THE BEGINNINGS OF ENTOMOLOGY IN ANCIENT GREECE*

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When modern entomologists outline the history of their discipline, as recently did Günter Morge in his *History of Entomology* (1973), they all agree that Aristotle was the first scholar to give an extensive account of these smallest of creatures. Yet many historians of the natural sciences still prefer to begin their study of entomology in a period of time as recent as the seventeenth or the eighteenth century, turning first to the observations made by the Dutchman Swammerdam (1637-80) on insect metamorphosis or by the Italian Malpighi (1628-94) on silkworm anatomy (*Bombyx mori*), or to the even later *Memoires pour servir à l'histoire des insectes,* written by the Frenchman Réaumur between 1734 and 1742. As justification for this procedure, they deny that scientific purposes and techniques were advanced enough before the modern period (so Daumas, 1957, and Byl, 1980). Such scholars too often pay little or no attention to the fact that they appraise ancient Greek entomology on an *a posteriori* basis and misapprehend its significance by opposing its undeniable limitations to recent discoveries instead of comparing its outstanding originality with the empiricism commonly displayed in other ancient Mediterranean civilizations (Harpaz, 1973).

By looking back to the earliest stages of entomology, one can better understand the historical context in which the utilitarian curiosity about insects manifested throughout the ancient world was developed by the Greeks into scientific observations that led to discoveries later proved correct. More importantly, these discoveries represent the first attempt at fundamental research. There can be little doubt that the modern science of insects owes its first and inspiring impulse to the ancient Greek scientists. The purpose of this paper is to point out only a few examples illustrating the main orientation of ancient Greek entomology, a full account of which is still to be undertaken.

In his biological works, Aristotle aimed, not at writing short monographs on individual animals or classes of animals, but rather at embracing the entire animal kingdom in descriptive essays combining comparative anatomy, physiology, and ethology. Therefore, Aristotle's data on insects, as on other animals, are scattered through his major treatises, *History of Animals*, *Generation of Animals,* and *Parts of Animals*, and in the minor works known as *Parva Naturalia.*

Since he was the first to study insects extensively or, at least, to compile and enlarge upon what was already known about them (Byl, 1980; Chroust, 1973; Grayeff, 1956), Aristotle had the task of defining them and even of giving their order a specific name. He succeeded in both tasks. He recognized that articulations are the basic characteristic of the insect body, and therefore he selected the Greek name, *entomos*, which came to be definitely adopted as the name for "animals which have insections either on their under or their upper surface, or in both places" (*HA* 4.523b13-17, trans. Peck, 1970); he further defined them as a zoological class on the basis of two general criteria, wings and mouth parts:

> Some insects are wingless (as the *ioulos* and the millipede), others winged (as the bee, the cockchafer, and the wasp); and sometimes one and the same kind of insect is found both winged and wingless (as the ant and the glowworm) (*HA* 4.523b17-21, trans. Peck).
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> Of insects, such as have teeth are omnivorous; such as have a tongue feed on liquids only, extracting with that organ juices from all quarters. And of these latter some may be called omnivorous, inasmuch as they feed on every kind of juice, as for instance, the common fly; others are blood-suckers such as the gadfly and the horse-fly, others again live on the juices of fruits and plants (*HA* 8.596b10-15, trans. Thompson, 1910).

Aristotle also focuses on complementary criteria in dealing with insect locomotion (*HA* 1.490a5-23: wings; a26-b1: legs), production of sounds and "music" (*HA* 4.535b3-12), senses (*HA* 4.534b15-535a4; *Sens.* 444b12), reaction observed after dissection (*HA* 4.531b30-532a5), classification of *Coleoptera, Diptera, Tetraptera* (*HA* 1.490a13-19), and again when he describes the ways in which insects sleep (*HA* 4.537b5-13), hibernate (*HA* 8.599a20-28), mate and reproduce (*HA* 4.538a25-28; 5.539a21-25, 541b34-542a17, 550b30-551a13, etc.), and reach full maturity after metamorphosis (*HA* 8.601a1-11). For each of these categories he cites a great many examples; moreover, he includes some chapters fully devoted to the breeding and social behavior of bees, wasps, and the like (*HA* 5.550b22-557b31; also *HA* 9.622b19-629b2).

