (3.105.26–106.7 Raeder; cited below) and Psell. *De omn. doctr.* c. 86.

[33] L. G. Westerink, 'Proclus et les présocratiques' in Jean Pepin et H. D. Saffrey (edd.), *Proclus, lecteur et interpr te des anciens* (Paris, 1987), 110–11. On Empedocles and Pythogoras in general, see Peter Kingsley, *Ancient Philosophy, Mystery, and Magic: Empedocles and Pythagorean Tradition* (Oxford, 1995).

[34] Herophilus 198, ed. von Staden (n. 13), 369–70.

οἱ δὲ Πυθαγόρειοι προσίενται, ὡς καὶ Ὀρφεύς, καὶ τὰ ἑπτάμηνα, καὶ φασὶν ἐν μὲν λϵ' ἡμέραις τὸ καταβληθὲν σπέρμα τύπον καὶ μορφὴν λαμβάνειν ἐπὶ τ[ὼ]ν ἑ[. . .

The Pythagoreans, on the other hand, as well as Orpheus, admit the existence of the seven-month child as well, and say that the sown seed takes shape and form in thirty-five days, but in the case of . . .

The remainder of the chapter is too fragmentary here to yield more than a few words. Proclus then devotes a chapter to citing Zoroaster in support of the seven-month child (13.33), and continues (13.34; 31 B 69 DK in part):

ὅτι καὶ ὁ Ἐμπεδοκλῆς οἶδεν τὸν διπλοῦν τῶν γεννήσεων χρόνον· διὸ καὶ τὰς γυναῖκας καλεῖ 'διγόνους', καὶ τὴν ὑπεροχὴν τοῦ πλήθους τῶν ἡμερῶν αὐτὸς εἶπεν, καὶ ὅτι τὰ ὀκτάμηνα ἄγονα· καὶ εἰκότως. τῶν μὲν γὰρ ἑπταμήνων ὁ πρῶτος ἀριθμὸς ὁ λϵ' ἐν ἀριθμοῖς ἐστιν ς' η' θ' ιβ', ὧν οἱ ἄκροι τὸν διπλάσιον ἔχουσιν λόγον καὶ τὴν διὰ πασῶν· τῶν δὲ ἐννεαμήνων ὁ πρῶτος ἀριθμὸς ἐν ἀριθμοῖς συμφώνοις ς' θ' ιβ' ιη', ὧν οἱ ἄκροι τριπλάσιον ἔχουσιν λόγον. μεταξὺ δὲ τούτων σύμφωνος ἄλλος οὐκ ἔστι λόγος, ὥστ' εἰκότως συμφωνίας οὐκ οὔσης ἄγονα τὰ ὀκτάμηνα. καὶ γὰρ οὖν οἱ μὲν ἀπὸ δυάδος ἕως ὀγδοάδος συντεθέντες ποιοῦσιν τὸν λϵ', οἱ δὲ ἀπὸ μονάδος ἕως ἐννεάδος τὸν μϵ'· προσήκει δὲ ὀγδοάδι ἀρχὴ δυάς (κύβος γὰρ ἀπ' αὐτῆς), ἐννεάδι δὲ μονάς (ἐν γάρ ἐστι νέον ἡ ἐννεάς), μέσος δὲ τούτων οὐκ ἔστιν. ὥστ' οὐδείς ἐστιν ἀριθμὸς ὀκτάμηνα ποιῶν, οὔτε ἀριθμητικῶς σκοπούμενος οὔτε] . . . c. 120 . . . [ποιεῖ γὰρ ὁ ς' ἐπὶ τὸν λϵ' τὸ]ν ἑπ[τάμηνον καὶ] ἐπὶ τὸν μϵ' τὸν ἐννεάμηνον χρό[νον, ὁ δὲ] ς' ἐπὶ τὸν μ' τὸν ὀκτάμηνον . . . c. 10 . . . κάμπτοντας ἐπὶ τοὺς ἐξ ἀρχῆς, [τὸν ἑπτὰ τὸν] ἐννέα τὸν ὀκτώ. τούτων δὲ ὃ μέν [ἐστιν ἐκ τῶν] περὶ τὴν ὀρθὴν τοῦ ῥηθησομένου τριγώνου, αἳ εἰσιν τετρὰς καὶ τριάς, θήλεια καὶ ἄρρην· ὃ δὲ ἐκ τῶν μεγίστων, αἳ εἰσι τετρὰς πεμπάς, θήλεια καὶ ἄρρην· ὃ δὲ ἐκ μεγίστης καὶ ἐλαχίστης, [αἳ] εἰσι πεμπὰς τριάς, ἄρρενες ἄμφω· ὥστ' εἰκότως ἄγονος. ὁ δὲ ς' ὀφθήσεται κατὰ τὸ ἐμβαδόν, ὅς ἐστι γάμος· ὥστ' εἰκότως ἄρρενα μὲν θήλει ζευγνὺς γόνιμός ἐστιν, ἄρρενα δὲ ἀλλήλοις ἄγονος. ταῦτα μὲν ἀπὸ τῶν ἀριθμῶν. οἱ δὲ ἀνατομικοὶ ἱστόρησαν καὶ τὰς ἐν τοῖς ἀριθμοῖς τούτοις διαφοράς· ὡς ὅταν ἐν ἓξ ἡμέραις τὸ σπέρμα ἀφρωθῇ, περὶ τὰς ἑξῆς η' εἰς αἷμα μεταβάλλει, περὶ δὲ τὰς ἑξῆς θ' σαρκοειδὲς γίνεται, περὶ δὲ τὰς λοιπὰς ιβ' μορφοῦται· καὶ οὕτως ἑξῆς διοργανωθὲν τίκτεται ἑπτάμηνον. καὶ ἐπὶ τῶν ἄλλων ὡσαύτως ἐν ταῖς ς' καὶ θ' καὶ ιβ' καὶ ιη' τὸν ὅμοιον δέχεται τύπον· ὡς εἶναι τὸν ς' κοινὴν ἀρχήν, διὸ καὶ οὗτος ποιεῖ ἑκάτερον.

