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NATURE

Revealing Nature amidst Multiple Cultures:

A Discourse with Ancient Greeks

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A paradox of present times is the growing unpopularity of science amidst its overwhelming triumph. Thousands of citizens can be mobilized at any time, at least in Europe, against nuclear industry, against chemistry, and against genetic engineering, the very fields in which science has made its greatest advance in this century. What is especially disquieting about these conflicts is that they apparently cannot be settled by rational discussion of facts. Moral, yet irrational, impulses motivate aggression, alarmed by suspicion of hidden interests of money and power. The old idea that science is revealing facts of nature is lost in the turmoil.¹

Parallel, I find, is the established tendency to stigmatize the concept of nature in social sciences. "There is no human nature apart from culture." "Humanity is as various in its essence as it is in its expression."² In the midst of mass communication and mass mobility, culture is found to speak with many voices, with many souls, as it were. Fixed standards are waning away within the multicultural conglomerate of the global village. No wonder even science has been declared a social construct.³

As cultural unanimity has been lost, cultural tradition is under attack, especially the one that has been dominant so long, our so-called Western tradition. Hostility from outside is met by bad conscience from inside. In the United States the accusations against dead white males have gained prominence, challenging "European cultural arrogance," which in turn is said to be based

¹ Bibliography is limited in this essay to a few basic references and some indications *exempli gratia*. For an apology of science on the background of modernist disputes, see R. G. Newton, *The Truth of Science: Physical Theories and Reality* (Cambridge, Mass., 1997).

² C. Geertz, *The Interpretation of Cultures*, (New York, 1973), pp. 35f.; cf. W. Burkert, *Creation of the Sacred: The Truth of Science* (Cambridge, Mass., 1996), pp. 1–4.

³ Cf. Newton, pp. 23–44; Th. Nagel, "The Sleep of Reason," *New Republic*, October 12, 1998, pp. 32–38.

on ancient cultures of conceit.⁴ Europe is hit by similar problems in a different key, as it is more the proximity of Islam than the thrust from Africa that is being felt.

What has been affected most of all amidst such controversies is the idea of progress.⁵ Even history of science nowadays hesitates to retell the great story of the linear ascending progress of science, society, and culture; one rather asks for "contextualization" of theories and theses. The "change of paradigms" has become a key word to characterize the ruptures and inconsistencies of the routes taken by science.⁶ The idea of objective truth is becoming an endangered species as it were, all the more in social sciences and *Geisteswissenschaften*. And yet we should acknowledge that in science at least there are not just fads and fashions to change paradigms, not just social games of power and influence: Something exists to prove or disprove statements and theories in general and in particular, and it is in relation to such criteria that science has been on the winning side, including its practical branch, technology. This success is not to be held against science, as if it were the result of arrogance and power; it is the very mark of its legitimacy. There has been an evolution toward increasing "fitness" of theories, fitness in relation to something we cannot but call "reality" or "nature."

The orientation of science toward "nature" or "reality" does not mean permanent possession of stabilized truth, but ongoing approximation. Progress of science has meant evolution of the mind too. Models have been constructed in unforeseeable ways, revealing unexpected features of reality, such as the wave-particle duality or the non-Euclidean geometry of the universe. Our imagination, trained by the continuous natural evolution, has to be trained

⁴ See the overview of C. Stray, *Journal of Hellenic Studies* 117 (1997): 229–31, referring especially to M. Bernal, *Black Athena* (London, 1987); the quotation is from Bernal, p. 73. See also B. Knox, *The Oldest Dead White European Males and Other Reflections on the Classics* (New York, 1993).

⁵ Cf. A. Burgen, P. McLaughlin, and J. Mittelstra, eds., *The Idea of Progress* (Berlin, 1997).

⁶ Th. S. Kuhn, *The Structure of Scientific Revolutions*, 2d ed. (Chicago, 1970).

afresh. Traditional prejudice may halt progress for centuries, but finally has to yield to factual refutation. Heavenly bodies do not move in perfect circles, as platonizing astronomers had held for about 2,000 years; even if Galileo Galilei still refused to be convinced by Johannes Kepler's ellipses, the postulate had to be given up in the end.

Advance means change, and change is dangerous for the homeostatic system we call life. Ruptures in the social system and corresponding anxieties will often be the consequence of progress. This is just "natural." Yet if the relation of science to natural reality should be lost from view, to be replaced by social interactions made absolute, this would be more than strange. It is true we are living in a social world; amidst infinitely multiple impulses of social dynamics, pressures, obligations, and evasions, we are forced to play social games with changing rules incessantly. It has been shown that nonhuman primates are using practically the whole of their intelligence for their social games. Why should it be different with humans? We are caught in the webs of our social world. In a certain way religion has succeeded in providing some openings of the closed system by suggesting the prospect of some non-empirical x to solve or to alleviate the paradoxes of existence,⁷ at the cost of creating further dependence on nonobvious authorities. In another form science is proposing a theoretical world, independent of social differences, games, and pressures, to be acknowledged as what is just the case. Whether we do need this is not clear to everybody. The proposition, however, originated in ancient Greece.

Lost unanimity in contemporary culture has radically questioned traditional "humanism" too, which claimed that our specific "Western" tradition was implementing mankind's progress toward an ideal of "humanity." Thus the comforting concept of antiquity as the cradle of our culture and the starting point of such

⁷ Cf. Burkert, *Creation of the Sacred*, pp. 26f.

progress has become controversial. If the Greeks are the oldest, they should be the dearest of those "white males." And yet, as we cannot and should not abandon the continuity of our own culture, the faint and distant voices of ancient Greeks may hold some message about our own position. The ancient world does present some simpler models for more complicated later developments, with the advantage of a more comprehensive perspective. The memories of antiquity may show the route that has been taken, the detours, the accidents, and the steps of success.

The Greek heritage, as is well known, has worked its compelling spell in at least three different parts of our culture, in art, in poetry, and in the compartment shared by science and philosophy. It is with this part that I shall take issue here. I would suggest that the crisis of science, the crisis of "nature," and the crisis of tradition are interconnected.

