**Proclus Diadochus**

Born: 8 Feb 411 in Constantinople (now Istanbul), Byzantium (now Turkey)

Died: 17 April 485 in Athens, Greece

Proclus's father, Particius, and his mother, Marcella, were citizens of high social position in Lycia. Particius was a senior law official in the courts at Byzantium. Proclus was brought up at Xanthus, on the south coast of Lycia, where he attended school.

It was intended that Proclus should follow his father and enter the legal profession. With this aim in mind he was sent to Alexandria but, while in the middle of his studies, he visited Byzantium and he became convinced that his calling in life was the study of philosophy. He returned to Alexandria where now he studied philosophy under Olympiodorus the Elder, in particular making a deep study of the works of Aristotle. He also learnt mathematics in Alexandria and in this subject his teacher was Heron (not the famous mathematician, Heron was a common name at this time).

Proclus was not entirely satisfied with the education he was receiving in philosophy in Alexandria so, while still a teenager, he moved from Alexandria to Athens where he studied at Plato's Academy under the philosophers Plutarch and Syrianus (a pupil of Plutarch). He progressed from being a student at the Academy to teaching there then, on the death of Syrianus, Proclus became head of the Academy. The title Diadochus was given to him at this time, the meaning of the word being successor.

At the Academy Proclus appears to have been well off and to have helped his friends and relations financially. He never married and lived a life which was, in certain respects, not unlike that proposed by Pythagoras. He did not eat meat and tried to live a religious life, composing hymns to the gods. His hymns were clearly highly thought of since seven of them have been preserved and are seen today as having considerable literary merit. Proclus was to remain as head of the Academy until his death.

A man of great learning, Proclus was regarded with great veneration by his contemporaries. He followed the neoplatonist philosophy which Plotinus founded, and Porphyry and Iamblichus developed around 300 AD. Other developers of these ideas were Plutarch and Syrianus, the teachers of Proclus. Heath writes:-

He was an acute dialectician and pre-eminent among his contemporaries in the range of his learning; he was a competent mathematician; he was even a poet. At the same time he was a believer in all sorts of myths and mysteries, and a devout worshipper of divinities both Greek and Oriental. He was much more a philosopher than a mathematician.

Of course, as one might expect, his belief in many religious sayings meant that he was highly biased in his views on many issues of science. For example he mentions the hypothesis that the sun is at the centre of the planets as proposed by Hipparchus but rejects it immediately since it contradicted the views of a Chaldean whom he says that it is unlawful not to believe.

Proclus wrote Commentary on Euclid which is our principal source about the early history of Greek geometry. The book is certainly the product of his teaching at the Academy. This work is not coloured by his religious beliefs and Martin, writing in the middle of the 19th century, says (see for example):-

... for Proclus the "Elements of Euclid" had the good fortune not to be contradicted either by the Chaldean Oracles or by the speculations of Pythagoreans old and new.

Proclus had access to books which are now lost and others, already lost in Proclus's time, were described based on extracts in other books available to Proclus. In particular he certainly used the History of Geometry by Eudemus, which is now lost, as is the works of Geminus which he also used. Heath, describing Proclus's Commentary on Euclid writes:-

Proclus deals historically and critically with all the definitions, postulates and axioms in order. The notes on the postulates and axioms are preceded by a general discussion of the principles of geometry, hypotheses, postulates and axioms, and their relation to one another; here as usual Proclus quotes the opinions of all the important authorities.

Another interesting part of Proclus's commentary is his discussion of the critics of geometry. He writes:-

... it is against [the principles of geometry] that most critics of geometry have raised objections, endeavouring to show that these parts are not firmly established. Of those in this group whose arguments have become notorious some, such as the Sceptics, would do away with all knowledge ... whereas others, like the Epicureans, propose only to discredit the principles of geometry. Another group of critics, however, admit the principles but deny that the propositions coming after the principles can be demonstrated unless they grant something that is not contained in the principles. This method of controversy was followed by Zeno of Sidon, who belonged to the school of Epicurus and against whom Posidonius has written a whole book and shown that his views are thoroughly unsound.

Morrow in confirms the great debt that we owe to Proclus, and in particular his Commentary on Euclid when he writes in:-

Proclus was not a creative mathematician; but he was an acute expositor and critic, with a thorough grasp of mathematical method and a detailed knowledge of the thousand years of Greek mathematics from Thales to his own time.

The recent book gives a good description of the writings of Proclus found in his commentary on Book I of Euclid's Elements. The book [7] is an important contribution to the study of the philosophy of Proclus and in particular his philosophy of mathematics.

Proclus also wrote Hypotyposis, an introduction to the astronomical theories of Hipparchus and Ptolemy in which he described the mathematical theory of the planets based on epicycles and on eccentrics. He combined his geometrical skills and his knowledge of astronomy to give a geometrical proof that the epicycle theory for the planets is equivalent to the eccentric theory. In the epicycle theory the Earth is in the centre of a circle which has smaller circles rotating round its circumference. In the eccentric theory the planets move round in circles whose centres do not coincide with the Earth.

Nothing here is original and Proclus is proving results first given by Hipparchus and Ptolemy. However, although Proclus believed that this theory should be studied by his students at the Academy, he was not uncritical, suggesting that the theory was overly complicated and also that it was an ad hoc theory with no reason to explain its various parts.

In his astronomical writings, Proclus described how the water clock invented by Heron could be used to measure the apparent diameter of the Sun. Proclus's method can be used at the equinox. Water is collected from the clock in a container while the sun rises. As soon as the Sun has risen the water is collected in another container and this measurement continues until sunrise the following day. Then the ratio of the weights of water in the two containers gives the apparent diameter of the Sun.

Among Proclus's many works are Liber de causis (Book of Causes), Institutio theologica (Elements of Theology), a concise exposition of metaphysics, Elements of Physics, largely giving Aristotle's views, and In Platonis theologiam (Platonic Theology) giving Plato's metaphysics. His contribution is well summarised in as follows:-

Proclus deserves to be remembered ... for the qualities he possessed that are exceedingly rare in any age and were almost unique in his: the logical clarity and firmness of his thought, the acuteness of his analyses, his eagerness to understand and readiness to present the views of his predecessors on controversial issues, the sustained coherence of his lengthy expositions, and the large horizon, as broad as the whole of being, within which his thinking moved.

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