34. Empedocles also recognizes two lengths of pregnancy. It is on that account that he calls women 'twice-bearing' [31 B 69 DK], and talks about the excess of the number of days and that the eight-month child is not viable. Rightly so, for in the case of seven-month children the first number, thirty-five, is the sum of six, eight, nine, and twelve, where the outer terms of the series [i.e. 6 and 12], are in the ratio of one to two, i.e. the octave. But of nine-month children the first number is the sum of the proportional numbers six, nine, twelve, and eighteen, where the outer terms of the series [i.e. 6 and 18] are in the ratio of 1/3. There is no other proportional ratio between these [i.e. between 7 and 9], so that rightly eight-month children are not viable because there is no harmony. So then, adding up from two to eight equals thirty-five and adding up from one to nine equals forty-five. Two is the base of eight (eight is the cube of two), and one is the base of nine (for one is a new nine),[35] but there is no mean of these numbers. So there is no number creating eight-month children, whether one looks at the matter arithmetically or . . . [a lacuna of *c.* 120 letters] . . . [For six times thirty-five equals] the sev[en month period and six] times forty-five equals the nine month per[iod, but] six times forty [equals] the eight month . . . [*c.* 10 letters] . . . corresponding[?][36] to the numbers at the start, [seven], nine, and eight.[37] Of these, one [i.e. seven] is the sum of those that are the sides of a right triangle, that is, four and three, female and male;[38] one [i.e. nine] is the sum of the two greatest, that is, four and five,

[35] Cf. Theon Sm. 106.3–11 (Hiller) and Arist. Quint. 3.5 (102.19–103.9 Winnington-Ingram) on the significance of nine.

[36] *κάμπτοντας*; I am not certain of the sense here of *κάμπτω*, which is used nowhere else in this work.

[37] That is, the number of months of gestation, the viable seven and nine, and the not-viable eight.

[38] In Pythagorean thought, odd numbers are male (based on the unity), even numbers are female (having had something added to the unity); so in the table of opposites, Arist. *Met.*

female and male. But the other [i.e. eight] is the sum of the greatest and the least, that is, three and five, both male.[39] So naturally it is not viable. Six will be seen to be one of the products of integers, the one which is 'marriage'.[40] So naturally, yoking male with female is productive, but male with other males is sterile. These things are proved by numbers.

But the anatomists also have discovered differences depending on numbers. So the fact that the seed becomes foam in six days, around eight days after that changes into blood, around nine days after that becomes fleshy, around the remaining twelve days takes shape. And so when it is in due order complete in its parts, the seven-month child is born. And in the case of the others [the nine-month children], in the same way in [respectively] six, nine, twelve, and eighteen, it receives its shape. So six is their shared base, and therefore it [six] produces each.

This account matches up quite closely with Damastes' calendar for both the seven- and the nine-month child and contrasts with Censorinus' account where the 'ten-month' child is based on the number seven. The seven-month child moves in the sequence 6 + 8 + 9 + 12 = 35, and in the ratios 3/4, 2/3, 1/2, with a total of 210 days (6 × 35); while the nine-month child moves in the sequence 6 + 9 + 12 + 18 = 45, and the ratios 2/3, 1/2, 1/3, with a total of 280 days (6 × 45).

Of the other Presocratics, Hippon (see n. 19) said that the embryo is formed in sixty days, the flesh becomes solid in the fourth month, the nails and hair grow in the fifth, and it is a complete human being in the seventh.[41] Diogenes of Apollonia (*fl. c.* 430 B.C.) is reported as saying that the male is formed in four months and the female in five, and that flesh condenses out of a moisture (*humor*) and then the sinews and bones condense out of the flesh.[42]

Hippocratic corpus[43]

The Hippocratic corpus contains several accounts of embryology, and the enigmatic series of questions found in *Epid.* 2.3.17 (5.118.1–5 L) might serve as an epigraph for the wide variety of speculations put forth by all our ancient sources:

ἃ δεῖ εἰδέναι ἐς τὸν ἑπτάμηνον· εἰ ἀπὸ τῶν γυναικείων ἀριθμητέοι οἱ ἐννέα μῆνες, ἢ ἀπὸ τῆς ξυλλήψιος, καὶ εἰ ἑβδομήκοντα καὶ διακοσίῃσιν οἱ ἑλληνικοὶ μῆνες γίνονται, καὶ εἴ τι προσέτι τούτοισι, καὶ εἴ τι τοῖς ἄρσεσιν ἢ καὶ τῇσι θηλείῃσι ταὐτὰ ποιέεται ἢ τἀναντία.

986a21–6; Walter Burkert, *Lore and Science in Ancient Pythagoreanism* (Cambridge, MA, 1972), 429, 474–6.

[39] I.e. take the smallest possibile Pythagorean triad: 3–4–5; then 7 = 3 + 4, the sum of the two sides adjacent the right angle; 9 = 4 + 5, the long side and the hypotenuse; while 8 = 3 + 5.

[40] An *embadon* is a triangular number, the sum of the series of integers, so 1, 3 (= 1 + 2), 6 (= 1 + 2 + 3), 10 (= 1 + 2 + 3 + 4), etc. These were assigned various mystic values. See Pl. *R.* 8.3 (546b–d) and Plut. *De anim. pro.* 1017c, 1018c; for later sources, cf. Philo, *Questiones in Gen.* 3.38 (206 Aucher), Lydus, *Mens.* 2.11 (32.4–14 Wuensch), Clem. Alex. *Stromata* 6.16.139, Anatolius on Ps.-Iambl. *Theolog. Arim.* 143.3–9 (de Falco), Theon Sm. 102.4–18; Arist. Quint. 3.6, 3.12 (102.1–12, 112.8 Winnington-Ingram). Ernest G. McClain, 'Musical "marriages" in Plato's *Republic*', *Journal of Music Theory* 18 (1974), 242–72. There is an alternative tradition in which 5 (2 + 3) is 'marriage'; see Burkert (n. 38), 33, n. 26, for sources.

[41] 38 A 16 DK (Censor. 7.2–4 and 9.2).

[42] 64 A 26 DK (Censor. 9.2) and A 27 (Censor. 6.1). But Galen (17A.1006.8 K) complains: 'Nearly all doctors agree that the male not only is formed [διαπλάττεσθαι] but also moves earlier than the female. Rufus [of Ephesus, *c.* A.D. 50] says that Diogenes of Apollonia in Book II of *On Nature* is the only one to maintain the opposite [64 B 9]. But I have not be able to find a copy of the work'.

[43] Although the dating of Hippocratic material is necessarily somewhat subjective, the works considered here—*Epid. II*, *Carn.*, *Septim./Oct.*, *Vict.*, *Nat. Puer.*—are generally dated to the end of the fifth/beginning of the fourth century B.C. See Jacques Jouanna, *Hippocrate* (Paris, 1992) for a useful overview, and see individual editions cited below.