Traditionally the "great story" of ancient Greece has been a hymn to progress, progress both toward rationality and toward humanity; the two appeared connected in their contrast to brute primitivity. The slogan had been the momentous step from "Mythos to Logos,"⁸ from fantastic tales about gods and the heroic past to a reasonable account of permanent nature, which is fundamental for "modern" consciousness. We are less secure today about the essence of such progress. The traditional praise of Greece has proved to be flawed, at least on three accounts:

(1) The originality of the "Greek miracle" is crumbling, as the older civilizations of the Near East have become better known. There are strata of high civilization that reach far beyond the pag-eant of Greece.⁹

(2) The focus of interest has shifted from "classical" to

⁸ This is the programmatic title of a less interesting book by W. Nestle, *Vom Mythos zum Logos*, 2d ed. (Stuttgart, 1942).

⁹ See W. Burkert, *The Orientalizing Revolution* (Cambridge, Mass., 1993); M. L. West, *The East Face of Helicon* (Oxford, 1996).

"wild."¹⁰ That has rekindled a special interest in myth, be it nostalgic or critical; this has ousted the concept of "primitive mentality." Myth is no longer viewed as an inferior genre, but as a central and persistent phenomenon of culture. This also means that the superiority of *logos* is becoming less clear.

(3) The "rationality" of the Greek achievement has been found questionable;¹¹ the *logos* claimed by Greeks, the "reasonable account" of Greek philosophy and science, can be criticized for various kinds of prejudice and blunder, within a society dominated by machos and slaveholders. Modern doubts about rationality find their reflection in the ancient evidence and cast their shadow on the rising sun of the Greek miracle.

Take as an example the book on the "Sacred Disease," attributed to Hippocrates, a doctor of the fifth century B.C. This is a polemical treatise on epilepsy, which fervently advocates a "natural" explication of this illness, with vigorous polemics against the traditional characterization as a "sacred disease," to be tackled by religious rituals. This is enlightenment versus superstition, we are prone to judge: Epilepsy, the author writes, is not at all "sacred" but "has its nature and its cause"; it is a natural phenomenon. So far we acclaim the birth of natural science as the foundation of medicine. But when the author goes on to set out his own explanation, which is that phlegm should enter blood vessels and thus cause the convulsive attacks of epilepsy, this is so arbitrary, so contrafactual, nay ridiculous that "science" is not an applicable qualification. The consequences from this theory for treatment would be zero, if not detrimental; a traditional "purifier" or witch doctor, we imagine, might easily come up with better results. So where is

¹⁰ The keyword comes from C. Lévi-Strauss, *La pensée sauvage* (Paris, 1962); see also R. G. Hamerton-Kelly, ed., *Violent Origins* (Stanford, 1987), pp. 149–76.

¹¹ See especially G. E. R. Lloyd, *Magic, Reason, and Experience* (Cambridge, 1979), and *The Revolutions of Wisdom* (Berkeley, 1987); R. Buxton, ed., *From Myth to Reason?* (Oxford, 1999).

the progress, but for the arrogance of polemics? This is not new knowledge, but rather a new kind of rhetoric, Geoffrey Lloyd has stated.¹² This new rhetoric indeed is contemporary with the political and judicial rhetoric that arose with emerging "democracy" just then. We see the social context in the evolution of media; we fail to see the triumph of science. We may still acknowledge that the author is dealing with a problem of excessive complication, which even today, after all the undeniable progress of brain specialists with most sophisticated equipment, lacks definite explanation. It is important to state that the interaction of phlegm and blood is a phenomenon that should be generally accessible, and refutable, whereas the reference to gods shifts the explanation "toward the obscure," as already Herodotus (2,23) would formulate. The cry of triumph was premature; but the route toward "nature" was promising.

It is easy to adduce examples of less controversial progress at the same epoch, "classical" discoveries from the crucial fifth century B.C., new chapters indeed of emerging natural science. A simple one is the statement that the moon shines by reflected light, light that comes from the sun. You can realize this if only you care to observe the moon regularly and realize how a globe's surface is lit by light from the side. It is still detracting from the charms of moonlight and flatly contradicts the Greek name "*Selene*," which means the "shining torch" of night.

One step further is the explanation of the moon's eclipses as produced by the shadow of the earth in the sky. This demands some exertion of imagination to understand the interrelation of what is below with what is above the horizon: the sun standing somewhere beneath, opposite the full moon in the sky . . . Both theses, reflection and eclipse, were findings of Anaxagoras, about 450 B.C. "A view of hidden things [comes by] the things that ap-

¹² Lloyd, *Magic*, pp. 24-27, 86-98.

pear," Anaxagoras said.¹³ Note that the sun's eclipse is easier to understand, though it is a much rarer phenomenon: You can recognize the moon covering the sun's face; this discovery is attributed to Thales, back in the sixth century.¹⁴

Let us note: These are discoveries of natural facts, explanations that are simply true, even if they were not accepted by everyone at the time, and some dissent was to remain for centuries. Statements of this kind are not dependent on personal or social issues. Of course there were conflicts, conflict with the traditional conviction that an eclipse is a "sign" that has some "meaning" for king and country, conflict with the seers whose prestige and livelihood depended on their competence to interpret such signs and to direct appropriate religious rituals. One could disregard the discovery of Anaxagoras, as general Nikias did to his doom at the siege of Syracuse, when he relied on the purported sign of the eclipse of August 27, 413 B.C., and led his army into catastrophe.¹⁵ Still Anaxagoras's findings were and remained true; they could be learned and verified afresh by subsequent generations: This is the case. Hélas, it no longer signifies anything; the theoretical world disregards the interests of our social world.

More radical is the thesis that the earth is a globe. Nowadays we can see a satellite's view of our spherical earth every night on TV. We shall still have some difficulty imagining that right down here, at Ann Arbor, is the Indian Ocean some 600 miles west of Australia, where ships are moving upside down. We do not know for certain who was the first to pronounce the thesis of the spherical earth in the fifth century; Plato, in the fourth century, knew about it, and Aristotle had proofs both from theory and from

¹³ H. Diels and W. Kranz, *Die Fragmente der Vorsokratiker*, 6th ed. (Berlin, 1952), 59 B 21a (henceforth DK).