So vast an undertaking as Aristotle's was inevitably involved a number of inaccuracies and misconceptions. Some of these came from the philosophical system and the principle of teleology underlying so much of his work; others derived from the lack of optical appliances, far more necessary for study of the anatomy and physiology of insects than for larger animals. Critics have often given undue emphasis to misconceptions inherent, or apparently so, in Aristotle's imprecise use of technical terms; the word *kampê,* for example, is used to mean either the "caterpillar" of a butterfly or the "larva" of *Cantharidae* (*HA* 5.551a14, 552b1), and *skôlex,* which means "worm" in *Iliad* 13.654 and in Theophrastus' *History of Plants* 3.12.6, is employed by Aristotle in the sense of "larva" (*HA* 5.552b3, 5). Such matters, however, often are more a problem for the philologist than for the entomologist. In certain other instances, criticism of Aristotle's entomology is based on misinterpretation of his text. Petit and Théodoridès (1962, 78), for example, erroneously attribute to Aristotle the view that insects are bloodless and do not breathe, when in fact his account, taken in its entirety, makes clear that he understood, correctly, that insects are animals that lack *red* blood and *pulmonary* respiration (*HA* 1.487a31, 489a20-23, 490b14-15, and 4.532a31-b10).

Some scholars have faulted Aristotle's subclassification of insects, which, it is true, is far from complete. However, as Peck pointed out in the introduction to his translation of *Historia Animalium* (1965, lxiv-vi), it should be kept in mind that Aristotle did not aim at creating a taxonomical system. He went straight to the highest level of comparative biology even though some debatable or untimely generalizations made his explanation confusing (Balme, 1962; Grene, 1972). Moreover, Aristotle himself suggests the need for further research and observation of this class of animals, which he found hard to catalog in detail because of both the number of species included in it and their minute size (e.g., *HA* 5.553a17-b7). In all the matters he dealt with, his sketch of entomology, although open to criticism, has proved accurate enough, at least in several fundamental principles, to provide the very basis of the modern science of insects (Singer, 1959).

None of the other contributions preserved from the ancient Greek tradition matches Aristotle's. Yet this does not mean that before and after him no valuable observations and discoveries were made. Theophrastus of Eresus, for example, disciple and successor of Aristotle as the head of the Lyceum, was much interested in botany and concerned with

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how to protect plants, trees, and crops from pests and diseases. Accordingly, he turned to economic entomology (Hatch, 1938) and dealt more systematically than Aristotle had done with geographic distribution, migrations, climatic effects on growth and action of insects, and the prevention and treatment of insect damage (e.g., *Hist. Pl.* 2.8, 5.4.5, 7.5.4, 8.11.2-4). His observations would be developed by Roman farmers, who were, however, mainly interested in applied entomology and made fewer attempts to venture into pure science (Morge, 1973, 51-53). Theophrastus' contribution to entomology, while rightly recognized as second in importance only to Aristotle's, still awaits extensive examination.

Occasional details preserved by poets and artists are another source for our knowledge of Greek entomology. As early as the second millennium B.C., Minoan and Mycenaean jewels were ornamented with patterns suggested by insects, either stylized or more realistically designed. The well known Mallia insect pendant (LaFleur, et al., 1979; Kitchell, 1981) and other Bronze Age pieces excavated on Crete and in Greece begin a long tradition of representations of insects on seals, ringstones, and coins, both scientifically and aesthetically valuable (see figs. 1-6).