What one must know about the seven-month child: are the nine months to be counted from the menses or from conception?[44] Do the Greek months happen in two hundred and seventy days or something in addition to these? Do the same things apply to males as to females or not?

The 270 days are Damastes' period for the birth of the nine-month child (nine months of thirty days). The 'addition' refers to the ten days added by some authorities to bring the total up to the next multiple of seven (seven periods of forty days).[45] Note here that the only two calendars mentioned are for seven- and nine-month children; the eight-month child is not viable by implication.[46] *Epid.* 2.7.13 (2.116.12–13 L) also states: *ὅ τι ἐν ἑβδομήκοντα κινέεται, ἐν τριπλασίῃσι τελειοῦται* ('whatever moves in seventy days is perfected in three times that'). Two hundred and ten days is the usual period for the birth of the seven-month child (seven months of thirty days) and also matches Damastes' period for motion. The text of *Epid.* 6.8.6 (2.344.11–12 L) is largely a repetition: *ὅ τι ἐν ἑπτὰ κινέεται, ἐν τριπλασίῃ τελειοῦται, καὶ ὅ τι ἐν ἐννέα κινεῖται, ἐν τριπλασίῃ τελειοῦται* ('whatever moves in seven is perfected in three times that; whatever moves in nine is perfected in three times that'). If we follow Galen's commentary (which has this reading in the text of *Epid.* 2.3.17) and understand 'seven' and 'nine' to be 'seventy' and 'ninety' (seven or nine periods of ten days), this succinct statement also matches up with Damastes' calendar for the nine-month child.[47]

The author of the Hippocratic *Carn.* 19 also gives a mathematical basis for the seven- and ten-month child (201.25–202.7 Joly = 8.612.1–10 L):

τὸ παιδίον ἑπτάμηνον γενόμενον, λόγῳ γεγένηται, καὶ ζῇ, καὶ λόγον ἔχει τοιοῦτον καὶ ἀριθμὸν ἀτρεκέα ἐς τὰς ἑβδομάδας· ὀκτάμηνον δὲ γενόμενον, οὐδὲν βιοῖ πώποτε· ἐννέα δὲ μηνῶν καὶ δέκα ἡμερέων γόνος γίγνεται, καὶ ζῇ, καὶ ἔχει τὸν ἀριθμὸν ἀτρεκέα ἐς τὰς ἑβδομάδας· τέσσαρες δεκάδες ἑβδομάδων ἡμέραι εἰσὶ διηκόσιαι ὀγδοήκοντα· ἐς δὲ τὴν δεκάδα τῶν ἑβδομάδων ἑβδομήκοντα ἡμέραι. ἔχει δὲ καὶ τὸ ἑπτάμηνον γενόμενον τρεῖς δεκάδας ἑβδομάδων, ἐς δὲ τὴν δεκάδα ἑκάστην ἑβδομήκοντα ἡμέραι, τρεῖς δεκάδες δὲ ἑβδομάδων αἱ σύμπασαι δέκα καὶ διηκόσιαι.

The seven-month child which is viable is born in ratio and lives, and has such a ratio and an even number of weeks [i.e. an integer multiple of seven]. But the eight-month child never lives. But if born at nine months and ten days, it also lives and has an even number of weeks: four groups of ten weeks is two hundred and eighty days (seventy days in ten weeks). The seven- month child also has thirty weeks: there are seventy days in ten weeks and three groups of ten weeks are two hundred and ten days.[48]

The Hippocratic treatise called *On the Seven-month Child* and *On the Eight-month Child* (*Septim./Oct.*) preserves an original and highly complex calendar for development. It presents a seven-month child born after an initial 'month' of fifteen

[44] The Arabic text of Galen's commentary (in German translation) apparently reads 'eight-month child' here. Galen attempted to explain the discrepancy between the seven-month child and the nine months: 'Was er über das mit neun Monaten geborene Kind sagt, muß man so verstehen, daß es auch von dem mit sieben und dem mit acht Monaten geborenen Kind gilt, weil seine Worte von allen Kindern gleichermaßen und allgemein gelten'. See Ernst Wenkebach and Franz Pfaff, *Galeni in Hippocratis Epidemiarum libros I et II, III, VI. CMG* V 10.1 (Leipzig, 1934), 300.29–32.

[45] For the 'additional' ten days, see Hp. *Carn.* 19 (612.1–10 L); for the multiples of seven, see Hp. *Septim./Oct.* 7.460.5–9 L (88.12–16 Grensemann, 178.17–22 Joly), both discussed below.

[46] So also *Epid.* 2.6.4 (5.134.2–3 L).

[47] See Wenkebach and Pfaff, *CMG* V 10.1 (n. 44), 295.35–296.6. Cf. Macrob. *Som.* 1.6.22.

[48] So 9 months of 30 days each is 270; add 10 to bring it up to the next multiple of 7 = 280 (4 × 70); 7 months = 210 days (3 × 70). The author is merely laboriously working out the factors.

days,[49] plus five full lunar months of approximately twenty-nine and a half days, followed by a final seventh 'month' of twenty days and a fraction, for a total of 182 and a fraction days.[50] Elsewhere, the author works with periods of forty days.[51] Miscarriages are most common in the first forty days. After forty days, the body of the foetus is articulated in all its parts. However, only in male foetuses is everything distinct; in females the flesh appears to have only swellings or buds (*τὰ δὲ θήλεα, ἐς τοῦτον τὸν χρόνον σάρκες φαίνονται ἀποφύσιας μοῦνον ἔχουσαι*).[52] What most other texts refer to as the nine-month child is here called the ten-month (or eleven-month) child, which is born after seven periods of forty days (280 days) in the same way that the seven-month is born in half a year.[53] The author's calculations correspond to the 'addition' mentioned in *Epid.* 2.3.17 (5.118.1–5 L) and to the calendar in *Carn.* 19 (612.1–10 L), where the child is born at nine months and ten days (280 days = 40 weeks).

The author of *Vict.* I.26 (6.498.14–24 L = 142.19–26 Joly in *CMG*) is much less dogmatic, though here too we see that only the seven-month and nine-month children are listed as viable.

