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CORNFORD, F.M.
1942



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The Journal of Hellenic Studies, Vol. 62. (1942), pp. 1-7.

Stable URL:

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WAS THE IONIAN PHILOSOPHY SCIENTIFIC ?

[This paper was prepared by the late Professor F. M. Cornford for the Joint Meeting of the Hellenic and Roman Societies held at Oxford in the summer of 1942. It was read there in his absence by Professor Gilbert Murray. To a suggestion that the paper should be published in the *Journal of Hellenic Studies*, Professor Cornford replied: "The paper is a very short (and not very convincing) summary of an argument which I am writing out at length in a book which I hope to publish when times are easier. I hoped to get some criticism and discussion, but not being well enough to attend, I did not gain much that way. Space in the *Journal* is too valuable to justify this sort of advanced patrol work being published as if it were a final statement with all the relevant evidence." After his lamented death, permission was obtained from Mrs. Cornford and from Mr. W. K. Guthrie, his literary executor, to publish the paper here with an explanation of its origin and intention.]

THIS paper is concerned with a problem which has puzzled me for many years. The Greek philosophers of the Ionian tradition, from Anaximander to Epicurus, are commonly called specially 'scientific,' in contrast with the Italian tradition started by Pythagoras. Why is it, then, that their systems are cast in the form of dogmatic pronouncements? It is not only that they describe, with complete confidence, matters beyond the reach of observation, such as the origin of the world; but when they come to matters of detail, they make assertions which could have been upset by a little careful observation or by the simplest experiment.

It has been argued—by Burnet, for instance—that this dogmatism may be only apparent. Our evidence is fragmentary, and comes largely from manuals compiled much later by men whose object was to discredit science for reaching contradictory conclusions, and by no means to record the methods employed to reach those conclusions. W. A. Heidel, too, thought that, if we possessed the philosophers' notebooks, we should find that their results were obtained by methods akin to those of modern science, though with less awareness of the need for caution in experimental tests. Behind these arguments lies the assumption that the questions they asked themselves, the motives prompting their inquiries, and the quarter to which they looked for the sources of knowledge, were the same then as now. This assumption is naturally made by most historians of science. Looking back at the past from our own standpoint, they are interested in those features of ancient thought—atomism, for example—which have proved fruitful in modern developments. The archaic features are ignored or dismissed as pardonable errors in the infancy of science. But if our aim is to regain the standpoint of ancient speculation, we cannot afford to discard all elements foreign to our own ways of thinking; any more than the historian of religion can afford to dismiss as 'superstitious fancies' beliefs and practices which the civilised world has outgrown. Rather we should fix attention on these strange features and try to recover the attitude of mind that will account for them.

We are asked to believe that these Ionian systems were based on observation; that hypotheses were then framed by rational inference from observed facts; and that, sometimes at least, these hypotheses were checked by experiment, though with insufficient caution. Let us recall a few of the philosophers' statements and consider whether they could have been founded on such methods.

(1) Anaximander coolly asserted that the distance of the sun from the earth is precisely three times that of the fixed stars, and that the stars' distance is nine times the diameter of the earth. The earth itself is a cylindrical drum, three times as broad as it is high.

(2) A main feature of Anaximenes' system was his reduction of differences of temperature to differences of density: the hotter, the thinner; the colder, the denser. Water is the only substance which can easily be seen passing into vapour when heated and becoming solid when cooled. When water turns to steam, it expands; when chilled into ice, it ought to contract into a smaller volume. But does it contract? If Anaximenes had put a jar of water outside his door on a frosty night, he might have observed that the water did not shrink when it turned into ice, but, on the contrary, split the jar. We may conclude that he never had recourse to this simple experiment. Nor is there any record of anyone testing his dogma in this obvious way.

(3) Empedocles explained respiration as a process whereby the warm air breathed out through the mouth is automatically replaced inside us by cold air drawn in through pores in the chest. Then the movement is reversed: the air inside, now heated, escapes through the same pores whereby it entered, and is replaced by cold air inhaled through the mouth. Plato adopts this theory. No one ever thought of sitting in a bath with the water up to his neck, to find out whether air bubbles could be observed passing through the water into his chest when he exhaled, and out again when he inhaled; and if not, whether his breathing was impeded.

