The First Jewish Scientist?*

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Five of Archimedes' works are addressed to Dositheus (probably of Pelusion, a city in northern Sinai, near today's Port Said; I shall mention the evidence for this below). These are the two treatises *On the Sphere and the Cylinder*, as well as the *Conoids and Spheroids*, the *Spiral Lines*, and the *Quadrature of the Parabola*.[1] Together they constitute the bulk of Archimedes' work in pure mathematics, and are the peak of ancient mathematics, and among the greatest achievements of mathematics of all times. Only two other extant works by Archimedes are addressed to other individuals: the *Sand-Reckoner*, addressed to king Gelon,[2] and the *Method*, addressed to Eratosthenes.[3] Dositheus was therefore Archimedes' main scientific correspondent.

The introductions in which Archimedes addresses Dositheus reveal little about Dositheus himself. Archimedes tells Dositheus again and again that the dead Conon would have been the ideal reader of the works[4] (Conon was a mutual acquaintance,[5] so Dositheus would cherish his memory no less than did Archimedes, and would not be offended by such remarks). Further, although Archimedes mentions 'open problems' he has stated, it is clear that Dositheus did not try to solve them himself.[6] All Dositheus ever did in this correspondence was to ask — repeatedly — for further mathematics from Archimedes.[7]

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[1]   See introductions to the works, to which I refer in the order of Heiberg's edition of Archimedes' *Opera*: V. I: 2.1, 168.2, 246.1; V. II: 2.1, 262.2.

[2]   *Ibid.*, V. II, 216.2.

[3]   *Ibid.*, V. II, 426.2-3.

[4]   *Ibid.*, V. I, Introduction to *Sphere and Cylinder I*, 4.14 Vol. II, Introduction to *Spiral Lines*, 2.13-19, Introduction to *Quadrature of the Parabola,* 262.3-9.

[5]   As is explicitly stated: *ibid.*, Vol. II, Introduction to *Quadrature of the Parabola,* 262.3-9.

[6]   *Ibid.*, V. 2: Introduction to *Spiral Lines*, 2.18-21. There is however evidence elsewhere that he may have had a go at a problem set by Pythion to Conon. In this case, again, he probably did not produce a mathematical proof: see Toomer (1975) 16, 34-5, 140.

[7]   Heiberg's edition of Archimedes' *Opera* Vol. I, Introduction to *Sphere and Cylinder* II, 168.3-5, Vol. II, Introduction to *Spiral Lines*, 2.2-3.

Dositheus therefore does not seem to be an original mathematician, but rather more like an ancient Mersenne:[8] an impressario of mathematics. Let us note how successful he was. He made Archimedes write down five works, and he preserved them all. All the references in these five treatises are internal to the corpus. Apparently, we have the entire Archimedean side of the correspondence.[9]

The date of Archimedes' death is securely established, as he died during the fall of Syracuse (212 B.C.). Furthermore, all the letters to Dositheus assume the death of Conon, and we know that Conon was still alive in the year 246.[10] We can thus give some dates for Dositheus as well — though his safely datable 'activities' are limited to the reception of letters. Let us say that he was passive in the second half of the third century B.C.

There are a few scattered references to Dositheus, a Hellenistic astronomer. Observations of the fixed stars are recorded.[11] He may have written a work *'against Diodorus'*, in which Aratus was mentioned:[12] so again, there is some connection to the fixed stars (which are the subject-matter of Aratus' poem). The behaviour of the fixed stars is generally of significance for calendrical purposes (the progress of the year is marked by the first risings and settings of fixed stars). Apparently Dositheus contributed also to the theory of the calendar, and Censorinus mentions him as the authority associated with an 8-year cycle.[13] The dates for these activities are vague, but they may fit our Dositheus, as do the

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[8]   Mersenne was a central figure in seventeenth-century mathematical France, especially as a go-between, a solicitor and distributor of mathematical results. See e.g. Mahoney (1973/1994), who calls Mersenne (p. 53) 'France's walking scientific journal'.

[9]   I assume here that most ancient mathematical works were never published in anything like the modern sense, mainly because there was no public interested in them, and that we should think instead in terms of tiny networks of interested specialists where works circulated (see Netz (forthcoming) chapter 7). We may thus imagine that Dositheus, probably with good connections in Alexandria, could have been Archimedes' main link with this network of correspondence; but nothing in the following argument rests upon this set of assumptions.

[10]   The argument is very complex, but convincing: see article on Conon, *Dictionary of Scientific Biography*, and, in general for Archimedean chronology, Knorr (1978).

[11]   E.g. Ptolemy, *Phas.* 67.1, 4, Pliny, *Nat. Hist.* xviii. 312.

[12]   *Commentaria in Aratum* 149.6. This *vita* is extant in a parallel form, in Latin and in Greek. The Greek calls Dositheus 'πολιτικός', while the Latin calls him *'pelusinus'*. We expect a provenance, and there is a *lectio difficilior* in favour of the Latin reading (since *pelusinus* was not a common provenance). It is therefore probable that this Dositheus was indeed from Pelusion, although other views have been suggested (see *Realencyclopädie* article, Dositheus₉).