διακρίνεται δὲ τὰ μέλεα ἅμα πάντα καὶ αὔξεται, καὶ οὔτε πρότερον οὐδὲν ἕτερον ἑτέρου οὔθ' ὕστερον· τὰ δὲ μέζω φύσει πρότερα φαίνεται τῶν ἐλασσόνων, οὐδὲν πρότερα γινόμενα. οὐκ ἐν ἴσῳ δὲ χρόνῳ πάντα διακοσμέεται, ἀλλὰ τὰ μὲν θᾶσσον, τὰ δὲ βραδύτερον, ὅκως ἂν καὶ τοῦ πυρὸς ἕκαστα τύχῃ καὶ τῆς τροφῆς· τὰ μὲν οὖν ἐν τεσσαράκοντα ἡμέρῃσιν ἴσχει πάντα φανερὰ, τὰ δ' ἐν δύο μησὶ, τὰ δ' ἐν τρισὶ, τὰ δ' ἐν τετραμήνῳ. ὡσαύτως καὶ γόνιμα γίνεται τὰ μὲν θᾶσσον ἑπτάμηνα τελείως, τὰ δὲ βραδύτερον ἐννέα μησὶ τελείως, ἐς φάος ἀναδείκνυται ἔχοντα τὴν σύγκρησιν ἥνπερ καὶ διὰ παντὸς ἕξει.

All the parts are differentiated and grow at the same time, nothing before or after anything else. The parts that are larger by nature appear sooner than the smaller ones, but they are not created any earlier. Everything is not put in order [i.e. fully formed] in the same amount of time but when each thing encounters fire and nourishment. Some[54] have all (the parts) visible in forty

[49] The reasoning for this is not made manifest here, but the author is assuming that conception takes place approximately halfway through a month, following the last menstrual cycle, so at *Septim./Oct.* 13 (7.460.4–7 L, 88.11–14 Grensemann, 178.14–16 Joly); see Dean-Jones (n. 3), 171–2. In this it resembles the modern Naegele's rule, calculating birth at 40 weeks from the last menstrual cycle. Here the author seems to mix a thirty-day lunar month with a more exact solar month.

[50] 436.1–8 L (88.17–90.2 Grensemann, 164.1–9 Joly). The author is working with a solar year of 365 days 6 hours. This gives a solar month (1/12) of 30 days 10 hours 30 minutes. The 'seven-month child' is born after six solar months (i.e. at the very start of the seventh month), half a year = 182 days 15 hours. Seven months are said to put the embryo at the beginning of completion (*τελείωιος*), i.e. the first point at which the foetus is viable: *Septim./Oct.* 7.448.7–9 L (78.19–20 Grensemann, 171.12–14 Joly). However, at *Septim./Oct.* 7.458.19–460.2 L (88.5–10 Grensemann, 178.7–12 Joly) the author works with a lunar month rounded off to 30 days, which gives him more pleasing fractions (1 day = 1/30; 2 days = 1/15; 3 days = 1/10).

[51] See A. Lami, 'Fare i conti con *Περὶ ὀκταμήνου*', in F. Lasserre and P. Mundy (edd.), *Formes de pensée dan la collection hippocratique* (Geneva, 1983), 355–82; Hanson (n. 14), 596–7.

[52] *Septim./Oct.* 7.448.21–450.6 L (80.13–20 Grensemann, 172.10–19 Joly).

[53] Here, of course, the mathematics is on a completely different basis from the solar calendar of the seven-month child. The ten-month child can be called eleven-month, since the conception might take place in the last few days of month 1, then 9 full months of 30 days (270 days), and the birth would then occur in the first few days of month 11 (for a total of 280). So *Septim./Oct.* 7.460.5–9 L (88.12–16 Grensemann, 178.17–22 Joly).

[54] The subject now seems to be the embryos.

days, others in two, three, or four months.[55] In the same way, the faster-growing are viable at the end of seven months, the slower-growing at the end of ten.

W. Burkert has suggested that the materials in *Carn.*, *Oct.*, and *Vict.*, which have a more explicit Pythagorean basis than other parts of the Hippocratic corpus, may derive from Philolaus.[56] This is possible but uncertain, and even these works show no uniformity of opinion.[57]

Some of the stages listed in *On the Nature of the Child* (*Nat. Puer.*) are similar to those found in Damastes, but none provides an exact parallel. Thus, in this Hippocratic account there are essentially ten stages: (1) seed from both parents forms a mass and condenses; (2) it acquires breath and a central passage (chapter 12 = 7.486.1–6 L); (3) enclosing membranes form (chapter 12 = 488.13–16); (4) blood from the mother contributes to the growth of the embryo and the membranes (chapter 14 = 492.7–18); (5) flesh begins to form, as do the membranes and the chorion (chapter 15 = 492.19–20, 16 = 496.11–16); (6) flesh grows into distinct members (chapter 17 = 496.17); (7) the embryo is fully formed and articulated by thirty days for males, forty-two days for females, corresponding to the lochial discharges (chapter 18 = 498.27–500.4, 502.17–20, 504.16–26); (8) growth of bones, nails, hair (chapter 19–20 = 506.3–510.17); (9) motion at three months for males, four months for females (chapter 21 = 510.18–25; also *Mul.* 1.71 = 8.150.7–11 L, *Ster.* 223 = 8.446.17 L); and finally, (10) birth.[58] The doctor claims first-person authority for this sequence, since he has seen a miscarried embryo of six days' gestation (*Nat. Puer.* 13).[59] A similar claim to have seen an embryo of seven days' gestation is made by the author of the Hippocratic *Carn.* (19 = 8.610.2–10 L), where the embryo was already fully formed, including the eyes, ears, and limbs, down to the fingers and toes.[60]

The Hippocratic physician Polybus[61] (as cited by the doxographer Aetius) shows traces of the same calendar found in *On the Eight-month Child.* He also maintained that the foetus was viable after 182 1/2 days, i.e. exactly half a year, when the sun passes from one tropic to the other. Likewise, the name 'seven-month' was traditional, since the days could be spread out over seven calendar months. In addition, he gave a physiological explanation: the eight-month child dies whenever it moves down in the

[55] Cf. Hp. *Epid.* 2.6.17 (5.136.7–8): *τρίμηνον παίδιον πάντα δηλοῖ* 'the three-months child [clearly then a miscarriage] shows everything clearly'.

[56] Burkert (n. 38), 262–4.

[57] To complete the survey of Hippocratic opinion, the work *On Sevens* (*Hebd.*, *περὶ ἑβδομάδων*; 1.8–13 Roscher) mentions seven days for the coagulation of the seed. W. H. Roscher, *Die hippokratische Schrift von der Siebenzahl* (Paderborn, 1913) and Mansfeld (n. 22 [1971]), 175–7.

