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Is the Word "Life" Meaningful?

THE TYPICAL MODERN biologist, resolved never to betray the methods of his science, when requested to tell us what he means by "life," finds the question an exceedingly awkward one. For any man determined to be sternly empirical, the usual characteristics assigned to living things, such as irritability, nourishment, growth, reproduction, and self-repair, can be no more than provisional hypotheses, if they amount even to this. Perhaps to be alive is in some measure the same as to be irritable, to have power of self-repair, to have power of nutrition, and so on; but these are propositions not to be accepted without some proof, and proof is not forthcoming.

As a matter of method the scientist basing himself on strict external experience ought, at least as far as he can, to oblige himself to explain the phenomena we call "life" in terms of what is generally known as the inanimate. In so far as he cannot, of course, he should at least keep an open mind on the subject, and be ready to grant that in living things

there may possibly be something as real as the objects witnessed by his senses, but which sensation alone cannot detect. Indeed, unless he grants this much, it is hard to see how he can avoid confusing properties common to animate and inanimate with those peculiar to animate: for example, increment or swelling, as against true growth.

Notice, however, that even in this present context, none of the terms just used is compellingly clear. "Empirical" is one of them. It has as many meanings as the term "experience" itself. "Living" and "hypothesis" are other words that have many meanings. Do we assume that "living," when said of tree and of thought, must stand for something basically the same? We might try to circumscribe the meaning of this term by pointing out that "life" and "lifeless," "animate" and "inanimate" are contradictories, so that a thing must be either alive or not alive. Again, since "lifeless" and "inanimate" are negative terms, the remark might be made that what the negation intends can hardly be apprehended unless what it is that is being negated be also apprehended. This last remark unfortunately is not as helpful as it looks. If "life" has many meanings—and we here put aside all its metaphorical uses—does "lifeless" negate one of them or all of them? Of itself a mere negative term does nothing to make the positive one more significant.

Let me offer an illustration that is apparently simpler inasmuch as the term has plainly but one meaning. Consider the assertion "a thing is either white or non-white." Now this proposition is not as lucid as some philosophers believe. The statement is in fact quite ambiguous. To see the reason for my hesitation compare the following cases: "the paper is non-white," "the square root of two is non-white." Of the paper we understand that if it is not white, it must bear some other color; but in the square root of two we expect no color at all. In other words, "non-white" could be a relative negation, holding good only in the genus color, where black and red are also non-white. But this negation could also be an absolute

one, where "non-white" is an infinite name, to be said just as truly of square roots as of square circles and of a host of other things. Now if this simple case calls for distinctions, what are we to expect of terms such as "life" and "lifeless"?

Indeed, there are writers on biology of a critical turn of mind, for whom the term "life" seems so elusive that it has no useful meaning at all. But we might turn upon them with the same inexorable question: what does it mean to maintain that the word "life" carries no meaning? Obviously, they must face the awkward consequence that now "non-living" will carry no meaning either. But how do they reach this position? What reasoning has brought them to make this statement? Before examining their procedure, allow me to point out that, for some unspecified reason, they generally assume, not merely that the inanimate can be safely identified, but also that this type of reality is the proper concern of physics and chemistry. They further assume that these sciences do not deal with living things, but as everyone knows, they seek to explain things like gravitation and protein: yet the physicist himself is just as much subject to gravitation as a stone or a sack of potatoes—except that in falling he may struggle against his fall—and the very workings of his mind involve chemical compounds. Yet physics and chemistry appear all-sufficient for these gentlemen: physics and chemistry will eventually explain life away by demonstrating that the non-living is quite enough to account for the living. Let it not be thought that I am protesting because I have an axe to grind, because I am reluctant to be dismissed as a mere agglomeration of molecules or atomic particles. In all sincerity, such use of words leaves me untroubled. Why be upset at the pronouncement that one is not really alive, so long as one can go on as before and perform certain functions which are said, or anyhow were said, to be those of life? What does it matter what we choose to call the thing? It matters, of course, only when we wish to talk to one another about it. Then we do stand in need of words, and of words with authentic meanings.