Such tests would instantly suggest themselves today, not merely to a man of science, but to any sensible person. Why did they not occur to the ancient philosophers, even when they were contradicting one another's theories?

They were, moreover, equally dogmatic on questions beyond the reach of observation, let alone experiment. They announced, with the same assurance, that the ultimate constituents of material things were water, or air, or the four elements, or atoms; and they described the process whereby an ordered world had arisen out of these elements. None of them had witnessed the process, or had the faintest conception of any method for isolating an element. Yet they narrate the history of the world from such beginnings as if it had happened before their eyes. Plato, whom our modern materialists despise as hopelessly unscientific, was the one philosopher who told the truth about ancient physics, when he said that it could be no more than a 'plausible tale.' That is exactly what all these Ionian systems were—an εἰκὼς μῦθος.

I suggest that the key to our problem lies in a difference of attitude towards the question of the *sources of knowledge* or wisdom. And here some light comes to us from the protest against the methods of philosophy, raised by doctors of the Hippocratic school. In an admirable survey of Hippocratic medicine, Heidel has pointed out that, in the medical art, a procedure was evolved which does go some way towards the methods of modern science. Doctors began to keep careful records of symptoms in individual cases; and from these they advanced to generalisations, and even to the rudiments of experimental procedure. Nearly all the experiments recorded in ancient literature were made by doctors.

Heidel, however, drew no distinction between the methods of medical science and those of philosophy. Hence he assumed, like Burnet, that the philosophers applied to their problems the inchoate scientific procedure of the doctors, and reached many of their conclusions by observation and experiment of which no record remains. Here, I believe, he was mistaken. There was, from the nature of the case, a radical distinction, and even opposition, between medicine and philosophy, in the way they approached such problems as they had in common.

Medicine was, from the outset, a practical art; indeed, it was the only practical art which, in ancient times, was impelled by its own needs to develop a scientific method. The doctor is a healer (ιατρός), a craftsman in the public service (δημιουργός), a hand-worker (χειρουργός) in surgery. He is always dealing with an individual patient, and always with a practical purpose—to cure that patient. Hence (unlike the philosopher, speculating about the origin of the world) he starts by noting the symptoms of a particular case, to find out what is wrong, and needs to be put right. The application of a remedy is based on a generalisation from accumulated experience—'This remedy has proved helpful in cases of this sort'—and it is experimental: 'Will it work in this case?' The doctor will be led on to speculate about the fundamental causes of disease and health. So at last he will arrive at the question of man's nature or bodily constitution—the elements and active or passive properties whose equilibrium needs to be restored by suitable treatment from outside.

Contrast with this procedure the route by which the philosopher approaches the nature of man. He starts with cosmogony. The questions implied (though they are answered rather than explicitly stated) are of this sort: What was the original state of things? What are the simplest constituents of all compound bodies? How can we give a natural explanation

of 'what goes on in the sky and under the earth' ? How did life begin ? From such speculations about the remotest origins of the world the philosopher arrived at accounts of the origin of plant, animal, and human life—accounts predetermined by doctrines already laid down as to the nature of the world as a whole. So, at the end, he came to the point where his theories impinged on the domain of medicine. The human body could only be composed of the same elements as all other bodies—water, or air, or the four elements, or atoms. The philosopher's 'physiological' theories (as we call them) were thus dictated by their cosmological dogmas; and they were ready to foist on the practical physician *a priori* accounts of the nature of health and disease.