[58] Cf. Macrob. *Som.* 1.6.22, who claims 70 days for males, 90 days (= 3 months) for females on Hippocrates' authority.

[59] This passage clearly underlies the report in the account of Varro ap. Censorinum about the 'experience of doctors' (Censor. 11.10). See I. M. Lonie, *The Hippocratic Treatises 'On Generation,' 'On the Nature of the Child,' 'Diseases IV'* (Berlin and New York, 1981), 158–68, esp. 162–3, on the possible Pythagorean basis for this claim.

[60] Robert Joly, *Hippocrate. Tome XIII* (Paris, 1978), 200.25–210.10. Lonie (n. 59), 160 states that the author 'claims to have procured the abortion of a seven-day embryo, not once, but several times'; sim. Dean-Jones (n. 3), 174. Rather the statement is that the common prostitutes claim to know when they have gotten pregnant and have frequently had abortions.

[61] Date uncertain; traditionally called Hippocrates' son-in-law. See H. von Staden, 'A new testimonium about Polybus', *Hermes* 104 (1976), 494–6 with earlier literature.

womb prior to birth, pressing on the umbilical cord and cutting off its food supply (a reference apparently to 'blue baby syndrome').[62]

Aristotle and after

Aristotle seems to have attempted to have a foot in both camps, giving seven and ten months as the normal times, but allowing others: 'For both seven-month and ten-month children are born and those in between; even the eight-month child lives but less often, especially in Greece' (*G.A.* 772b7–11; cf. 776a22 and *H.A.* 583b31–5, 584b7–14). Elsewhere he stated that children can be born at seven, eight, nine, and the majority in ten months, while some even reach eleven months (*H.A.* 584a36–84b1).[63] Seven-month children are often born before they are fully formed (e.g. in the ears and nostrils), but the imperfect parts grow and the children usually survive (*G.A.* 775a1–4: *H.A.* 584b2–7). In keeping with his general theories, the male with its greater heat is perfected faster than the female (*G.A.* 775a10–15).[64] The male achieves motion and articulation around forty days (generally on the right side), the female in around ninety days (generally on the left). Aristotle reported an experiment, similar to the Hippocratic one, of dropping the miscarried foetus into water and examining it.[65] The forty-day male foetus is about the size of a large ant but fully articulated, the female is not fully articulated until after ninety days (*H.A.* 583b3–24).

Among the later members of the Peripatetic school, an account deriving ultimately from Nicomachus of Gerasa (*fl. c.* A.D. 100)[66] attributed a system of sevens to Straton of Lampsacus[67] and Diocles of Carystus.[68] The sequence closely follows the account in *Nat. Puer.*: in the first week a membrane forms; in the second (14 days), drops of blood appear on the surface; in the third (21 days), blood appears in the humour inside; in the fourth (28 days), the humour coagulates into something midway between flesh and blood, solid and liquid; in the fifth (35 days), it achieves human shape, about the size of a bee.[69] This is the calendar for the seven-month child; the stages are not specified for the nine-month child, but the limbs are formed in the sixth week

[62] Aetius, *De Plac.* 5.18 (429.1–12 Diehls) = [Plut.] *Mor.* 908b: *τὰ δ' ὀκταμηνιαῖα μὴ ζῆν, ὅταν προκύψῃ μὲν τῆς μήτρας τὸ βρέφος, ἐπὶ πλεῖον δ' ὁ ὀμφαλὸς βασανισθῇ· ἄτροφος γὰρ γίνεται † ὡς τοῦ τρέφοντος αἴτιος†* (179–80 Lachenaud). A similar explanation is found in *Septim./Oct.* concerning pains in mother and child, but this is tied to the periods of forty days and is said explictly to occur to children of seven and nine months as well (7.436.15–444.21 L, 90.20–92.7 Grensemann, 165.17–169.15 Joly); see the discussion in Grensemann (n. 20), 56–7, especially whether the *ὅταν* clause in [Plut.] represents a necessary or pathological condition.

[63] Cf. *H.A.* 584b20, where the MSS read either eleven or ten.

[64] The bibliography on Aristotle and the biology of women is vast. See, *inter alia*, Maryanne C. Horowitz, 'Aristotle and woman', *Journal of the History of Biology* 9 (1976), 183–213; Johannes Morsink, 'Was Aristotle's biology sexist?' *Journal of the History of Biology* 12 (1979), 83–112; Lloyd (n. 10), 94–106; Silvia Camprese, Paulo Manuli, and Guilia Sissa (edd.), *Madre Materia* (Turin, 1983), 139–45, 162–70; Suzanne Saïd, 'Féminin, femme et femelle dans les grands traités biologiques d'Aristote', in Edmond Lévy (ed.), *La femme dans les sociétés antiques* (Strasbourg, 1980), 93–123.

[65] This did not involve dissection as such; see Lloyd (n. 16), 179, n. 55.

[66] Preserved in Ps.-Iambl. (62.8–64.15 Falco) and Macrobius (1.6.65–6); see Roscher (n. 57), 92–4, for parallel texts; see Mansfeld (n. 22 [1971]), 164–8, for discussion of sources.

[67] Third head of the Lyceum, died *c.* 287–269 B.C. See Mansfeld (n. 22 [1971]), 165, n. 50 and 177–8.

[68] Dates uncertain, but probably a rough contemporary of Aristotle; see von Staden (n. 13), 44–6.