Let me remark on one curious feature of these thinkers. By an odd kind of method they seem to make the meaning of living depend upon our ability to verify it in the sort of life (so-called) that we know least about. They seem to be arguing that, if we cannot be sure whether such and such an obscure organism is alive, we cannot be sure that anything is alive. I am willing to grant that a test of this sort may become a valid means of determining certain laws of life—whether life supposes a connection with some special molecular structure, perhaps, or something of the kind. But I am utterly unable to understand how it can help us to know what life is as we have already named it, or whether this or that object is alive or dead. Here is a significant passage from Professor W. S. Beck's book on the subject:

As perceptual objects, plants are plants whether we call them living or not: "life" is a conceptual object. In other words, Pirie is correct: "life" is beyond rigorous definition—but he, I, we will speak of life because we all know what it means in the large area of non-ambiguity. The errors to be avoided are compulsive rigidity and failure to be happy in the company of uncertainty. When asked what viruses are and what they do, we can answer. When asked, what is life, we must reply with no more than an enigmatic smile.¹

But consider: if "life" does have a meaning, and a meaning which we all know "in the large area of non-ambiguity," why on earth make *this* meaning depend upon verification in the lowest animate forms? Why should not the meaning of a word be plain enough in some usages, and yet unverifiable in others? Granted that a thing must be alive or not alive, does it follow that I must always know, and know for sure, whether it is one or the other? In any case, a little investigation would

reveal that "the large area of non-ambiguity" is perhaps not so unambiguous as all that.

In his next paragraph, Professor Beck, perhaps unwittingly, makes a further observation, and this an eminently proper and sensible one:

At the moment, I am having difficulty thinking of any use to which a definition of life could be put—other than to the everyday problem of recognizing death. When a scientist manipulates a living system, it is occasionally useful to him to know it has died. If the system is a horse, there would seem to be few problems. But we quickly discover that the ambiguity of 'life' affects 'death' in reverse. If it is a bacterium, a seed, or a spore, the problems may be insurmountable, and in practice we usually establish an arbitrary end point at which death, by decision, is recognized to have occurred. Quiescence and death can look very much alike and their distinction brings us straight to the bar of verbal distinctions.²

In other words, we can be reasonably sure about the distinction between a live horse and a dead one (though I would have preferred a live man and a dead one); but we cannot be as sure whether a particular organism is an animal or a plant; nor whether a given object, at this moment, even *is* a plant or something not alive at all.³ Now, our objection was that the man who hopes to arrive at some characteristic (perhaps we should use the plural) enabling him to set life apart from non-life should never begin with what is alive very obscurely, if alive at all. Why not begin with horses? He can see them with the naked eye. Or why not start with the kind of thing that asks what horses are, which eventually constructs microscopes and finds itself faced with the obscure forms of

life? Even the Aristotelians observed that "in animals life is patent and obvious, whereas in plants it is hidden and not clear...⁴ Life seems to consist primarily in sensing and thinking." They went so far as to allow a sense in which plants are not alive.

But this procedure of going from the more known to the less known may provoke an immediate counter-objection. For is it not a general principle of science that we must try to explain the complex in terms of what is at least less complex? Now a horse, or a biologist, is more complex than an amoeba, and therefore should not be studied until the simpler organism has been studied. The difficulty is easily met. Though far more complex than the amoeba, the horse, in a sense, is far more known to us; and a dead horse is far more recognizably dead than a dead amoeba.

But how do we know that horses are alive and that stones are not? I do not know what horses experience on the subject, but I observe that they are not indifferent to it, a fact which I gather from their obvious concern for what will promote and sustain life, a concern not present in tractors, though both haul loads. Call life what you will, in some measure I know what it is to enjoy it, in my own being and person. I know I am alive as I use my senses. My sensations are of all kinds, external and internal; and I know very definitely that I have them, and know that I know this. I also know that this sort of knowing does not carry me far. Even in the most striking of my sense powers, that bafflingly complex sense of touch, I am aware of heavy limitations. Having listened to the physicist on heat, and to the psychologist on distinctions and thresholds of touch, I cannot help concluding that I shall never be able to bridge the gap between what they have to say about warmth and my sensation of it.

Still, none of this vagueness about sensation need prevent me from defining what an animal is, namely, "a body endowed with power to sense." None of these terms is clear as day, but there they are, and we all know what they mean "in the broad

area..." although each of them can be interpreted as ambiguous. "Body," for instance, means one thing when said of a dog, and something else again when said of the abstract sphere in geometry. And there are many ways of "having" something, such as "to have a body," "to have sight," "to have a friend," "to have shoes," and so forth. "Sensation," too, may refer to so-called external sensation, the analysis of which soon becomes utterly bewildering; or it may mean the sensation of sensation, as when I sense the distinction between the feel of a thing and its color; or it may apply to the sensation I have of a thing no longer there; or to the recognition of what I saw as seen in the past; and even to my groping after a past sensation, as when I rack my brains for a forgotten name or face, and so on.

Still in this order of sensation is my experience when told that a horse is approaching. From individual past sense-contacts I have gathered that a horse is very likely to have two ears, though I could be wrong about this one now approaching. But if I do prove to be mistaken, I will feel sure that there is something wrong, not with what has been gathered from many recollections, but with this particular horse. And this point is one of which even a horse can be aware.