¹⁴ See W. Burkert, "Heraclitus and the Moon: The New Fragments in P. Oxy. 3710," *Illinois Classical Studies* 18 (1993): 49–55.

¹⁵ Thucydides 7.50.4.

observation;¹⁶ he knew about an attempt at measurement—it was about 75 percent too large,¹⁷ but still remarkably correct as to the order of size. Eratosthenes, 150 years after Aristotle, had the “correct” number; Christopher Columbus, following Ptolemy, chose a smaller number, better suited to strengthen his own optimism. Already Aristotle had written that there should be one ocean stretching from Gibraltar to India. One proof for the sphericity of the earth came right from the moon’s eclipse: If it is the earth’s shadow that is seen in the eclipse, it always appears circular, whether the full moon is high in the sky or just at the horizon; it would be different if the earth were a flat disk. More persuasive was the change of height of the polar star, as one went south or north.¹⁸ But remember that for about 2,000 years this insight about the spherical earth could not be proved directly, nor put to any practical use. Ancient ships were not equipped to sail around the globe; this first happened in 1522 of our era. One could discuss the problem of antipodes: some could express their disbelief; intellectuals would accept the proofs. There had been the discovery of a fact that is not obvious in direct experience, to be transmitted, to be learned by future generations—irrespective of personal or social interests.

Yet if Greek cosmologists agreed on the sphericity of the earth, they equally agreed, with negligible exceptions, on the thesis that the earth is immobilized at the center of the universe. There were arguments for this thesis, collected by Ptolemy the astronomer, physical arguments most of all;¹⁹ it needed the new physics to be developed from Galileo to Newton to dispel those arguments and to make the earth circling around the sun a “physical” reality. Yet even the erroneous theory about the earth at rest is different from

¹⁶ Cf. W. Burkert, *Lore and Science in Ancient Pythagoreanism* (Cambridge, Mass., 1972), pp. 303–6; Aristotle, *De caelo* 2,14, esp. 197b23ff.: arguments “through that which appears to the senses.”

¹⁷ 400,000 *stadia* = ca. 72,000 km circumference.

¹⁸ Aristotle, *De caelo* 197b30.

¹⁹ Ptolemy, *Syntaxis* 1,7.

the pronouncement that Earth is the Mother of humans, or of gods and humans, or of the local polis. This is rhetorically effective, even "existentially" relevant, as it may justify patriotic war and heroic death; this is the power of myth, as against any scientific hypothesis.

It is only our present state of knowledge that makes the distinction between discoveries such as the earth's sphericity and errors such as the earth's immobility. Both assumptions had been equally persuasive, well argued, and persistent in earlier epochs. There has been progress, but it appears only in retrospect. There is no criterium within the actual *status quo* to distinguish correct from wrong theories; there is no reliable indication where doors may open for future progress.

The discovery or rather the program of Greeks, of certain Greeks in their grand century, was still the revelation of independent and persistent reality, to be made a subject of intelligent discourse. It is the very concept of "nature" that has thus been created. The Greek word is *physis*, translated as *natura* by the Romans. Heraclitus, about 500 B.C., was the first to use the word in a prominent way. *Physis*, by etymology, is a form of "being"—the verbal root is identical with English "be"; it mainly meant the growth of plants in Greek. "Nature likes to hide," one of the most quoted sayings of Heraclitus,²⁰ refers precisely to this: Plants grow in secrecy; if you try to "see" this, digging up roots or unfolding buds, you will destroy the plant. Growth occurs on its own, undisturbed, but according to a predetermined course that repeats itself again and again: *Physis* is the opposite of manipulation. In contrast to all those conscious efforts of people—their decrees, conventions, actions, coercions—there is a basic department of reality that keeps to its course and makes sense by doing so, that develops by its own intrinsic laws, and that sustains life and ourselves. You may observe it with discretion; you cannot influence it

²⁰ DK 22 B 123.

directly, though you can hinder or destroy it. And you can put its essentials into speech, you can give an account, *logos*, you can show by *logos* what is the fact.²¹ This is the *condicio sine qua non* of discoveries, of statements that will just be true: The world of nature is independent from the social world, though it forms a basis even for that. It is represented in all phenomena that we have come to call biological, but also in the greater frame of the universe, which appears to exhibit some "order," *kosmos*, to put it in Greek. This concept too goes back to Heraclitus.²²

The contrasting concept was termed *nomos* by the Greeks, meaning "law" in the sense of "convention" or "custom": This refers to the inescapable integration of every person into the thrust and the limitations of traditional values and commandments. Such rules, *nomoi*, are dominant though limited in scope.²³ They make persons differ in language, customs, and character. Thus *nomos* approaches our concept of "culture." Theoretical descriptions of "society" and its functioning have occurred since the fifth century, in Protagoras, in Thucydides, and of course in Plato.²⁴ *Nomos* seemed necessary to counteract egoistic interests and unlimited private profit; but one could argue that there were so many different variants of *nomos* that none could be obligatory in general. This is graphically illustrated in the work of Herodotus, who is particularly concerned about the diversity of religious belief and practice. He approvingly hints at tendencies to find the divine in *physis*, the universe and its phenomena, such as the sky and the sun.²⁵ A free and disinterested view will keep hold of the reality of *physis*.

²¹ Heraclitus, DK 22 B 1: "[I am] distinguishing each thing according to *physis* and declaring how it is."

²² See J. Kerchensteiner, *Kosmos* (Munich, 1962).

²³ See F. Heinemann, *Nomos und Physis* (Basel, 1945).

²⁴ Important texts are Plato, *Protagoras* 323a–28d; Pericles' speech in Thucydides 2,34–46; Plato, *Republic*.

²⁵ Cf. W. Burkert, "Herodot als Historiker fremder Religionen," in *Hérodote et les peuples non grecs: Entretiens sur l'antiquité classique XXXV* (Vandoeuvres/Geneva, 1990), pp. 1–32.