The earliest Greek texts in which insects are mentioned are the Homeric poems, where the tiny creatures appear most often in similes; at least ten different genera are recorded, including wasps (*Il.* 12.167-70, etc.), bees (*Il.* 2.86-100, etc.), cow-flies (*Od.* 22.299-301), wood pests (*Od.* 21.395), butterflies (?—see *Il.* 11.53), flies (*Il.* 2.469-73, etc.), cicadas (*Il.* 3.149-52), locusts (*Il.* 21.12-16), and dog ticks (*Od.* 17.300). The descriptions contain some acute ethological observations expressed in a colorful, if not always scientific, way. In *Iliad* 2.86-94 the Achaean warriors hasten on to the place of gathering,

> as the tribes of thronging bees go forth from some hollow rock, ever coming on afresh, and in clusters over the flowers of spring fly in throngs, some here, some there. (Trans. Murray, 1946)

At *Iliad* 16.259-65, the great-hearted Patroclus and his soldiers march forth against the Trojans. Straightaway they pour forth,

> like wasps of the wayside, that boys are wont to stir to wrath, ever tormenting them in their nests beside the way, foolish that they are; and a common evil they make for many. And the wasps, if so be some wayfaring man as he passeth by rouse them unwittingly, fly forth one and all in the valour of their hearts, and fight each in defence of his young. (Murray)

Understandably, agricultural pests and disease vectors appear most frequently. Homer compares the panic-stricken wooers of Penelope fleeing through the halls of the palace at Ithaca to a herd of kine that the darting gad-fly falls upon and drives along in the spring (*Od.* 22.299-301). Elsewhere the poet provides some of the earliest evidence for measures taken against migratory locusts (*Il.* 21.12-14, Murray):

> beneath the onrush of fire, locusts take wing to flee unto a river, and the unwearied fire burneth them with its sudden oncoming, and they shrink down into the water.

Further references to insects are found in ancient Greek comedy, proverbs, and fables. Aristophanes refers to fleas, bugs, and other undesirable guests to make fun of Socrates (*Nub.* 144-52), the Corinthian people (*Nub.* 710), the Athenian elders (*Vesp.*), and Dionysus (*Ran.* 114-15). References to sacrifices, prayers, and special rites devoted to gods and heroes such as Zeus *Apomyios* ("Averter of flies"), *Myiagros* ("Fly-catcher"), or *Myiodes* ("Fly-hunter") in Olympia (Paus. 5.14.1; Pliny the Elder, *HN* 10.75, 29.106), Apollo *Parnopios*

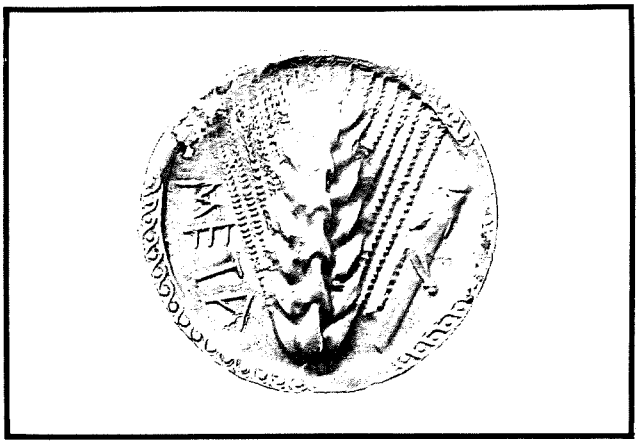

Figure 1: Locust. Didrachm. Metapontum, 550-470 B.C. Courtesy of Bibliothèque royale Albert I, Cabinet des Médailles, Brussels (Photograph: J. Lippens).

("Averter of locusts") in Athens and in Boeotia (Paus. 1.24.8; Strab. 13.1.64.613C), Heracles *Kornopiôn* ("Locust-scarer") in Thessaly and *Ipoktonos* ("Killing the worms in vines") in Erythrai (Strab. *ibid.*), in order to keep away flies and pests attacking crops or vineyards—all these disclose aspects of the struggle of the ancient Greeks against noxious insects (Bodson, 1978).