The characteristic reaction of the scientific doctor is vigorously expressed in the treatise on *Ancient Medicine*. The author (who may be Hippocrates himself) attacks all writers on medicine who start from a groundless postulate or assumption, such as that all diseases are caused by 'heat or cold or moisture or whatever else they may fancy.' Such postulates, he says, may be inevitable in dealing with 'problems beyond the reach of observation' (τὰ ἀφανέα τε καὶ ἀπορέόμενα), such as 'what goes on in the sky or under the earth.' There is no means of testing the truth of assertions made in this field. But medicine has long had a different principle and method of its own, securely based on discovered facts, which must be taken as the starting-point for further discovery. Philosophers like Empedocles have written about the nature of things, how man came into being at the first, and of what elements he was constructed. All this has no more to do with medicine than with painting. Man's nature can be ascertained only by discovering his reactions to food and drink and the effect of habits in general on each individual. These effects will differ from one individual to another. We must start with the observation of particular cases.

The contrast could not be more clearly expressed. The philosopher descends from above to deduce the nature of man from unproved postulates; the physician builds up his doctrine from below, generalising from particular observed facts.

My next point is that these two opposite approaches—the *a priori* approach of the philosopher and the empirical approach of the physician—are reflected in two opposite accounts of the sources of knowledge or wisdom.

The empirical account is set forth by Aristotle,¹ himself the son of a practising physician. It starts with the *senses*. In the higher animals sensation gives rise to *memory*. In man repeated memories of the same thing result in a unified *experience*: 'This remedy benefited Callias in this disease, and also Socrates, and so on in many cases.' We then advance to the *generalisation*: 'This remedy is good for all phlegmatic temperaments in burning fever.' Such generalisations constitute *Art*. For practical purposes experience may be sufficient, because the physician is curing not 'man' in general, but some individual who 'happens to be a man.' On the other hand, we associate knowledge or wisdom rather with art than with mere experience, which knows only the fact, not the reason. *Knowledge* in the full sense comes last, with the understanding of causes.

It is not for nothing that Aristotle's illustrations are all taken from the art of medicine. This empirical theory of knowledge had already been mentioned by Plato as having interested Socrates in his young days. Its author, in fact, was none other than the physician Alcmaeon of the early fifth century, who taught that man is distinguished from the animals by possessing understanding as well as sensation; that our sense-perceptions are centred in the brain; and that from them arise *memory*, *judgment* (or belief), and finally *knowledge*. Alcmaeon even tried, by dissection, to trace the 'pores' leading from the sense organs to the brain.

Here, then, in the practical art of medicine, we find the root of empirical epistemology—the idea that the senses are the ultimate source of knowledge, of that understanding which distinguishes man from the animals. There is no earlier trace of this view of knowledge. It was formulated when the doctors, under the influence of Ionian rationalism, were freeing

¹ Ar. *Met.*, A1.

their art from its magical phase and reflecting upon the procedure they actually followed in the successful advance of discovery.

If this view is correct, the first steps towards inductive science, as understood since the Renaissance, were taken by the physicians, in opposition to the philosophers. The medical art, moreover, was the only art known in antiquity that was impelled to formulate a method based on observation and rudimentary experiment. It thus became the only 'natural science' (in our sense) that existed before Aristotle. When Aristotle set his three pupils, Theophrastus, Eudemus, and Meno, to write the history of earlier thought, he divided the field into (1) Metaphysics and Natural philosophy, (2) Mathematics, and (3) Medicine. He felt, it would seem, the force of the Hippocratic contention that Medicine stood alone, with a starting-point and procedure of its own, opposed to those of the philosophers.

The alternative theory of the sources of knowledge was formulated by Plato; though I shall argue that it was by much the older of the two, and had all along been unconsciously assumed by the philosophers. It will account for their dogmatism.

It rests upon a very different conception of the nature and contents of *memory*. The empirical view we have just considered is materialistic. It starts from the tangible bodies outside us, which send off images to invade our senses and stamp impressions on the waxen tablet. At birth the tablet is blank. The impressions accumulate, like a vast unsorted heap of postage-stamps. These are the sole contents of memory. Having got so far, the materialist has reluctantly to admit something suspiciously like a mind, with an entirely inexplicable power of sorting out the stamps and assigning them to their respective countries in an album. The album will symbolise knowledge; and the materialist will then try to forget all about the activity of the stamp-collector.