[13]   Censorinus, 41.12. For a discussion of such theories see Neugebauer (1975) 619 ff.

scientific interests. A certain personality emerges: an astronomer, not much of a theoretician himself, however keenly interested in mathematical theory.

Other than this nothing is known of this person. Yet he may have been the first Jewish scientist.

The argument rests essentially on the name. Of course this is a Greek name, formed on the common principle of a concatenation of two morphemes ('gift' and 'god', in this case). But as is well known, many Hellenistic Jews carried Greek names alongside or instead of Hebrew names[14] ('Dositheus' would have been the Greek equivalent of 'Matityahu'). The *Realencyclopädie der Klassischen Altertumswissenschaft (RE)* lists 11 individuals with the name Dositheus. Numbers 1-2 are known from late Hellenistic and from Roman Attic inscriptions, respectively, and their ethnicity cannot be settled, though they may well have been Greeks. Numbers 3-5 are Hellenistic Jews from Palestine (3) or from Egypt (4-5). Number 6 is known only from pseudo-Plutarchic quotations, and his date and area cannot be securely established. Clearly however he was pagan, as he wrote mythological narratives. Number 7 is the father of a disciple of Epicurus and therefore in all probability a pagan. Number 8 wrote an *ars*, in late antiquity: nothing can be known of his ethnicity. Number 9 is our astronomer. Number 10 was a first-century A.D. Samaritan. Number 11 was a Cilician active in late antiquity.

So far therefore we see that the name could be used both by Greeks and by Jews. However in the relevant area (Egypt and Palestine) and period (Hellenistic and early Roman times) the name is attested four times, always as the name of either Jews or Samaritans. The *RE* is of course a very limited reference for this purpose, as it concentrates on the better-known figures (those known through literary sources). Other reference works use the extensive non-literary documents from Egypt. There is a complete prosopography for Ptolemaic Egypt, *Prosopographia Ptolemaica* (which is now in the process of being brought up to date). Besides 4-5 and 9 of the *RE* (all known through literary sources), the *Prosopographia Ptolemaica* has 22 persons with the same name. For at least eight of these, the ethnicity can be reconstructed from the context in which they are mentioned, and they are *all* ethnically Jewish.[15] The *Lexicon of Greek Personal Names*[16] does not cover Egypt itself, yet volume I (which covers the Aegean Islands, Cyprus and Cyrenaica) is relevant for us. Of the 43 people called Dositheus which it covers, 21 are from Cyrenaica and, of these, 20 are certainly Jewish. So clearly many of the people of Egypt who were called Dositheus were Jewish. More than this: many of the Jews in Egypt were called Dositheus. Names can be followed through the index to the inscriptions from Egypt in the

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[14]   See e.g. Horbury and Noy (1992) 11.
[15]   These are numbers 1545, 1893, 3901-3, 4151, 5100, 16170.
[16]   Fraser and Matthews (1987).

Jewish Inscriptions of Graeco-Roman Egypt.[17] The name Dositheus occurs four times, second only to Sabbataios (five times). The judgement of Tcherikover and Fuks, forty years ago, was simple: 'Dositheus can be considered almost as a Jewish name'.[18] The many papyri published since corroborate this judgment. A recent article goes further, and tends to believe that *-theos* compounds in general became practically Jewish names.[19] Remarkably, Hellenistic Egyptian Jews managed to appropriate *'Theos'* as their god; that is, when a name contained the morpheme *'Theos'*, the assumption would have been that the god in question was the god of the Jews.

Pelusion, probably Dositheus' home-town, was the main entry point into Egypt from Palestine.[20] The region had a dense Jewish population. It was Ptolemaic policy to employ Jews as soldiers-settlers in the frontiers of the Delta,[21] and a place not far from Pelusion itself was known as 'the camp of Jews'.[22] It is clear however that Pelusion was an Egypto-Greek city, with active Egyptian pagan traditions.[23] Plutarch would speak of its inhabitants simply as 'Egyptians'[24] — though the sense of such terms is hard to determine. In general, we know Alexandria very well thanks to literary sources, but other than this the shores of Egypt are far less well-known than its desert interior (where papyri have been preserved). In all probability, Pelusion, a major city, was as ethnically mixed as Alexandria itself; furthermore, it would have been surprising had its population not reflected its position as the entry-point from Palestine. That it had a substantial Jewish population is therefore almost certain.

So one can argue that the name 'Dositheus' was often used by Jews, and that many Pelusians must have been Jewish; and therefore a Pelusian Dositheus had a good probability of being a Jew. This is part of my argument, but a somewhat stronger argument can be adduced.