[69] Cf. Aristotle's comparison to an ant (above).

for the female nine-month child and in the seventh for the male.[70] The doxographic tradition also credited Diocles, Polybus, and the Empirical School with the belief that eight-month children are viable, but many perish due to weakness (according with Aristotle's opinion), and that people are in general unwilling to raise eight-month children (an interesting reference to exposure of weak children).[71]

Among the later sources, we find the doctor Athenaeus of Attaleia, founder of the Pneumatic school (first century B.C./first century A.D.), writing one of the fuller preserved accounts:

Ἡ δὲ πρώτη διαμόρφωσις τῶν ἐμβρύων διασημαίνει περὶ τὰς τεσσαράκοντα ἡμέρας· ἕως μὲν γὰρ Θ' ἡμερῶν οἷον γραμμαί τινες αἱματώδεις ὑποφέρονται· περὶ δὲ τὰς ὀκτωκαίδεκα θρόμβοι σαρκώδεις καὶ ἰνώδη τινὰ διασημαίνεται, καὶ σφυγμὸς ἐν αὐτοῖς εὑρίσκεται ὁ τῆς καρδίας. περὶ δὲ τὰς τρεῖς ἐννεάδας, ὥς φησιν ὁ Διοκλῆς, ἐν ὑμένι μυξώδει γίνεται φανερῶς ἀμυδρὸς ὁ τύπος τῆς ῥάχεως καὶ ὁ τῆς κεφαλῆς. περὶ δὲ τὰς τέσσαρας ἐννεάδας ὁρᾶται πρῶτον διακεκριμένον ὅλον τὸ σῶμα ἢ τὸ τελευταῖον, μιᾶς προστεθείσης τετράδος, περὶ τὴν τεσσαρακοντάδα. συμφωνεῖ δὲ τοῖς χρόνοις τῆς παντελοῦς τῶν ἐμβρύων διακρίσεως καὶ ὁ φυσικὸς Ἐμπεδοκλῆς, <καὶ> φησιν ὅτι θᾶσσον διαμορφοῦται τὸ ἄρρεν τοῦ θήλεος, καὶ τὰ ἐν τοῖς δεξιοῖς τῶν ἐν τοῖς εὐωνύμοις.[72]

The first articulation of embryos is observed around the fortieth day. After nine days, certain bloody 'lines' (so to speak) can be made out. Around the eighteenth day fleshy clots and certain fibrous parts are observed and the pulse of the heart can be found in them. Around the third period of nine days [day twenty-seven], as Diocles says,[73] there clearly occurs the faint shape of the spine and the head in a mucus-filled membrane. Around the fourth period of nine days [day thirty-six] one can first see the whole body separated out [into its parts] and complete, with the addition of a period of four days, around the fortieth day. The natural philosopher Empedocles agrees with the times for the completion of the separation of the embryos,[74] and says that the male takes shape faster than the female and the embryos on the right side [of the womb] faster than those on the left.

Athenaeus, then, is moving in nine-day periods plus a final four-day spurt to complete the form and to match up with the traditional count by groups of forty.[75]

Damastes' calendar also has affinities with a somewhat cryptic passage found in the late Hippocratic tract *Alim.* 42 (*περὶ τρόφης*; 9.112.12–116.2 L).[76]

Ἐς τύπωσιν λε' ἠέλιοι, ἐς κίνησιν ο', ἐς τελειότητα σι'·
ἄλλοι, ἐς ἰδέην με', ἐς κίνησιν ς', ἐς ἔξοδον σο'·
ἄλλοι, ν' ἐς ἰδέην, ἐς πρῶτον ἅλμα ρ', ἐς τελειότητα τ'·
ἐς διάκρισιν μ', ἐς μετάβασιν π', ἐς ἔκπτωσιν σμ'·
οὐκ ἔστι καὶ ἔστι· γίνεται δὲ ἐν τούτοισι καὶ πλείω καὶ ἐλάσσω, καὶ ὅλον καὶ κατὰ

[70] The later date for the male is surprising.

[71] Aetius, *De Plac.* 5.18 (428.8–15 Diehls) = [Plut.] *Mor.* 908a (178 Lachenaud); fr. 174 Wellmann. See Lachenard (n. 31), 179 and 307; Grenseman (n. 20), 57.

[72] Athenaeus ap. Orib. *Lib. Inc.* 16 (3.105.26–106.7 Raeder). See above for his citation of Empedocles.

[73] Frg. 175 Wellmann; see above for Diocles.

[74] See above.

[75] Mansfeld (n. 22 [1971]), 164 and 167, n. 59.

[76] The text is that of the Budé edn of R. Joly, *Hippocrate, Tome VI, 2e Partie: Du régime des maladies aiguës, Appendice, De l'aliment, De l'usage des liquides* (Paris, 1972). Joly assembles previous opinion and argues for a date in the second or third century B.C. (132–6). H. Diller, 'Eine stoisch-pneumatische Schrift im Corpus Hippocraticum' *Sudhoffs Archiv* 29 (1936), 178–95 (repr. in *Kleine Schriften zur antiken Medizin* [Berlin, 1973], 17ff.) and K. Deichgräber, *Pseud-hippokrates' Über die Nahrung* (Mainz, 1973), 11–13, 69–75, argue convincingly for a date around the birth of Christ. However, part of the argument for the later date rests on the influence of Athenaeus and the Pneumatic school but Athenaeus' calendar differs from the one found here.

μέρος, οὐ πολλὸν δὲ τὰ πλείω πλείω καὶ ἐλάσσω ἐλάσσω· τοσαῦτα καὶ ὅσα ἄλλα τούτοισιν ὅμοια.

Until impression, 35 suns; until movement, 70; until completion, 210.
Others: until shape, 45; until movement 90; until coming out 270.
Others: until shape, 50; until the first leap, 100; until completion, 300.
Until separation, 40; until, change of position, 80; until expulsion, 240.
They are not, and they are. More and fewer happen in these, both according to the whole and the part, but the more is not much more and the fewer (not much) fewer. Such are these things and all the others like them.

The calendar for the advanced stages is the same as that found in Damastes, and he can help shed some light on this mysterious passage, although, because of the problems of dating, we cannot know who is influencing whom. Most likely both Damastes and the Hippocratic author were drawing on a common Pythagorean tradition. The first group (35, 70, 210) is clearly the seven-month child. The times for *form* and *birth* are common to all the main Pythagorean accounts, and the author of *Nourishment* shares the distinct stage of *motion* with Damastes. The next sentence (45, 90, 270) deals with the nine-month child. Again, the author has the same numbers for *form*, *motion*, and *birth* as Damastes (not shared with any other account). The third sentence (50, 100, 300) deals with Damastes' ten-month child, again with the same numbers unique to these two accounts, with ten full months. The fourth sentence (40, 80, 240) is the eight-month child. The calculations are those of Damastes, but in the Hippocratic account the child is not viable. Not only does the ordering imply that 'the first three series produced viable infants but the final one did not',[77] so does the vocabulary and the commentary. In the vocabulary, we can note the author's use of διάκρισις instead of ἰδέη; μετάβασις instead of κίνησις (or πρῶτον ἅλμα); and ἔκπτωσις instead of τελειότης (or ἔξοδος). For the aphoristic commentary, we can rely on the explication of Sabinus (second century A.D.)[78] preserved in Aulus Gellius (3.16). His lemma provides a slightly different text and a subject for the mysterious 'They are not, and they are':

sed huius de mense octauo dissensionis causa cognosci potest in libro Hippocratis, qui inscriptus est *Περὶ τροφῆς*, ex quo libro uerba haec sunt: *ἔστιν δὲ καὶ οὐκ ἔστιν τὰ ὀκτάμηνα.* Id tamen obscure atque praecise tamquam aduerse dictum Sabinus medicus, qui Hippocratem commodissime commentatus est, uerbis <his> enarrauit: *ἔστιν μὲν φαινόμενα ὡς ζῶα μετὰ τὴν ἔκπτωσιν· οὐκ ἔστιν δέ, θνήσκοντα μετὰ ταῦτα· καὶ ἔστιν οὖν καὶ οὐκ ἔστιν φαντασίᾳ μὲν παραυτίκα ὄντα, δυνάμει δὲ οὐκέτι.*