Another interesting example of Greek entomology has to do with *Mantis religiosa,* an insect not described by Aristotle or Theophrastus, but mentioned by Theocritus in a comparison (*Id.* 10.18). The feeding behavior of the mantis is correctly depicted by Aristarchus of Samothrace, whose short account has been indirectly transmitted in the ancient commentaries to Theocritus' poems (Schol. Vat. 3-4M):

> This creature looks like a grasshopper, and if it sees another insect it is a source of great trouble to it. Mantis is green, has its forelegs long and thin, and it keeps them moving constantly.

Mantis religiosa appears in representations on a few coins issued at Metapontum. The anatomical accuracy of these depictions (see fig. 6) demonstrates once again the Greeks' interest in, and careful observation of, the different species of insects living around them and sharing their environment.

Ancient authors also provide a great deal of data about insects praised by the Greeks for their usefulness, among which the most appreciated were the bees (Bodson, 1978, 25-43; Byl, 1980, 340-55). The first and most obvious reason for the high regard in which the bee was held was, of course, its role in the production of honey. When considering the life

Figure 2: Locust. Decadrachm. Acragas, ca. 412-411 B.C. Courtesy of Staatliche Münzsammlung, Munich (Photograph: H. Hotter).

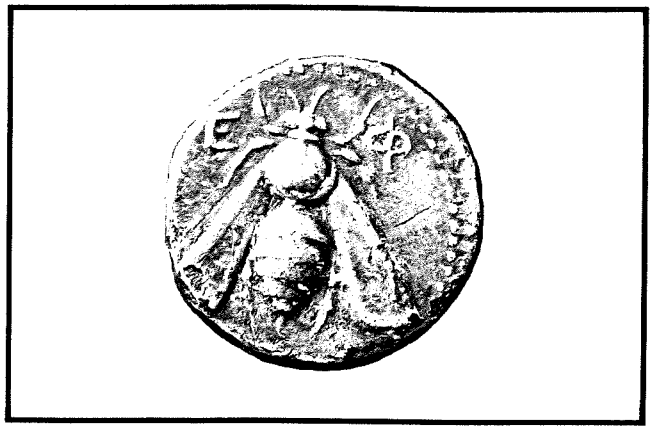

Figure 3: Bee. Tetradrachm. Ephesus, 394-295 B.C. Courtesy of Bibliothèque royale Albert I, Cabinet des Médailles, Brussels (Photograph: J. Lippens).

at the beehive, however, the ancient Greeks were also impressed by this insect's social organization, its order and discipline, its cleanliness and neatness. Therefore, they took the bee as a model for private and public life, for men, women, and children, and as a symbol in religious cult (Xen. *Oec.* 7.17, 32-39). Despite the Greeks' mistaken notions about the "king" of the beehive and about the origin of honey (which they supposed fell from the air onto plants and flowers as dewdrops, which the bee then collected: Arist. *HA* 5.553a17-554b21; *Gen. An.* 3.759a8-b35), they provided an extensive introduction to apiculture (*HA* 5.553b23-554a14).

Although not so useful an insect as the bee, the cicada also attracted the attention of the Greeks, for whom it was a symbol of autochthonia, of music, of cheerfulness, of harmony, of summertime (Bodson, 1978, 16-20). As a result, it also became one of the best known of the insects. The Greeks not only distinguished different species (Arist. *HA* 4.532b14-17), but they also were aware of the mechanism of muscles which produced the sound so charming to Greek ears that it could be called music (Archilochus, fr. 223 West; Bodson, 1976) and they recognized that only male cicadas are able to sing (Xenarchus, fr. 14 Edmonds: "Aren't the cicadas to be envied? They have wives that never have a word to say.").