Antiphon, a so-called sophist of the fifth century, impressively denounces *nomos*:²⁶ "In this we are made barbarians, the ones against the others; for by nature we are all organized in a similar way in all respects, barbarians and Greeks. You can observe the necessities of what is organized by nature in all humans, as it is provided by the same faculties for all of them; and in this there is neither barbarian nor Greek discriminated among us: We all breathe into the air by mouth and nostrils, we laugh when we are glad in our mind, and we weep when we are feeling distress; and by hearing we accept the sounds, and through brightness we see with our eyesight; and we are active with our hands, and we walk with our feet. . . ." Well, this is just "natural," this is simple and evident, and still it must give pause to all forms of xenophobia: Note how humans weep and laugh. The distinction between Greeks and barbarians had long been popular: We, the Greeks, are the center and peak of humanity, with all the others around, who are incomprehensible and inferior. Antiphon, with a clever language game, inverts this: We ourselves are made barbarians by such discrimination, in contrast to nature, which determines what is necessary, and which does not make such difference. The necessities of nature are not to be discussed or negotiated: How to breathe, to eat, to hear, and to see, these are just facts of nature, constituting the community of humankind.

I like even better a scene of Aristophanic comedy. In Aristophanes' *Clouds*, the comic hero Strepsiades, refined by the teachings of Socrates, is approached by his banker, who wishes to collect the interest for a loan he has made to Strepsiades. Strepsiades, however, tells the banker: "Look [at the sea]: Do you have the impression that the sea is more now than before?" No, the banker says, "it would not even be just for the sea to be more." "Behold,"

²⁶ DK 87 B 44. Wendy Doniger reminds me how close this is to the speech of Shylock in Shakespeare's *Merchant of Venice*, III 1: "Hath not a Jew eyes? hath not a Jew hands . . . if you prick us, do we not bleed? if you tickle us, do we not laugh? . . ." Note that the Antiphon text was published from a papyrus in 1916: the coincidence with Shakespeare is due to nature, not to literature.

Strepsiades says, "the sea does not become any more, even if the rivers are flowing into it. But you postulate that your money should become more and more [every day]?"²⁷ It would be good to remember this justice of nature when looking at the Dow Jones Index. Nature is homoeostatic; so is life. Data of "nature" are outside social and economic strife. The discovery of "nature" presents a basis for insight and for sensible discourse, free from the snares of greed and profit, the limitations of which become apparent.

The discovery of "nature" in the fifth century was felt to be a kind of triumph and a source of joy. Once more we meet Anaxagoras. What is the sense of human life? he was asked; "to look at the sky, the stars, the moon, the sun," was his response.²⁸ The Greek word for such a "look," a comprehensive, interested, yet noncommittal look, is *theoria*. With slight changes of meaning, this word *theoria* has remained another keyword in the wake of ancient Greeks: "theory." Primarily *theoria* meant to observe a festival. At Olympia, for example, there are the toiling athletes, there are businessmen making money, but there are also those who just enjoy the free look at what is going on.²⁹ A play of Euripides praised the happiness of the man who manages "to see the not-aging order [*kosmos*] of immortal *physis*"; such a man will definitely be above disreputable money affairs.³⁰ For Aristotle, too, a "theoretical life" seems to be the most perfect form of human existence.³¹ So this is, I suggest, a decisive discovery of classical Greece, the proposition of a "theoretical world," which has become the "world of science,"

²⁷ Aristophanes, *Clouds* 1290–95. This banker unhesitatingly discovers social values in nature: the "justice" of the sea.

²⁸ Iamblichus, *Protrepticus* 51,11 = Aristotle, *Protrepticus* Fr. 11 Ross, and *Eudemian Ethics* 1216a11 = DK 59 A 30.

²⁹ This simile is attributed to Pythagoras by Heraclides Ponticus, Fr. 88 Wehrli; cf. W. Burkert, "Platon oder Pythagoras? Zum Ursprung des Wortes 'Philosophie,'" *Hermes* 88 (1960): 159–77.

³⁰ Euripides fr. 910 (= DK 59 A 30).

³¹ Aristotle, *Nicomachean Ethics* 10; cf. W. Jaeger, "Über Ursprung und Kreislauf des philosophischen Lebensideals," in *Scripta Minora I* (Rome, 1960), pp. 347–93.

independent yet understandable; and the satisfaction of understanding can become an overwhelming personal joy. The happiness of a contemplative life is well known, and praised, in other forms in other civilizations; today most will think of India in such a context. The peculiarity of the Greek program is the view at verifiable reality, a *kosmos* of *physis*.

If this was inaugurated by Greeks in the fifth century, the question of the historical and social context comes back, including the problem of an "Oriental" background. Classical antiquity was not a new beginning; nor was Homer the first poet rising from the uncontaminated dawn of humanity. The Greeks were at the Western fringe of Asiatic high cultures.³² As the direct knowledge about the Ancient Near East has been regained in the last two centuries, we know about Egypt, Mesopotamia, Syria/Palestine, and Asia Minor as high cultures with writing, with literature, with a high level of sophistication, of discussions and reflections, including forms of science and mathematics, long before the Greeks.

Take a cuneiform tablet from the house of a family of conjurer-priests at Assur in Iraq, about 650 B.C.³³ This text, as a comment on older myths and rituals, describes how the god Marduk constructed the universe: "On the Upper Earth he established the souls of men, in the center; on Middle Earth, he made sit his father Ea, in the center" (Ea is the god of subterranean water); "In Nether Earth, he included the 600 gods of the dead [*Annunaki*], in the center." So far this states three stories of our world, the earth on which we live, the water below—just as Thales had the earth resting on water—and farther down, at the lowest register, the Netherworld with its appropriate gods. Heaven, by correspondence, has three registers too: The highest story belongs to the God Heaven

³² See n. 9 above.

³³ A. Livingstone, *Mystical and Mythological Explanatory Works of Assyrian and Babylonian Scholars* (Oxford, 1986), pp. 78–91; cf. W. Burkert, "Orientalische und griechische Weltmodelle von Assur bis Anaximandros," *Wiener Studien* 107/8 (ΣΦΑΙΡΟΣ, Festschrift Hans Schwabl, 1994/95): 179–86.

himself, called Anu with his Sumerian name, together with 300 heavenly gods; Middle Heaven, made of resplendent stone, is the throne of Enlil, the active ruling god; the lowest story, made of jasper-stone, darker but transparent, is the place of constellations: Marduk "designed the constellations of the gods on that."³⁴ The text does not bother to explain why we see alternately the resplendent sky at day and the jasper-sky with stars at night.

