HISTORY FROM PETROLOGY AT THE EAST PACIFIC RISE

Complex structures from powder diffraction
Organizing cell division
The roots of nature

Robert Temple


Western science was essentially founded by Aristotle and his pupil and lifetime colleague Theophrastus. But not until now, some two millennia later, have all their surviving zoological and botanical writings become available in decent texts and translation.

Aristotle’s writings on zoology were the first great works of scientific observation. Although he considered the explanation of biological phenomena to be the ultimate goal, he recognized the primary importance of gathering data, cataloguing this in his Historia Animalium. The appearance of the final volume of this work, under the title History of Animals, brings to a close the Loeb Classical Library’s project of publishing the entire surviving scientific canon of Aristotle in English, with facing Greek text, a task that has taken 55 years to complete. And the final volume is the best, containing a spectacularly comprehensive index and the so-called Book X of the History, which was tossed on through scirbial error centuries ago and has now been identified as Aristotle’s separate treatise On Failure to Generate. It should be emphasized that the title History of Animals itself is a mistranslation — an accurate rendering would be Information about Animals Obtained by Enquiry. The work is in fact a magnificent, and often surprising, compilation of just that, relating to no fewer than 560 named species, the structure, physiology and behaviour of many of them described in great detail. Here we learn, for example,

that Aristotle had discovered the ’waggle dance’ of bees, anticipating von Frisch by some 2,300 years.

Aristotle was fanatically devoted to personal observation (made easier by the fact that he lived in a wide variety of localities in Greece, Asia Minor and the islands). When he had to rely on the reports of others, he did so with skepticism, often writing “but this has not been verified” or “this has not yet been properly observed”. Even his information from exotic locations tended to come only from trusted sources, such as his nephew Callisthenes who accompanied Alexander the Great on his conquests. Alexander, whose tutor Aristotle had been, was a beneficiary of Aristotle’s studies; royal Macedonian funds subsidized the research institute, called the Lyceum, established by Aristotle at a former gymnasion in Athens in 335 BC. There, Aristotle founded the practice of taxonomic research.

Aristotle’s longest zoological work, Close Investigations According to Kind (Exêgêseis kata Genos), seemed also to have vanished without trace. But I believe that its scattered contents remain and can be reconstructed. It led directly on from his psychological work On the Soul and was intended to ‘explain’ the phenomena of enquiry marshalled in the History in terms of causes, thereby elucidating the essential differences or characteristics of living things. It consisted in sequence of the eight short, scattered treatises now called Parva Naturalia, Parts of Animals, Progression of Animals, Movement of Animals and Generation of Animals.

A correct understanding of Aristotle’s terminology is the key to his methodology.
logical approach in biology. Modern scholars have now established that the words *genos* and *eidos* should not be translated ‘genus’ and ‘species’, and to do so reduces Aristotle’s zoology to a confused mass of apparent contradictions. The two terms as used by Aristotle were not classificatory but analytical. Aristotle never had taxonomy as an aim, fascinating detail. More than 500 varieties of plant are described, and there are attempts at categorization and physiological theorizing (he was clear about the sexuality of plants, for example). The first volume deals with plants that grow of their own accord, whereas the two final volumes deal with “human ingenuity and contrivance” in relation to plants, covering topics such as agriculture, viticulture, and pests and diseases of crops. Part of the introduction of the *Enquiry* seems to have been written by Aristotle, who then handed over the job to Theophrastus.

The causal book, more accurately translated as *Explanations of Plants*, originally contained two more books: Book VII became separated from the main work and for several centuries circulated under the title *On Wine and Olive Oil*, but, apart from five fragments, has now been lost; Book VIII also became separated, although most of it survives as *On Odours*.

But Theophrastus was not just a botanist — he wrote more than 200 treatises on an immense variety of topics, the complete fragments of which are collected and translated, for the first time, in two spectacular volumes just published by Brill. Here we find the separate treatises *On Types of Honey*, *On Flavours* and *On Fruits* and writings on physics, logic, metaphysics, mathematics, theology, zoology, botany, human physiology, ethics, politics, rhetoric, poetics, music and miscellaneous. And the publication of Theophrastus’s *Meteorology* should also be celebrated. It was thought that this work had been lost, but Hans Daiber found it in a maharajah’s library in India in the 1980s, and the Arabic and Syriac texts and English translation now appear in an excellent volume published by Transaction. In *Meteorology*, we are treated to distinctions between different types of earthquakes and atmospheric phenomena (seven types of thunder are described). The volume also contains articles on sensory perception, vision, animal intelligence, the concept of place, the nature of the intellect and the opinions of other philosophers as dealt with by Theophrastus.

Whereas Aristotle died at the age of 63, Theophrastus lived into his 80s, and as many as 2,000 people eventually attended his lectures. In a fragment of a letter written late in his life, Theophrastus confesses that he cannot any longer delay finishing his work — it is a curious irony that it took him nearly as long to complete his botanical works as it took the Loeb Library to publish them in English.

With these new books, zoologists, botanists, historians of science and philosophers will have an endless feast, and may also begin to understand the extraordinary symbiotic relationship that existed between Aristotle and Theophrastus.

Robert Temple may be contacted c/o David Higham Associates Ltd, 5–8 Lower John Street, Golden Square, London W1R 4HA, UK.

Theophrastus: wrote on an immense variety of topics.