

Petronian Numbers

In: Greek Roman and Byzantine Studies,
9 - 1968 - p. 55 - 57

5141
HUXLEY, G.
1968

~~Dir~~ Huxley G

Wiskunde

Math

68 HUXLEY G., *Petronian numbers* [et les nombres pythagoriciens] ; cf. Petron
Himeraeus.

Petron Himeraeus. — HUXLEY G., *Petronian numbers* : GRBS IX 1968 55-57.

| It is possible that Petron's triangular cosmological system had 180 rather
than 183 spheres. The Petronian triangle is different from the normal Pytha-
gorean triangular numbers.

Greek Roman and Byzantine Studies
~~IX~~ 1968

VV2910

23 feb

Petronian Numbers

George Huxley

PLUTARCH remarks that a certain Petron of Himera declared the universe to consist of 183 *kosmoi* arranged so as to form a triangle with sixty worlds along each side and the remaining three at the corners (*De defectu oraculorum* 22.422B). This remarkable theory was known to Plutarch indirectly from the writings of Phantias, the Aristotelian scholar of Eresos in Lesbos, who quoted Hippys of Rhegion on Petron's cosmology.¹ The date of Hippys is not known—there is no special reason to date him as early as the first half of the fifth century B.C.²—but we need not doubt that Phantias reported a genuine piece of western Greek (or possibly Sikeli)³ philosophical doctrine. Petron's theory deserves closer examination.

Plutarch was puzzled by the statement that the *kosmoi* were ἀπτομένους ἀλλήλων κατὰ στοιχείον (422D), but he earlier states (422B) that they were in contact with each other and rotated “as in a dance,” ἄπτεσθαι δὲ τοὺς ἐφεξῆς ἀλλήλων ἀτρέμα περιόντας ὥσπερ ἐν χορείᾳ. The meaning therefore is that each world rotated on a fixed axis but touched its neighbour, which therefore rotated at the same speed but in the opposite sense, if all the *kosmoi* were of the same size. Plutarch's words suggest that the three *kosmoi*, one at each of the corners, also rotated, but here a problem would have demanded Petron's attention if he thought his system out thoroughly. Three spheres in contact, having parallel axes and equal diameters, cannot drive one another. The solution is to place spheres at the corners, each having a greater diameter than the two other spheres in contact with it. At each corner there would thus be two, not three, points of contact.

Petron's difficulties would not have ended there, however, for a continuous series of mutually driving, contra-rotating spheres must

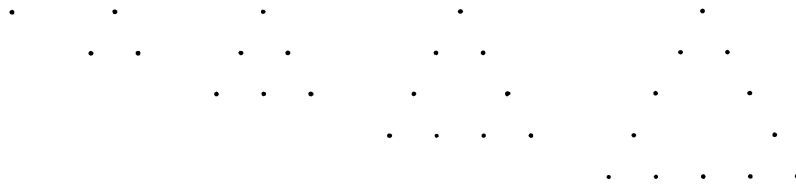
¹ *De def.or.* 23.422D.

² Cf. Jacoby on *FGrHist* 554 T 1 and F 5. The *Suda* s.v. Ἰππῖνος vs Ἰππῖνος (Hippys T 1) state: ἱστορικός, γεγονώς ἐπὶ τῶν Περσικῶν. καὶ πρῶτος ἔγραψε τὰς Σικελικὰς πράξεις, ὥς ὕστερον Μύης ἐπετέμετο.

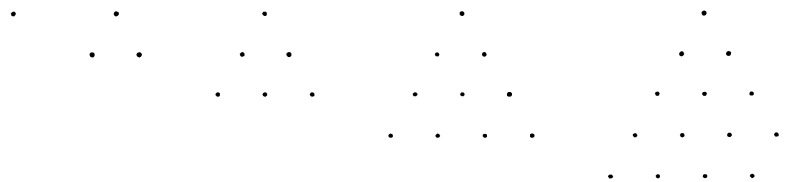
³ E. A. Freeman, *The History of Sicily from the Earliest Times* II (Oxford 1891) 159–160.

be of an even number if one adjacent pair is not to rotate in the same sense and so create friction at the point of contact. Petron's system had 183 spheres if Phantias reported his theory correctly, and so if all the spheres were in contact, each with its neighbour, there must have been friction at one point. It is possible that Phantias or Hippys misunderstood Petron, who perhaps gave 61, not 62, spheres to each side of his triangular universe. The sum of spheres in it would then have been $(59 \times 3) + 3 = 180$, an even number, permitting a free running system.

Petron's system is of little astronomical interest, although it is remarkable that Leukippos seems also to have contemplated a triangular universe.⁴ The Petronian triangle does, however, have a place in early Greek number theory, because it is different from normal Pythagorean triangular numbers. The typical Pythagorean number is a sum of successive terms in the series of natural numbers. Thus $1 + 2 + 3 + \dots + n = \frac{1}{2}n(n+1)$ is a Pythagorean triangular number of side n . The Pythagorean series begins 1, 3, 6, 10, 15 ... Petronian triangular numbers are of the form 1, 3, 6, 9, 12, 15 ... Thus



are Petronian triangles, but



are Pythagorean. Erwin Schroedinger failed to understand this distinction when he wrote: "One of the early Pythagoreans, Petron, contended that there were altogether 183 worlds, arranged in a triangle, though, by the way, this is not a triangular number."⁵ The

⁴ Diels, *Vorsokr.*¹¹ 67 A 24 line 33.

⁵ *Nature and the Greeks* (Cambridge 1954) 36. W. Nestle, *RE* 37 (1937) 1191 s.v. PETRON, states that there were 163 Petronian κόσμοι, but that seems to be a mistake.

corresponding Petronian square numbers would be of the form:

.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		.	.	.	.	.	.	.	.	.	.	.	.	.
				.	.	.	.	.	.	.	.	.	.	.
						.	.	.	.	.	.	.	.	.
							.	.	.	.	.	.	.	.
								.	.	.	.	.	.	.

So this series would begin 1, 4, 8, 12, 16 ...

THE QUEEN'S UNIVERSITY OF BELFAST
September, 1967

.

.

.

.