Compare what Anaximandros from Miletus wrote about one hundred years later: There are three skies, formed from the Infinite—Anaximander indeed uses a plural, "skies" (οὐρανοί), which is quite unusual in Greek.³⁵ These "skies" take the form of wheels circling around the earth, while the earth, a column-drum in shape, is suspended at the center. The wheels, from fiery openings inside, produce the stars, the moon, and the sun, at growing distances. If the stars belong to the smallest wheel, this agrees with the constellations in the lowest register according to the Assur system. Even closer is the agreement with Iranian religious lore: In Iranian texts, a sequence of "steps" marks the ascent of the soul after death toward the god Ahura Mazda, via Stars, Moon, and Sun, in this sequence, up to the "endless lights." For Anaximander, there is "the Infinite"; it is "the Divine" that encompasses and steers everything. But one should equally take account of the Hebrew Bible: A construction of four heavenly wheels is found in Ezekiel (1:15–18), when he describes his vision of the throne of god, the *merkavah*; the four wheels are constructed "like a wheel inside a wheel . . . and the rims of the wheels were full of eyes all round." This is uncannily close to Anaximander's cosmos, though dated about fifty years

³⁴ A very similar formulation occurs in the Platonic *Epinomis*, 983A_f; cf. P. Kingsley, *Ancient Philosophy, Mystery, and Magic: Empedocles and Pythagorean Tradition* (Oxford, 1995), p. 203.

³⁵ Anaximandros, DK 12 A 9, A 10, partially misunderstood in later doxography. "Three steps" in Iranian tradition: W. Burkert, "Iranisches bei Anaximandros," *Rhein. Museum* 106 (1963): 97–134.

earlier, while god's resplendent throne recalls Marduk's throne in the earlier text from Assur.³⁶

Undoubtedly Anaximander's speculation stands within a context of similar picturesque drawings of the universe, competing with Mesopotamian, Iranian, and Hebrew constructions. What does mark the "progress"? The disappearance of the "underworld," as the earth shrinks to become a column-drum? What is more important, Anaximander does not refer to specific theology, to groups of recognized gods, as the Assyrian priest does—nor was he a member of a priestly family, for all we know, or a prophet such as Ezekiel. He does not speak of the throne of god, be it Enlil, Jahwe, or Ahura Mazda. Babylonian gods such as Anu and Enlil, Igigi and Annunaki, would have been meaningless to him as to his public. But even a Greek pantheon would have been just a local pantheon, one city's pantheon, with limited scope and limited obligations. Anaximander spoke of "the divine" in neutral form, encircling and steering the universe. The ruling power of a religious world has turned into an object within a theoretical world. In the segments of his world Anaximander arranged just the generally known and visible heavenly bodies in a spatial, technical construction, in "wheels," instead of divine categories. This was evidence accessible to others; this should constitute "consensible knowledge."³⁷ The "wheels" introduce a mathematical element into the model: The earth cannot fall, because it is at the center, at equal distance from all sides. The figures Anaximander gave for heavenly distances are absolutely arbitrary, derived from Hesiod's mythical poem.³⁸ Anyhow, his construction was wrong, especially as to the sequence

³⁶ Ezekiel 6; cf. M. L. West, *Early Greek Philosophy and the Orient* (Oxford, 1971), pp. 88ff. Note that the redaction of Genesis 1 and 2 might be about contemporary with Anaximander.

³⁷ For this concept, see Newton, *Truth of Sciences*, p. 120, referring to J. Ziman, *Reliable Knowledge* (Cambridge, 1978).

³⁸ Hesiod, *Theogony* 720–25: a nine days' fall from Heaven to earth, the same from earth to Tartaros; hence Anaximander uses multiples of nine.

of heavenly bodies. But that could be corrected, and this was rapidly done: Anaximander's construct was an adequate basis for subsequent emendations. Anaximander has "discovered the account [*logos*] of sizes and distances" in astronomy, as Eudemus, Aristotle's pupil, was to formulate.³⁹

To what degree the decisive difference from the Assyrian priest or Ezekiel would have been recognizable for Anaximander's contemporaries is another question. Just then Pherecydes of Syros invented a new mythical story in Greek about the universe, as did "Orpheus" in another key.⁴⁰ A supreme god to "shake" the universe is heralded by Xenophanes; a *daimon* or goddess recurs in Parmenides to arrange the heavenly circles and to procreate gods; Empedocles has Aphrodite creating our world of living creatures in her workshop.⁴¹ If there was progress in the reduction of religious elements, in keeping clear of pantheons, the step was made reluctantly by the Greeks themselves, and it could be taken back. Aristotle contrasts "those who give an account of nature" with "those who give an account of gods," *physiologoi* with *theologoi*,⁴² but his "first philosophy" tends to become "theology," and his own physics culminates in a theological concept, the "unmoved mover" of the universe; Plato introduced the term "craftsman," *demiourgos*, to create the universe, a concept the Christians were eager to take over. It was the subsequent progress of science that fixed Anaximander's status, as against "Orpheus" or Pherecydes; but there was not one line of uninterrupted progress. And yet improvement of unwarranted constructs was possible because there was discussion, not authority, there was a high degree of freedom within the social system, and there was the reference to generally accessible reality that made "consensible knowledge."

³⁹ Eudemus Fr. 146 Wehrli; cf. Burkert, *Love and Science*, pp. 308–11.

⁴⁰ See H. S. Schibli, *Pherecydes of Syros* (Oxford, 1990); A. Laks and G. W. Most, eds., *Studies on the Derveni Papyrus* (Oxford, 1997).

⁴¹ DK 21 B 25, 28 B 12/13, 31 B 73, 95–98.

⁴² Hesiod and his like are *theologoi*, Aristotle *Met.* 1000a9; Empedocles is a *physiologos*, *Poet.* 1447b19.