The reason for the disagreement about the eighth month can be understood in the book of Hippocrates called *On Nutriment*, from which these words are taken: 'Eight-month children are and are not'. This statement, so obscure, compressed, and almost self-contradictory, was explained by the doctor Sabinus, who wrote the most useful commentary on Hippocrates: 'They "are", since they seem to be living things after the miscarriage. They "are not", since they die afterwards. So they "are and are not", since they exist momentarily in appearance, but not in actuality.'

Asclepiades of Bithynia (first century B.C.) maintained that in the case of males, because of their greater heat, articulation begins on the twenty-sixth day or even earlier, and the parts are complete by the fiftieth. Females, owing to their lack of heat, do not begin until the second month is over (i.e. sixty days) and are complete by the fourth month (i.e. 120 days).[79] Galen in his earlier work *De semine* (4.542–4 =

[77] Hanson (n. 14) at 593.
[78] PW 25; K. Deichgräber, *Die griechische Empirikerschule* (Berlin, 1965), 25–9.
[79] Aetius 5.21.2, [Plut.] *Mor.* 909b (183 Lachenaud).

92.22–94.11 de Lacy) says that he is following Hippocrates in dividing foetal development into four stages: (1) seed, up to the sixth day; (2) flesh, where the growth may be properly called κύημα (the embryo is full of blood, with heart, brain and liver still indistinct); (3) heart, brain and liver become distinct, and other parts take on their shapes; (4) full articulation and movement, now no longer called ἔμβρυον but παιδίον. Galen does not, however, give any durations for these stages. Later in *De foetuum formatione* he denied that there was any single scheme for formation, movement, or birth in embryos (4.653.10–12 K and cf. the general account at 4.662–3 on the development of heart, brain, and liver).[80] Finally, Aristides Quintilianus (possibly third century A.D.) gives the standard set of Pythagorean proportions but does not specify the internal stages: the ratios produce six, eight, nine, and twelve; added these produce thirty-five days (months × 5) for the shaping (διαπλάττεσθαι) of the seven-month child; one through four equals ten, added to thirty-five equals forty-five days for the formation (μορφοῦσθαι) of nine-month child. Similar calculations to those in Proclus show the non-viability of the eight-month child.[81]

DAMASTES' CALENDAR

We can now examine Damastes' calendar against these theories. It is clear that his calculations owe the most to the accounts with a Pythagorean background. A summary table (Table 1) may help to make their relations clear.

As has been pointed out, none of these ancient authors expresses an idea of 'prematurity'. All the foetuses, whether born at seven, eight, nine, or ten months, go through exactly the same stages (when these are specified). The child is born fully formed; it is merely that the times allotted for each stage are compressed (or speeded up) for the children born early. Second, Damastes is working with full months and is not counting inclusively, that is, the seven-month child is born at the *end* of a full seven months (of thirty days each), etc. This is in fact the most common form of reckoning.[82] Third, Damastes (unlike Diogenes, Hp. *Nat. Puer.*, *Septim./Oct.*, Aristotle, Straton/Diocles) makes no sex distinctions in the development: male and female foetuses follow the same stages at the same time.[83] Fourth, and most important, unlike nearly every other source, Damastes considers the eight-month child viable. For Damastes, the eight-month child is merely another part of the developmental calendar.[84]

DAMASTES' MATHEMATICS

The mathematics of the later stages in Damastes' calendar—*form*, *motion*, and *birth*—is straightforward and follows the general Pythagorean model. The number of days to reach the stage *birth* equals the number of months times thirty full days per

[80] See Phillip De Lacy, *Galen: On Semen. CMG* V 3.1 (Berlin, 1992), 218; A. Debru, 'L'ordre de formation des organes embryonnaires: la *retractio* de Galien', *Bulletin d'Histoire et d'Épistemologie des Science de la Vie* 2 (1995), 156–63.

[81] Arist. Quint. 3.18 (117.17–118.18 Winnington-Ingram) and 3.23 (124.5–16). Other more complicated calculations follow.

[82] Contrast Hanson (n. 14) at 589. Inclusive counting is found in Varro's account and Hp. *Septim./Oct* (with special explanation).

[83] It is, of course, possible that separate remarks about the female child have not been included in the sketch we have here, but there is no evidence for such an assumption and no Pythagorean account lists sex differences in its calendar.

[84] Contrast Damastes' repeated ἀποκυΐσκεται with the vocabulary of Hp. *Alim.* 42 (above).

TABLE 1. Damastes' calendar

	Pythagorean accounts			
	7-month	8-month	9-month	10-month
Damastes	6: foam +8 = 14: blood +9 = 23: flesh +12 = 35: form 70: motion 210: birth	6 +10 = 16 +9 = 25 +15 = 40 80 240	6 +9 = 15 +12 = 27 +18 = 45 90 270	6 +8 = 14 +12 = 26 +24 = 50 100 300
Varro/ Censorinus	6: humour +8 = 14: blood +9 = 23: flesh +12 = 35: form 35 × 6 = 210: birth	not viable	–	humour: 7 *c.* 40 (40 × 7) – 6 = 274
Empedocles/ Proclus	6: humour +8 = 14: blood +9 = 23: flesh +12 = 35: form 35 × 6 = 210: birth	not viable	6 +9 = 15 +12 = 27 +18 = 45 45 × 6 = 270	–
Hp. *Alim.*	35: form 70: motion 210: birth	40 80 (240) not viable	45 90 270	50 100 300
Aristides Quint.	6 + 8 + 9 + 12 = 35: form	not viable	(1 + 2 + 3 + 4) +35 = 45	–

Other accounts (in approx. chronological order)

Empedocles	7-month viable 36d: limbs (not tied to months) 49d: complete
Alcmaeon	agnostic
Hippon	birth at any point in 7–10 months 60d (2m): form 120d (4m): solid flesh 150d (5m): nails/hair 210d (7m): complete
Diogenes of Apollonia	4m (male): form 5m (female) humour → flesh → sinews/bones

(*table continued*)

month. The number of days until the stage *motion* equals the number of months times ten, i.e. one-third of the way through each gestational period, and the number of days for *form* equals the number of months times five, i.e. half *motion*, or one-sixth of each gestational period (or *form* times the initial number six equals the full term).