In Ptolemaic Egypt, ethnicity mattered.[25] Now the name 'Dositheus' need not have been used specifically by Jews. In fact it was used, in other times and places, by non-Jews. But in the Egyptian Ptolemaic context, it would have been marked as a name whose owners tended to be Jewish. In an ethnically mixed

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17   Horbury and Noy (1992) 258-63.
18   Tcherikover and Fuks (1957) xix.
19   Clarysse (1994) 200.
20   See Fraser (1972) 108.
21   Schürer, Vermes and Millar (1986) V. III, 41-2.
22   Josephus, *BJ* i.191.
23   See article 'Pelusion' in *Realencyclopädie*, especially cols. 413-4.
24   *Ant.* 3.4.
25   What ethnicity meant is another, difficult question (see, e.g. Goudriaan (1988)). We should not project directly our concepts of neatly-defined ethnic identities. But it is certainly the case that Egypt had a very mixed population, very much aware of its diversity.

environment, therefore, giving the name 'Dositheus' to your son would have been a meaningful act.

If our astronomer was not Jewish, he might have been Greek, or he could have come from an Egyptian family, belonging or struggling to belong to the Greco-Egyptian elite. In either case, and especially in the latter, it is less than likely that he would be given a name which to some extent was marked as Jewish. There is thus — reasoning backwards — a strong probability that he was Jewish. Perhaps a pagan farmer in an obscure village in the Delta which happened to lie far from Jewish settlements, might hit upon the idea of calling his son 'Dositheus': possible, but unlikely. But a pagan member of the elite, in the major border town on the way to Palestine, would never commit such a blunder.

Nor is there anything inherently improbable about a Hellenistic Jew being interested in astronomy. A generation or two later, we have the earliest attested Jewish Hellenistic philosopher: Aristobulus of Alexandria.[26] Substantial fragments of his works survive, and he appears to have been attracted to Hellenistic philosophy of the Pythagorean-Platonic sort, i.e. a relatively mathematical type of philosophy. Most interesting is a fragment preserved by Eusebius, via Anatolius, which I quote here in translation.[27]

> In the feast of the Passover, it is necessary not only that the sun should be passing an equinoctial sign, but the moon also. For since there are two equinoctial signs, the one vernal, the other autumnal[28], and since these two are diametrical to each other,[29] and the day of the Passover is given as the fourteenth of the month (at evening): the moon will be positioned at a position diametrically opposite to the position of the sun, as indeed one can see in full moons;[30] and the one will be at the vernal equinoctial sign — the sun — and the other will necessarily be at the autumnal equinox — namely the moon.

We see here an interest in the theoretical astronomical aspects of the calendar: this is exactly what we associate with Dositheus. Dositheus' astronomy must have been more high-powered than this extremely elementary fragment from

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26   Hengel (1974) 163 ff.
27   Eusebius *HE* vii. 32.17-18. I follow in general the vocabulary used by the Loeb translation.
28   An equinoctial sign is a group of fixed stars Ñ a 'sign' among which the sun rises in an equinox. There are two such signs, for spring and autumn equinox.
29   The points of rising of the sun change relative to the fixed stars, completing a circle every year. The position occupied by the sun during the spring equinox is diametrically opposite that which it occupies during the autumn equinox.
30   The moon is full if and only if it is diametrically opposite the sun (otherwise the rays of the sun are reflected obliquely, and the moon cannot be full). In calendarical terms, the fourteenth evening of a Hebrew month is when the moon is full.

Aristobulus. But the principle is more important than the mathematical level. An interest in the astronomical theory of the calendar was not only possible for some Hellenistic Jews: it could even be integrated into their religious identity.

So far, therefore, an argument showing that a Hellenistic astronomer, a correspondent of Archimedes, may have been Jewish. The case is strong, I believe, yet the argument can not be conclusive. And the ethnic identity of the individual Dositheus, finally, is not really important. However Dositheus has a special interest. He was a correspondent of Archimedes, possibly a pivotal figure in the transmission of Archimedes' mathematical work. That such a person may have been Jewish should come as a shock. There is no doubt that Jews and Greeks must have had many contacts in the Hellenistic period. Still, it has been noted that 'though the Jews were apparently living side by side with Greeks ... there is no mention, in either pagan or Jewish writers, of contact between non-Jewish scholars, critics, and poets ... and Jewish scholars, even Philo'.[31] How should we approach the evidence offered in this article, then? First, we may note that the arena for contact, in this case, was pure mathematics. Probably this is a more natural cross-cultural discipline than, say, Homeric scholarship. More important, we should note how much circular reasoning must lie behind such sweeping claims as that quoted above from Feldman (1993). We simply do not know, in general, about the ethnic origins of ancient intellectuals. The medium of Hellenistic high culture was relatively impersonal, leaving few traces of such characteristics as ethnicity. This is the culture of the *koine*, and not only in the purely linguistic sense. It is the shared culture of an elite spread thinly across the eastern Mediterranean. Mathematics is impersonal; it suited Hellenistic culture.

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[31]   Feldman (1993) 56.

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