History of philosophy is more interested in general principles than in the details of astronomical constructs. A decisive voice in the Greek concert, widely heard in the discourse on nature, was that of Parmenides. His simple thesis that "Being is, not-being is not" seems too abstract to raise emotions; still it was to become a basic tenet of Greek natural philosophy. It is the negative complement of the thesis of Parmenides that makes it a resounding paradox: There is no coming to be or passing away, since there is Being.⁴³

There is some "Oriental" background and context for Greek forms of speaking and thinking even here. Already in Akkadian cosmogony we find the three concepts of "becoming" or "creating" (*banû*), "destroying" (*balaqu*), and "being there" (*bashû*) combined into a system; everything is bound to that pattern. In the epic of creation, *Enuma Elish*, the primeval god Anshar is addressed: "You are of wide heart, destiner of destinies; whatever is created or annihilated, exists with you."⁴⁴ "Everything" is found to be there within the borderlines of creation and destruction: "To become and to be destroyed, to be and not to be": this is a verse of Parmenides, formulating the same concepts in Greek.⁴⁵

The specialty introduced by Parmenides is to isolate "being" within the tripartite system and to set it in opposition to both "becoming" and "being destroyed." This, in turn, reflects basic categories of the Greek language, the marked contrast of "aspect," the durative versus the punctual aspect. In the case of "being," language presents two roots, *es-* (it is) for the durative, and *phy-* (become), semantically related to *gen-* (generate), for the punctual

⁴³ The huge literature on Parmenides, with many conflicting interpretations, cannot be discussed here. I am especially indebted to E. Tugendhat, "Das Sein und das Nichts," in *Durchblicke: Martin Heidegger zum 80. Geburtstag* (Frankfurt, 1970), pp. 132–61; Ch. Kahn, *The Verb "BE" in Ancient Greek* (Dordrecht, 1973); A. Mourelatos, "Heraclitus, Parmenides and the Naïve Metaphysics of Things," in *Exegesis and Argument: Studies in Greek Philosophy Presented to G. Vlastos* (Assen, 1973), pp. 16–48.

⁴⁴ *Enuma Elish* 2, 65; S. Dalley, *Myths of Mesopotamia* (Oxford, 1989), p. 241.

⁴⁵ DK 28 B 8,40.

aspect; in English both verbal roots have been mixed up to form one irregular paradigm, "is" alternating with "be." For Greeks, there is opposition: "if it became, it is not," Parmenides wrote (B 8,20), as if doing an exercise in Greek grammar; there is no *physis*, in the sense of "coming to be," Empedocles agreed.⁴⁶ The Indo-European background of Greek is the reason why very similar formulas do appear in Indian speculation. "Not-being cannot arise, being cannot pass away": this comes from the *Bhagavad Gita*.⁴⁷

And this gives the linguistic exercise its special relevance, both in India and with Parmenides: As "being" becomes absolute, there is no birth and there is no death. "Coming to be extinguished, and perishing not to be heard of": this is the statement of Parmenides.⁴⁸ Death does not happen. As reality is pronounced absolute, the reality of death is made to disappear. Should we say that Parmenides is using a pseudo-argument arising from the accidents of Indo-European language to annihilate death?

Yet Parmenides' thesis is about "reality," and it proved successful right at this level. Neoplatonists made Parmenides an idealist; moderns are prone to see him rather as a materialist.⁴⁹ His followers at any rate began to explain the natural world with all its changes, the multiple phenomena of coming to be and passing away, through the postulate of uncreated and imperishable constituents. This was argued with varying hypotheses by Anaxagoras, by Empedocles, and by Democritus. Anaxagoras held that "everything" is just there and was there all the time, one thing contained within the other in infinitely small quantum; Empedocles thought he could do with four elements, four "roots" and their "mixture," whereas Democritus went further in abstraction and

⁴⁶ Empedocles, DK 31 B 8.

⁴⁷ *Bhagavad Gita* 2,16 (using the same two roots; interpretation is controversial).

⁴⁸ Parmenides, DK 28 B 8,21, inverting expressions like "he perished not to be known, not to be heard of"; *Odyssey* 1,242.

⁴⁹ J. Burnet, *Early Greek Philosophy*, 4th ed. (London, 1930), p. 182.

stripped the basic constituents of qualities such as color, in order to derive everything from different geometrical forms of very small, indivisible particles, his "atoms." We need not go into details. Once more it is the following evolution that makes the status of Parmenides—and of Democritus—more than the authentic text of Parmenides' verses that happen to survive. And once more it is a judgment from our state of knowledge that we see the success as well as the shortcomings of, for example, Anaxagoras: It is true that the baby gets everything it needs for growing from its mother's milk, so all that stuff has been contained in the milk before: Anaxagoras was right to state this; but he was wrong to deny that flesh or bones could not arise from different constituents;⁵⁰ Empedocles, in turn, suggested a quantitative formula for the constitution of bones, which, of course, was by far too simple.⁵¹ The route to natural science had been envisaged, but for the moment it did not lead very far; the difficulties were much greater than expected.

But the really strange and surprising fact is that the central thesis of Parmenides, the formula of indestructible being beyond birth and death, as taken up by his followers, makes a principle that still dominates our physical worldview: the principle of conservation, conservation of mass on the one side and of energy on the other, as it appeared in the last century, conservation of the duality of mass and energy, as it has become the thesis since Albert Einstein. Nothing can come from just nothing, and nothing can simply disappear—hence our problems with all kinds of refuse that cannot be annihilated; so far Parmenides is simply right.

The Parmenidean postulate is by no means trivial, nor is it evident in a general way. Myth will tell a different story. In the Babylonian *Enuma Elish*, for example, the gods say to Marduk: "Command destruction and creation: it will be so."⁵² A king

⁵⁰ DK 59 B 10.

⁵¹ DK 31 B 96.

⁵² *Enuma Elish* 4,22; Dalley, *Myths*, p. 250.

has the power of "life and death"; at least his power to kill is undisputed. All the more, a god can "command destruction," and it will be so. Christian theology, guided by ancient cosmogonic myth, has taken a similar view; it introduced a god creating from nothing, *ex nihilo*, and also prone to destroy his world in the end. No, Parmenides had protested, even a god cannot work absolute annihilation, nor could he start with nothing. Our understanding of science largely agrees with Parmenides.