Few of the ancient authors who mention bees, cicadas, or other insects were, or pretended to be, scholars or scientists. Yet their interest in these creatures, however variously inspired (and we have seen that insects captured the attention of the ancients for reasons utilitarian, economic, religious, ethical, and artistic), was so acute that their comments have

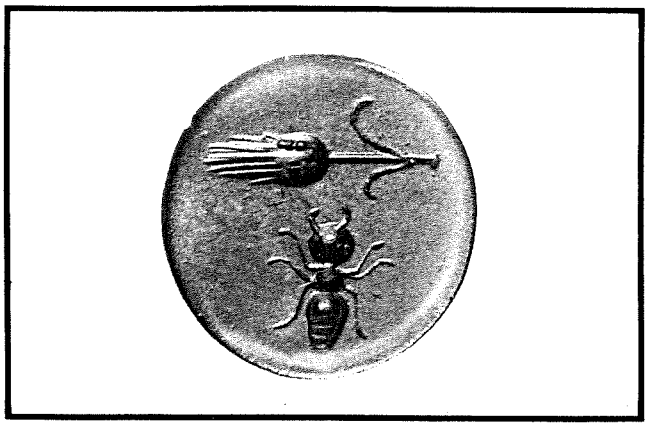

Figure 4: Ant. Sard. Roman Empire (period of Augustus). Courtesy of Kestner-Museum, Hannover (Photograph: Museum).

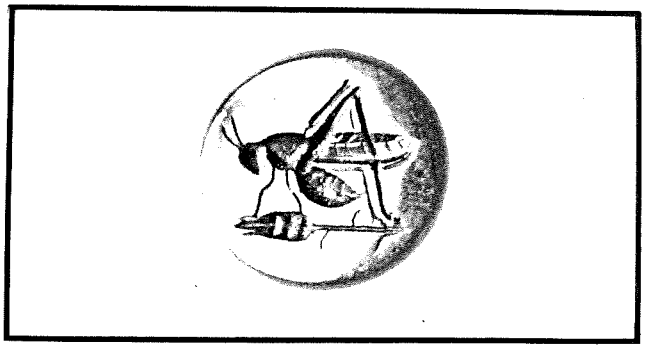

Figure 5: Composed insect (roughly locust-like). Sard. Roman Empire (period of Augustus). Courtesy of Kestner-Museum, Hannover (Photograph: Museum).

contributed significantly to our knowledge of the ancient science of entomology. The Peripatetic school produced the first scholars to become engaged in a scientific, if imperfect, approach to the smallest animals. Despite failures and misconceptions—some of them determined by prejudices against evidence, many by the lack of appropriate tools—their achievements were in many respects very advanced and constitute major successes of the ancient sciences.

Today, after so much progress has been made in so many directions, some of the general scientific principles first defined by Aristotle or Theophrastus are likely to sound more significant than their specific discoveries, which were so often, but unavoidably, elementary or mistaken. However, the data collected and discussed by the ancient Greek entomologists have never been methodically examined, most probably because the topic never appealed either to historians of the sciences or to classicists any more than it did to Keller (1913), who was convinced that "Den Insekten haben die Alten der klassischen Epoche im allgemeinen wenig wissenschaftliches Interesse entgegengebracht." A careful, thoroughgoing evaluation of the ancient texts and archaeological evidence would contribute not only to the history of the natural sciences, entomology in particular, but even to the history of the humanities, since, for the ancient Greeks at least, science and philosophy were kindred disciplines.

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References

Balme, D.M. "ΓΕΝΟΣ and ΕΙΔΟΣ in Aristotle's Biology." *CQ*, 12 (1962), 81-98.