The memory implied in Plato's theory of *Anamnesis* is stored in a very different way. The senses have nothing to teach us: they are classed with the lusts of the flesh as a positive hindrance. Perfect knowledge can be enjoyed only by a disembodied spirit with no sense-organs at all. In this life knowledge is recovered from a memory which is not a record, inscribed since the moment of birth, of those personal experiences which are, of course, different for every individual. It is an *impersonal* memory, the same for all men. Its contents embrace the whole intelligible realm of eternal objects and truths, including all pure mathematics—the whole of knowledge worthy of the name. If this knowledge was ever acquired, it was acquired before the soul first entered a mortal body; but it is more likely that it is eternally possessed by the immortal soul. In this life it is latent; but no limit can be set to the amount that can be recovered by recollection, when the soul withdraws from the body and its senses to think by itself. The process of recovery is illustrated in the *Meno*, where the solution of a not very simple geometrical problem is elicited by questioning from a slave who has never been taught geometry. The doctrine, supported by fresh arguments in the *Phaedo*, forms the one substantial proof of pre-existence accepted by all parties in the first part of that dialogue.

It is instructive to attend to the more or less mythical associations and images surrounding *Anamnesis* in the *Phaedrus*. There the immortal soul is defined by its essential power of self-motion—the power of Eros. The three main forms of desire—the love of pleasure, the love of honour, and the love of wisdom (φιλοσοφία)—are typified by the winged chariot, drawn by the two horses of appetite and passion, and guided by the Intelligence, which alone is capable of seeing truth. The soul-chariots follow the gods in the procession compared to the procession of the already purified initiates to the final revelation at Eleusis. In the divine company, the soul, before incarnation, journeys outside the sphere of the visible heavens to the Plain of Truth, to learn there all the truth it can ever know. After its descent into a mortal body, some part of this knowledge can be regained by recollection, prompted by intimations of beauty shining through the veil of appearances. In this experience of the awakened love of wisdom, the soul is rapt into a condition of enthusiasm or ecstasy, declared to be on a footing with the divine madness of the seer inspired by Apollo, and of the poet inspired by the Muses. Neither seer nor poet has access to the truth of things while he is in his sober senses. And,

like the seer and the poet, the philosopher needs to be rapt beyond this world of sensible experience and to recover a vision denied to the bodily eyes.

The imagery of the *Phaedrus* myth enables us to connect the theory of philosophic knowledge as drawn from memory with prophetic enthusiasm and the inspiration of the poet. To all three—seer, poet, and sage—their peculiar wisdom comes as a revelation—a light breaking in upon what we call the ‘inner consciousness.’ All three have laid claim to a spiritual faculty with access to an unseen world, beyond those limits of time and space which confine the body and its senses. The mantic inspiration of Apollo endowed the seer Calchas with knowledge of the *past* and the hidden *present*, as well as of the *future*: the whole pageant of events in time was unrolled beneath the prophet’s vision. In dreams, moreover, the soul (as Cicero says) is ‘called away from the contagion of its bodily associate, and remembers the *past*, discerns the *present*, and foresees the *future*; for the spirit is alive and in full vigour while the sleeper’s body lies as if dead.’ The knowledge disclosed to the poet by the daughters of Memory is equally extensive. In the second *Iliad* Homer calls on the Muses to ‘put him in mind’ of all who went to Troy: ‘for ye are goddesses, and are present (πράεστε) and know all things, while we only hear the report of fame and know nothing.’ This means that the poet, when he is inspired, can see the past as an eye-witness present at the events he illustrates, no longer dependent on hearsay. So too the Muses who came to Hesiod on Helicon ‘know how to tell many fictions that wear the guise of truth but know also how to declare the truth when they will.’ The fictions are what we call creatures of ‘imagination’; but what the Muses proceed to reveal to Hesiod is the truth about the remote past, the origin of the world and the birth of the gods. We should take these claims to supernormal knowledge more seriously than we do. For Homer and Hesiod they were already traditional and beginning to fade into a conventional artifice. But earlier they had been made quite literally. I suspect, indeed, that Homer felt as if he were not merely imagining, still less inventing, the scenes he describes, but seeing with the inward eye what had really taken place; just as Ion the rhapsode assured Socrates that, when he recited the parting of Hector and Andromache or the slaying of the Suitors, he was transported out of his sober senses and ‘his soul believed that, in its rapt (ἐνθουσιάζουσα) condition, it was present at the events in Troy or Ithaca.’