But there is more: Parmenides sees "being" in strict relation to speech and cognition. He insists that language is directed toward "being." Language may have, nay language should have, a specific content, or else it would be "nothing": "you say nothing," οὐδὲν λέγεις, is an expression of colloquial Greek to criticize and to put aside what the partner has just said. To speak with sense means "to speak being," τὰ ὄντα λέγειν. This is not "grooming talk,"⁵³ not speech as a social act, which articulates agreements and disagreements, sympathies and antipathies, supremacy and obedience. There is "objective" speech; it implies cognition. "Not without 'being' (in which it has been made speech) will you find cognition," Parmenides wrote (B 8,35). The intent toward "being" also means toward truth in an absolute sense, beyond personal, social, or political concerns. The revelation pronounced by Parmenides concerns the "well-rounded heart of *Alēthēia* [truth]." This contrasts with the "opinions" of normal humans, βροτῶν δόξαι.⁵⁴ In fact mortals are not only mistaken in many respects: their intelligence largely consists in hiding their thoughts, emotions, and interests, and thus tricking others. Parmenides insists on the relation of speech to "being." The Parmenidean enquirer has embarked on a lonely road—"far indeed does it lie from the steps of men" (B 1,27)—but the findings can be publicized in a poem that claims truth. A new kind of communicative group

⁵³ A term introduced by D. Morris, *The Naked Ape* (New York, 1967), comparing social "small talk" with monkeys grooming their partners' fur.

⁵⁴ DK 28 B 1,29 f; cf. Kahn, *The Verb "BE" in Ancient Greek*.

should form, controlling what they say with regard to "being," free from the others' opinions. Is this discovery or just a postulate? It often fails in reality; and still this is quite a remarkable new form of rhetoric. Some may assume Parmenides received his paradoxical message through a kind of mystical revelation; but in his words there are "ways of enquiry" (ὁδοὶ διζήσιος) and their "signposts." His followers attempt to pursue such a way with varying success.

There is one field where such pursuit hardly fails: mathematics. One may consider Euclidean mathematics the gist of the Greek heritage.⁵⁵ Mathematics is a very special form of *logos*, indeed the most successful and stable one, even if mathematics will always remain the option of a minority. It does not depend on authority; nor must it be negotiated between conflicting interests. It is independent from specific cultural patterns, from language, race, or origin. All will agree, once they have decided for consistency. When measuring circles. Westerners and Chinese must end up with the same approximative value for π .

Once more there is an "Oriental" prelude to Greek science. In Mesopotamian astronomy, significant astronomical numbers were recorded and used for prediction of astronomical events. This was developing with important steps precisely in the sixth and fifth centuries.⁵⁶ Contacts with Greece, within the common Persian empire, cannot be denied. The concept of the zodiac as the "path of the moon" and the "path of the sun" in the sky, followed by five more planets, and divided into twelve "signs," seems to be one piece of transferable knowledge between East and West at that time.⁵⁷ There also was the problem of the inequality of seasons—

⁵⁵ See Einstein, as quoted by Newton, *Truth of Science*, p. 9.

⁵⁶ See B. L. Van der Waerden, *Die Anfänge der Astronomie* (Groningen, 1966); F. Rochberg-Halton, "Babylonian Horoscopes and Their Sources," *Orientalia* 58 (1989): 102–23.

⁵⁷ We know about a sixth-century poem on the zodiac by Kleostratos, DK 6; the first horoscopes in cuneiform are dated to 409 B.C.: Rochberg-Halton, "Babylonian Horoscopes."

summer, in our hemisphere, is a few days longer than winter—which troubled Greek as well as Babylonian astronomers, down to the final solution through Kepler's ellipses; the difference was duly integrated in the Babylonian calculations.

In fact the Babylonians developed quite successful mathematical methods to describe the heavenly phenomena, including the movements of the planets, methods that work with great precision, though without a three-dimensional cosmic model and also without formulation of principles, even without demonstration, it seems.⁵⁸ If natural science means the precise description of phenomena with the use of mathematics, the Babylonians are the inventors. The first Greek attempt at natural science in mathematical form, the planetary system of Eudoxus, which uses the complicated geometry of homocentric spheres, came in the fourth century. Thus the Babylonians should get a "first" in natural science. They did not care about a geometrical model, but their figures were precise; theirs might even be called the more modern position. Eudoxus's system is a spatial construct, visible to the mind and even constructible as a machine: Ever since the Greeks we are accustomed to imagining a cosmic machinery, already intimated in Anaximander's "wheels." Eudoxus's system was wrong, but it was improved soon, leading to Ptolemy's elaborate cosmos, which became canonical for 1,400 years, to be replaced by the heliocentric world machine of Nicolaus Copernicus.

Deductive-demonstrative mathematics in the form of Euclidean geometry seems to have taken its essential form by the fifth century. We encounter its first elaboration with Hippocrates of Chios, about 430 B.C.; he was already tackling the frontiers of classical geometry, the problem of cubic roots and the squaring of the

⁵⁸ For deductive proof as a Greek discovery, see B. L. Van der Waerden, *Science Awakening* (New York, 1961); qualifications in H. J. Waschkes, *Anfänge der Arithmetik im Alten Orient und bei den Griechen* (Amsterdam, 1989), esp. pp. 302–26. See also Newton, *Truth of Science*, pp. 137–39.

circle.⁵⁹ The "classical" elaboration of geometry, the *Elements* of Euclid, was composed about 300 B.C.

Archimedes—about 220 B.C., when he discovered the formulas for the surface and the volume of the sphere—wrote: "By nature, these properties had existed before for these figures, . . . but it happened that all missed this and nobody realized this."⁶⁰ So he experienced the overwhelming joy of discovery of what he called a "natural" fact. Since Archimedes, and thanks to him—though with less joy—every schoolchild is taught these formulas. Progress in mathematical knowledge is undeniable. Archimedes holds that mathematical facts are just there all the time. Moderns may criticize him for underestimating the role of construction in mathematics; he did not envisage non-Euclidean geometry. But there are modern mathematicians who still will say that numbers with their strange properties have been created by God.