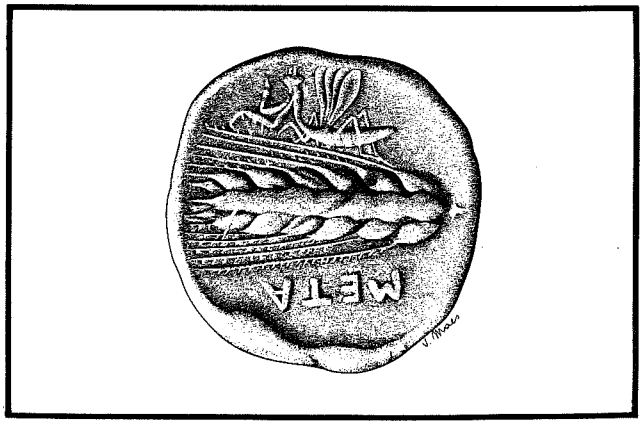

Figure 6: *Mantis religiosa.* Didrachm. Metapontum, ca. 420 B.C. After G.M. Richter, *Animals in Greek Sculpture,* New York: Oxford Univ. Press, 1930, fig. 224 (Drawing: V. Maes).

Bodson, L. "La stridulation des cigales. Poésie grecque et réalité entomologique." *AC,* 45 (1976), 75-94.
Bodson, L. ΙΕΡΑ ΖΩΙΑ. *Contribution à l'étude de l'animal dans la religion grecque ancienne.* Brussels: Académie royale de Belgique, 1978.
Byl, S. *Recherches sur les grands traités biologiques d'Aristote: sources écrites et préjugés.* Brussels: Académie royale de Belgique, 1980.
Chroust, A.H. *Aristotle: New Light on His Life and on Some of His Lost Works.* Vol. I. London: Routledge & Kegan Paul, 1973.
Daumas, M. *Histoire de la science.* Paris: Gallimard, 1957.
Grayeff, F. "The Problem of the Genesis of Aristotle's Text." *Phronesis,* 1 (1956), 105-22.
Grene, M. "Aristotle and Modern Biology." *Journal of the History of Ideas,* 38 (1972), 408-18.
Hatch, M.H. "Theophrastus of Eresos as an Economic Entomologist." *Journal of the New York Entomological Society,* 46 (1938), 223-27.
Harpaz, I. "Early Entomology in the Middle East." *History of Entomology.* Ed. R.F. Smith, et al. Palo Alto: Annual Reviews, Inc., 1973, pp. 21-36.
Keller, O. *Die antike Tierwelt.* Vol. II. Leipzig: Cramer, 1913.
Kitchell, K.F. "The Mallia 'Wasp' Pendant Reconsidered." *Antiquity,* 55 (1981), 9-15.
LaFleur, R.A., et al. "A Re-examination of the Mallia Insect Pendant." *AJA,* 83 (1979), 208-12.
Lilja, S. "Vermin in Ancient Greece." *Arctos,* 10 (1976), 62.
Morge, G. "Entomology in the Western World in Antiquity and Medieval Times." *History of Entomology.* Ed. R.F. Smith, et al. Palo Alto: Annual Reviews, Inc., 1973, pp. 40-45.
Murray, A.T., trans. *Homer. The Iliad.* Vols. I-II. Cambridge, MA: Harvard Univ. Press, 1946.
Peck, A.L., trans. *Aristotle. Historia Animalium.* Vols. I, II. Cambridge, MA: Harvard Univ. Press, 1965, 1970.
Petit, G., and J. Théodoridès. *Histoire de la zoologie des origines à Linné.* Paris: Hermann, 1962.
Scarborough, J. "On the History of Early Entomology, Chiefly Greek and Roman, with a Preliminary Bibliography." *Melsheimer Entomological Series XXVI.* University Park, PA: Entomological Society of Pennsylvania, 1979, 17-27 (known too late to be used in this article).
Singer, C. *A History of Biology to about the Year 1900.* 3rd ed. London: Abelard-Schuman, 1959.
Thompson, D'A.W. *The Works of Aristotle.* Vol. IV. *Historia Animalium.* Oxford: Clarendon Press, 1910.