Now the upshot of the *Phaedrus* myth is that knowledge of reality—the unseen nature of things—comes to the philosopher through the analogous exercise of a spiritual faculty called *Nous*, having the same power to rise beyond the bounds of time and space, as the spectator of all time and all existence. The stages of this journey are enumerated in the *Symposium* and the central books of the *Republic*. It carries the soul all the way from the shadows of the Cave to the vision of the Good. The journey is always described in terms of progressive illumination, such as we inevitably use in speaking of intellectual discovery. All the great pioneers of thought have seen the light suddenly irradiate the intelligible pattern in an array of facts that had seemed disorderly and meaningless. This experience Plato equates with poetic and prophetic inspiration. Such moments of illumination come when thought has been extremely concentrated, shutting out the distracting influx of external impressions. A truth which has long been shaping itself breaks through into consciousness, and we seem to recognise something we have always known and had forgotten.

This theory of the sources of philosophic knowledge is no flight of Plato’s fancy. It reproduces a serious belief far older than the empirical theory of Alcmaeon—a belief, moreover, which still flourishes in no small part of the world. In that phase of society when writing is unknown or confined to a small lettered class, the wisdom of the community is possessed and orally transmitted by persons of a type in which the attributes of seer, poet, and philosopher are united. Prophecy (in the wide sense) has been defined as the expression of thought, whether subjective or objective, and of knowledge, whether of the present, the future, or the past, acquired by inspiration and uttered in a condition of exaltation or trance. The artistic form of such utterance is poetry. Epic poetry, the literature of entertainment, preserves the history of the race and the great deeds of the men of old. Didactic poetry covers the origin

of the world and of human institutions, the genealogical descent of families, catalogues, proverbial or gnostic wisdom, and information useful to the farmer and the sea-farer—all the elements combined in Hesiod.

Taught by the Muses, the poets are aware of no boundary separating the utterance of spiritual adventures and journeys to the unseen world from information about the right times for sowing crops or about the winds prevalent in certain seasons, which must have come from normal experience and observation. All this lore is vested in a class claiming mantic powers and universally respected as the most intellectual and gifted members of the community. Examples are: the *rishis* of ancient India, the druids in Gaul, the *filid* of ancient Ireland. Their successors today are found in the Siberian *shamans*, the seers of Polynesia (which is said to possess the richest oral literature in the world), the priests who taught Roscoe the history of Uganda, and so on. Such men are not witch-doctors or vulgar magicians or pathological neurotics. They are rather remarkable for health and sanity, and when not exercising their mantic powers, go about their business like anyone else.

Here I am relying on a great mass of evidence in Mr. and Mrs. Chadwick's survey of oral literature all round the outskirts of Mediterranean civilisation, from Gaul and Ireland, across Scandinavia and Siberia, to Polynesia, India, and North Africa. Their results are summed up in Mrs. Chadwick's *Poetry and Prophecy*, a book which I earnestly recommend to all students of literature. I will quote one paragraph:

'The fundamental elements of the prophetic function seem to have been everywhere the same. Everywhere the gift of poetry is inseparable from divine inspiration. Everywhere this inspiration carries with it knowledge—whether of the past, in the form of history and genealogy; of the hidden present, in the form commonly of scientific information; or of the future, in the form of prophetic utterance in the narrower sense. Always this knowledge is uttered in poetry which is accompanied by music, whether of song or instrument. Music is everywhere the medium of communication with spirits. Invariably we find that the poet and seer attributes his inspiration to contact with supernatural powers, and his mood during prophetic utterance is exalted, and remote from that of his normal existence. Generally we find that a recognised process is in vogue, by which the prophetic mood can be induced at will. The lofty claims of the poet and seer are universally admitted, and he himself holds a high status wherever he is found.'

