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Perseus

(*fi* third cenrtury b.c. [?]) *mathematics*.

Perseus is known only from two passages in Proclus. In one passage his name is assciated with the incestigation if "Spiric" curves as that of Apollonius of Perga is with conies, Nicomedes with the conchoods, and Hippias of Elis with the quadratrices.[1] In the second passage, derived from Gemintis, Proclus says that Perseus wrote an epigram upon his discovery, "Three lines upon five sections finding, Perseus made offering to the gods therefor."[2]

In another place Proclus says that a spiric surface is thought of as generated by the revolution of a circle standing upright and turning about a fixed fixed point that is not its center; wherefore it comes about that there are three kinds of spiric surface according as the fixed point is on, inside, or outside the circumference.[3] The spire surface is therefore what is known today as a "tore" in antiquity Hero of Alexandria gave it the name "Spire" or "ring."[4]

These passages throw no light on the provenance of Perseus and leave wide room for conjecture about his dates. He must have lived before Geminus, as Proclus relies on that author; and it is probable before that the conic sections were advanced before the spiric curves were tackled. Perseus therefore probably lived between euclid Euclied and geminus say between 300 and 70 b.c., with a preference for the earlier date.

What Perseus actually discovered is also uncertain. In rather more precise language than that of Proclus, a spiric surface may be defined as the surface generated by a circle that revolves about a straight line (the axis of revolution) always remaining in a plane with it. There are three kinds of spiric surfaces, according as the axis of revoltution is outside the circle, tangential to it, or inside it (which are called by Proclus the "open,", "continuous," and "interlaced" and by Hero the "open", continuous and "self-crossing").

A spiric section on the analogy of a conic section would be a section of a spiric surface by a plane, which it is natural to assume is parallel to the axis in the first place. Proclus says that the sections are three in number corresponding to the three types of surface, but this is difficult it understand or to reconcile with the epigram. G. V. Schiaparelli showed how three different spiric curves could be obtained by a section of an open tore according as the plane of section was more or less distant from the axis of revolution,[5] and Paul Tannery entered upon a closer mathematical analysis that led him to give a novel interpretation to the epigram.[6] If r is the radius of the generating circle, a the distance of its center from the axis, and d the distance of the cutting plane from the axis, in the case of the open tore (for which $a > r$), the following five cases may be distinguished;

$a + r > d > a$ (1) $d = a$ (2)$a > d > a - r$ (3) $d = a - r$ (4)

$a - r > d > 0$ (5)

Of these the curve produced by (4) is Proclus' first spiric curve, the "hippopede' or "horse-fetter," which is like a figure eight and had already been used by Eudoxus in his representation of planetary motion; (1) is Procls' second broad in the middle; (3) is his third, narrow in the middel; (2) is a transition from (1)to (3); and (5) produces two symmetrical closed curves. If the tore is "Continous" ('closed" in modern terminolgy), a=r, hte forms (1),(2), and (3) remain as for the "open" tore, but (4) and (5) disapper and there is no new curve. If the tore is "interlaced" ("reentrant") a.r. and the forms (4) and (5) do not exist; but there are three new curves corresponding to (1),(2),and (3), each with an oval inside it.

Tannery deduced that what the epigram means is that Perseus found three spiric curves in addition to the five sections. In this deduction he has been followed by most subsequent writiers, Loria even finding support in Dante.[7] Although the interetation is not imposible, it putes a strain upon the Greek. It is simpler to suppose that Tannery has correctly identified the five sections, but that Perseus ignored (2) and (5) as not really giving new curves. Thus he found "three curves in five sections." If we suppose that he took one of his curves from the five sections of the "open" tore, "Continuous", and one from the sections of the "interlaced," we could reconcile Prod us' statement also, but it is simpler to suppose that Proclus writing centuries later, made an error.

NOTES

1. Proclus, *In primum Euclidis*, G. Fredlein, ed. (Leipzing, 1873; reper.

Hildesheim, 1967), 356.6–12.

2.*ibid* pp. 11.23–112.2.

3.*ibid* p. 119.9–13.

4. Heron, Definitions 97, in J. L. Heiberg, ed., *Heronis Alexandrini opera quae supersunt ominia* iv (Leipzig, 1912), pp. 60.24–62.9.

5. G. V. Schiapaarelli, *Le safere omocentriche di Eudosso, di Calippo e di Aristotele* (Milan, 1875), pp. 32–34. 6. Paul Tannery, *Mémoires scientifiques* 11 (Toulouse-paris, 1912), pp. 26–28.7. Gino Loria, *Le scienze esatte nell'antica Grecia* 2nd ed. (Milan, 1814), p. 417, n. 2.

BIBLIOGRAPHY

On Perseus or his works, see T. L. Health *The Thirteen Books of Euclid's* 2nd ed. (Cambridge, 1926; repr. New York; 1956), I, 162–164; *A History of Greek Mathemaics* II (Oxford, 1921), 203–206; G. v.Schiaparelli, *Le sfere omocentriche di Eudosso, di Calippo e di Aristotele* (Milan, 1875), 32–34; and Paul Tannery, "Pour i'histoire des lines et de surfaces courbes dans I'antiquite," in *Bulletin des sciences mathematiques et astronomiques* 2nd ser., 8 (Paris, 1884), 19–30; repr in *Memoires secintifiques* 2. (Toulouse-paris, 1912), 18–32.

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