I wish to confront the sentence of Archimedes with what Francis Crick wrote about the great achievement of this century's science, the discovery of the genetic code, the structure of the "double helix": "All the time the double helix has been there, and active, and yet we are the first creatures on earth to become aware of its existence."⁶¹ Crick in all probability did not know the text of Archimedes. Still there is the same happiness of discovery, of spelling out and representing in a model what had been there all the time. Such is "nature." Well, we are now beginning to manipulate the double helix, and this creates all sorts of anxieties and controversies. This does not invalidate science; we may respect or even share the feeling of overwhelming wonder at what has been discovered.

⁵⁹ The evidence in DK 42. Cf. W. Burkert, "ΣΤΟΙΧΕΙΟΝ: Eine semasiologische Studie," *Philologus* 103 (1959): 167–97.

⁶⁰ Archimedes, *De sphaera et cylindro* 1, pp. 2f. Heiberg; Cf. W. Burkert, "Konstruktion und Seinsstruktur: Praxis und Platonismus in der griechischen Mathematik," *Abhandlungen der Braunschweigischen Wissenschaftlichen Gesellschaft* 34 (1982): 125–41.

⁶¹ F. Crick, *What Mad Pursuit* (New York, 1988), p. 62.

In this discourse with ancient Greeks, we have concentrated on the “glorious fifth century,” on the so-called Presocratics or rather pre-Platonics. It is true that Plato has made an ambivalent intervention in this perspective. Apparently it was Socrates who, in his protest against Anaxagoras, insisted on reinstalling the social world with its practical values, instead of the world of *theoria*. A poignant criticism was that the “theoretical” view, the ideal of reasonable, disinterested discourse, did not solve any problems of real life. “What is above ourselves is nothing for ourselves,” *quod supra nos, nihil ad nos*, “Socratic” moral philosophers held. Plato achieved a momentous synthesis of both “theory” and practical philosophy. Yet granting precedence to the “Good” even above “Truth,” he also opened the way to ideological dogmatism and even to “totalitarian” systems.⁶² Plato brought enormous advance at the level of argument; he made mathematics a decisive element in the theory of knowledge; yet his daring consequence of developing the metaphysics of mind—mind as the bearer of knowledge, prior to matter, embedded in an immortal soul—this construct of Platonic philosophy is becoming less and less acceptable in our natural worldview. A special synthesis occurred when Christianity adopted Platonism, stressing the independent, responsible “soul” as against the body, which meant freedom from needs and desires, from social constraints and political power, but still obedience to supreme authority, down to “the sacrifice of intelligence,” *sacrificium intellectus*.

We are experiencing the breakdown of these postulates and constructs. Several factors, not directly related to each other, are contributing to enforcing the change. I would mention

- Darwin’s theory of evolution, refined in contemporary biology, which placed humans in a continuous series with the other forms of life,

⁶² This was the accusation of K. Popper, *The Open Society and Its Enemies I: The Spell of Plato* (London, 1945; 4th ed. 1962).

- the spectacular success of molecular physics and chemistry, which analyzes the processes of life in exact and minute details. By consequence, thinking is seen in its corporeal dimension, as "preparation for motion," a process in the brain.
- the presence of the computer, which gives a model of "thinking without mind." This goes together with more and more complex theories of self-organization.

I think we cannot and we should not try to rebuild the old Platonic house for soul and mind. To assume that mind prescribes the forms of reality is no less off course than the Parmenidean thesis that the inherent logic of Indo-european language excludes death. Nostalgic feelings, though, can hardly be eliminated. Should whole libraries of philosophical texts be judged antiquated? Even an obituary on book culture seems to be called for: Books in the Greek style, to be read, to be judged and criticized by the autonomous individual reader, books with their rhetorical and personal appeal, may rapidly become obsolete. In fact literacy started with lists, not with literature, in the ancient Near East; now we are back to accumulating growing series of information, handled by intelligent programs but also subject to fortuitous "attractors" that make dominating trends. We are close to a state when six billion individuals can simultaneously crisscross a jungle of competing and conflicting informations, pursuing their interests without acknowledged guidelines, but for the trivial fact that both financial and sexual interests stand out as dominating attractors—still reflecting nature's design of the basic needs of food and procreation. It seems especially strange how distinctions between "virtual" and "real" seem to disappear; "virtual reality" is the slogan of the day. We are caught within the World Wide Web, while the science of nature has become so complicated that nobody can "know" about it without gross simplifications. And research has become so costly that it is completely dependent on private or public financing, which necessitates all sorts of political and economic strategies to

precede and to determine research. Nature goes into hiding again. No wonder the theoretical world of natural science is becoming unpopular, while the social sciences have turned away from "nature" to delight in their own autonomy. The social-economic world, in its virtual expansion, is finally about to englobe the theoretical world.

I hope that in this respect the discourse with ancient Greeks has been illuminating. There remains the fact that we cannot get rid of the "necessities of nature," as Antiphon said, to breathe, to eat, to hear, and to see, that we remain earth-dwellers on one globe from which we cannot escape. And whether we speak of the "universe" or of "nature," we are using Greek names and concepts. Of course, names are not important. But reality makes itself felt. "Nature" as a basic concern, as a power not to be disregarded, has come back with the environmental movement; this entrains vigorous sympathies for all that is "natural." Still the "environmental" perspective remains anthropocentric, nay egocentric: Here we are: the rest is arranged around ourselves in positive or negative relations, "environmental." The theoretical world picture should be different.

There remains the ideal of an intelligent look at realities, and of sensible discourse, of "consensible knowledge." This also means to expect continuing revelations of "nature." Neither these endeavors nor their success are dependent on special varieties of race, gender, or social systems. There remains the experience and the postulate of individual, self-responsible minds, of conscious and independent personality. This finally leads back to a sentence of Plato: "Every soul has seen 'Being,' or else it would not have come into human shape."⁶³ The chance to catch sight of reality constitutes human dignity. I would call this the legacy of the ancient "theory of nature." I do not think this is just Western cultural arrogance. If the Greek outlook has fertilized European style, if this

⁶³ Plato, *Phaedrus* 249E.

has become world style, it cannot be forced to hide as opposed to different cultural approaches or aspirations. It rather means a chance of freedom versus social and economic pressures. It includes the postulate of free discussion, of free roads toward truth. Pleading, and hoping, for intellectual culture is not advocating the ivory tower as opposed to the street parade; it rather means pleading for an essential section of human rights.