To understand the attitude of the early philosopher, we must see him as emerging from this composite figure of the mantic person. By Plato's time seer, poet, and sage had become distinct, but he divined their original affinity. He had before him a complete survival of the type in Empedocles. As philosopher, Empedocles narrated the past and future history of the cosmos; as prophet, he revealed the destiny of the soul and the means of purification; everyone admits his genius as a poet; and he called himself a god who had risen above the trammels of mortality. Earlier still, Heracleitus had denounced the 'learning of many things.' Searching himself, he found within him the *Logos* which he delivered in the oracular style of 'the Lord of Delphi, who neither explains nor hides the truth, but indicates it by a sign.' Pythagoras was the hierophant of philosophic mysteries, revealed only to the pure. Parmenides, from whom Plato inherited the image of the Soul-chariot, was borne by the horses of the Sun beyond the gates of day and night, to learn the nature of things from a goddess. The truth so revealed already came to him in the form of logical deduction from self-evident premises—the form in which the truths of geometry unfold themselves to *Anamnesis*. Parmenides is the prophet of Reason; and he sets the senses at defiance.

Yet earlier, in the sixth century, the wise men who shared with the poets the title σοφισταί were no doubt rationalists; but it is an anachronism to represent them as entirely sceptical and disillusioned men of science, starting afresh to study Nature by observation and experiment. They stood within the old tradition; and it is likely that Anaximander, for example, would look back to the cosmogony of Hesiod, and other cosmogonies of the same fundamental pattern, as the genuine revelations they claimed to be. In Hesiod's short account of the

origin of the world, the mythical element is already reduced to the thinnest veil of allegory or metaphor. Anaximander had only to remove the last vestiges of poetical symbolism and to fill out the scheme with operant factors which seemed indubitably prosaic and natural.

The philosopher thus appears as the rationalising successor of the poet-seer, relying at the outset on the traditional wisdom, confirmed by his own inward conviction. On the other hand, his rationalism was to bring him later into conflict with those two other figures, who had been taking their separate ways. The prosecution of Anaxagoras is believed to have been instigated by the seers, whose occupation as interpreters of omens would be gone, if philosophers were allowed to explain eclipses and earthquakes—‘ what goes on in the sky and under the earth ’—as natural events and not signs of divine wrath. Diopieithes, whose decree forbade such atheistical heresies, was himself a seer. And in the moral sphere, the authority of the poets on matters of religion and conduct was threatened by the Sophists and Socrates. Among Socrates’ accusers, Meletus figures on behalf of the poets, and it is with him that Socrates debates the religious count in the indictment. The quarrel between poetry and philosophy was carried further by Plato, to lengths which strike us as extravagant.

These rivalries throw light back upon the time when poet, seer, and sage were the same person. After they had become separate, the poet and the seer still claimed the inspiration of the Muses and Apollo. Plato revived the corresponding claim of the philosopher. But, as I have argued, this was no novelty. The philosopher had all along felt that his spirit was reaching out, beyond every-day experience, to an unseen realm of certain truth.

Against the prestige of this immemorial tradition, the protest of the physicians, with their empirical theory of knowledge, had little weight. Those very Hippocratic writers who object to the philosopher’s empty assumptions, indulge in dogmatic pronouncements equally unfounded. ‘ All disease,’ they will say, ‘ is due to lack of balance in the four humours.’ Their only excuse is that the four humours can be seen and touched and dealt with, whereas no one has ever seen ‘ the hot ’ and ‘ the cold.’

If Aristotle had followed his father’s profession and never joined the Academy, who can say how far he might have carried the empirical impulse of medicine into the whole field of natural philosophy ? But he succumbed to the influence of the divine Plato ; and no sooner were he and his master dead than they became authorities, whose intuitions rendered the study of brute fact superfluous. Thence onwards and all through the Middle Ages, the philosopher ranked once more beside the prophet, and the premises to which all knowledge must conform were furnished by the combined revelation of faith and reason. The empirical theory of knowledge has only raised its head again effectively in the last few centuries. It is a mistake to assume that it governed the speculations of ancient Ionia.

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