The Pythagorean basis for the earlier stages (*foam*, *blood*, *flesh*, and the subtotal of *form*) for the seven-month child is made explicit by Varro/Censorinus and Proclus: the subtotal of *form* (months × 5) is reached from the starting number six (see n. 66) by adding eight (in the ratio 3/4, a musical fourth), nine (2/3, a fifth), and twelve (1/2, an octave). For the nine-month child the Varro/Censorinus account differs from the other

TABLE 1. *Continued*

Hippocratic corpus

	7-month	8-month	9 month	10 month
Ep. 2.7.13/6.8.6	70: motion	not viable	90	–
	210: complete		270	
Carn.	210: birth	not viable	280 (9 months + 10d = 40 × 7)	
Septim./Oct.	182+ : birth	not viable	–	280 (7 × 40)
	[= 15d + (29+ × 5) + 20+]			
	40: articulation (males distinct; females incomplete)			
Vict.	viable	–	–	viable
	parts visible in 40d or 2, 3, or 4m			
Nat. Puer.	6: form			
	30: limbs (male)	42 (female)		
	90: motion (male)	120 (female)		

Others

Aristotle	7–11 months; all are viable; 8-month less so			
	c. 40: motion/articulation (male); c. 90 (female)			
Straton/Diocles	7d: membrane	–	6w: articulation (male)	
	14: blood on surface		7w (female)	
	21: blood in humour			
	28: coagulation			
	35: form			
Athenaeus	9: bloody lines			
	18: fleshy clots/pulse			
	27: head/spine			
	36: first articulation			
	40: complete			
Asclepiades	26: articulation (male)		60 (female)	
	50: completion (male)		120 (female)	

d = days; w = weeks; m = months.

Pythagorean accounts by starting from seven, but Proclus shows the logic of Damastes' internal stages: beginning from six, add nine (2/3, a fifth), twelve (1/2, octave) and eighteen (1/3, octave and a half) to reach the subtotal of forty-five (month × 5).

Damastes' calculations for the eight- and ten-month child are unique in the surviving record and his account as preserved does not make his reasoning explicit. The calendar in the Hippocratic *Nutriment* shares the higher stages of the eight- and ten-month child but does not include the ratios that underlie the earlier stages of *humour*, *blood*, and *flesh*. We can only reconstruct his system from the outside, that is, we can search for numbers making a series which starts from six and adds up to forty (for the eight-month child) and fifty (for the ten-month child).

It is easy to find Pythagorean ratios for the stages of the ten-month child (6–8–12–24): 6 to 8 is 3/4, a fourth (the same ratio as in the seven-month child); 6 to 12 is the octave (same as for the nine-month child); and 6 to 24 is 1/4, a double octave. The numbers 6–8–12–24 form a well-known sequence, referred to as the 'subcontrary'

(ὑπεναντία) and renamed the 'harmonic' (ἁρμονική) by Archytas and Hippasus.[85] However, the ratios selected create difficulties. In going from the seven- to the nine-month child, each of the intermediate stages increases. However, for the ten-month child, the stage of *blood* is reached in only an additional eight days (fourteen total) and so one and two days *fewer* than the nine-month and eight-month child respectively. The ten-month child reaches the stage of *flesh* in only an additional twelve days (twenty-six total) and so one day faster than the nine-month child.

The numbers for the eight-month child, 6 + 10 + 9 + 15 = 40, create enough difficulties to make one almost agree with the numerologists that they can never be harmonious. In particular, it is hard not to wonder if the middle terms, the number of days for blood and flesh, have been reversed. If blood were 9 (rather than 10) and flesh were 10 (rather than 9) the subtotal would be the same, but the intermediate stage would at least be one day longer than the equivalent stages in the seven-month child. No standard Pythagorean sequence produces 6–10–9–15 (or 6–9–10–15).[86] However, we can point out that 6, 10, and 15 are a set of triangular numbers (1 + 2 + 3 = 6, + 4 = 10, + 5 = 15), and the remainder, nine, is a pleasing square. However, the eight-month child, at 240 days, does fit perfectly into a scheme of forties, such as we have seen in *Carn.* and *Septim./Oct.*, and to some extent in Censorinus. Damastes then may also have been trying to reconcile the more common Pythagorean sequences with a different calendar based on forty, but one which considered the eight-month child viable.

Thus we have a brief but fascinating fragment preserved from a lost work. We find a physician and philosopher who combined arguments based on a view of a beneficent Nature and a Pythagorean view of foetal development with original theories and practical advice on paediatrics. He is a forerunner of Soranus in discussing pregnancy together with childcare. The disappearance of all but a few lines of his works is a profound loss; their survival, a minor miracle.[87]

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[85] To solve for the next number in the sequence (where $a > b > c$): $a = bc/(2c - b)$. A clear explanation with diagrams at Plut. *De anim. pro.* 1017f, 1019c–e; cf. Arist. Quint. 3.5 (101.12–23 Winnington-Ingram), Iambl. *In Nicomachi Arithm. Introd.* 100.19–101.5, 113.16–22 (Pistelli) = Hippasus 18 A 15 DK (I.110.30–36); Porph. *In Ptolemaei Harm.* 93.7–17 (Düring) = Archytas 47 B 2 DK (1.435.19–436.13); Theon, *Mathematica* (Hiller 114.14–115.4, 118.4–119.16). See Heath (n. 24), I, 85–6; Burkert (n. 38), 440–1.

[86] For a standard sequence that does add to 40, see Plut. *De anim. pro.* 1019a–b: (1 × 4) + (2 × 4) + (3 × 4) + (4 × 4) = 4 + 8 + 12 + 16 = 40; also $1^2 + 2^2 + 2^3 + 3^3 = 1 + 4 + 8 + 27 = 40$.

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