Let us not venture at all into the realm opened by the observation that I know that I know, or that I know this knowledge to be little; that I am certain of not knowing this or that, or uncertain of knowing this or that as I ought or might. After all, we are merely trying to find out whether the term "life" can be meaningful, and are only maintaining that it is meaningful when applied to ourselves and to horses with respect to sensation. However ignorant I may be of what a sensation is in protozoa (*zoa* does mean "animals," though some things now given that name may not be animals at all), or however eager to know just what a sensation is, I see no grounds for concluding that we have been using a word that now turns out to be meaningless. So far as I can see, ignorance of where life begins or ends in the world of the microscope

has nothing to do with my certitude of being alive, however little I may know about my own kind of life.

We must beware of a disguised or unconscious Cartesianism, which would allow no knowledge deserving of the name unless it is as distinct and sure as geometry. Consider how strange is the condition of a mind obsessed with this mathematical ideal of clarity, yet attempting to investigate the obscure domain of viruses and protein molecules. No wonder an enigmatic smile is the best a man can manage in reply to an inquiry about the nature of life, if he is convinced that no idea is of any value unless clear and distinct and, simultaneously, that, if he cannot achieve an idea of life as in viruses, he cannot do so anywhere.

We have tried to save the meaning of the word "life" at least in what Professor Beck calls "the broad area of non-ambiguity." Let me now draw your attention to a distinction so far ignored. I mean the distinction between the definition or interpretation of a word, and the distinct definition of what it is that the word stands for. These definitions reflect two different ways of knowing the same thing. To know what the word "man" is used to stand for does not require that you be able to define exactly what a man is. Merely to point to a man, or to say that he is a two-legged, featherless animal, is enough to interpret the name, but does not tell just what it is to be a man. We all know what the word "circle" is used to mean; but, if asked to state what a circle is, we might want to return to our textbooks.

Names stand for confused wholes; our knowledge of the whole becomes more distinct when we can define, not just the name, but the whole that the name is meant to stand for. Notice, besides, that there are various ways of defining what a thing is, most of them no more than tentative. Indeed, we are forever groping our way toward distinct knowledge but rarely achieving it. Yet this failure should not make us turn away from confused knowledge as if it were no knowledge at all... worthless as it is. A mind would be perverse if it

sought to rest in confusion, and banal if it held such knowledge to be distinct. On the other hand, to be confused is not necessarily to be unsure. I may be quite sure of being alive without even suspecting that an attempt to define life could be made. And if a good definition could some day be achieved, might not the name for it turn out to mean, not something one and simple, but life in many different forms which could be called one only by virtue of a certain proportion? In the meantime, the relevance of confused knowledge stands in need of defense.

Terms like "body," "animal," "man," are of course those of primordial knowledge, of what is sometimes called "common sense" and of natural language as distinguished from technical language such as that of theoretical physics. But even natural language is not tied down to simple naming of things first known. It may still turn up in the type of definitions and demonstrations which does not resort to logical fictions. Yet even when merely defining in this way we already move on a different level of knowing. The only point I want to make here is that distinct knowledge obtained by definitions of what a thing is—whether these be constructed by direct analysis and composition, or achieved only at the term of a demonstration—is a later knowledge that can never be divorced from the earlier kind. Hence, even when the physicist defines time by the way he measures it, he cannot abstract from what time is as first named, although he may abstract from the definition of what that time is. If his symbolic construction of time bore no reference to time as we know it before any of it is measured, this construction would be pure fiction, with no reference to reality at all.

Take the definition of animal as "a body endowed with sensation." After this definition is reached, are we now able to disregard the knowledge we had acquired of what we sought to define? If we could, what would our definition define? If I did not already have some vague knowledge of what is called "animal," how could I so much as ask what an animal is? To

be meaningful, the question must take account of distinction and relation between vague yet valid knowledge and subsequent analysis. If we had to dispense with that earlier knowledge, which we more or less immediately acquire in the course of early life, as devoid of all value so far as scientific research is concerned, science would have to do with wholly arbitrary constructs—something no student of nature may allow.

To return to our original questions: is the term "life" meaningless so long as we cannot distinctly define what life is? Is what we call "alive" to be discarded because we cannot state once and for all exactly what it is? It appears to me that Bertrand Russell's observation applies to biologists as well as to astronomers—and perhaps to Russell as well when he declares Mr. Smith to be no more than a collective name for a bundle of occurrences.⁴

Professor Werner Heisenberg has likewise put the matter very plainly in his recent book:

... One of the most important features of the development and the analysis of modern physics is the experience that the concepts of natural language, vaguely defined as they are, seem to be more stable in the expansion of knowledge than the precise terms of scientific language, derived as an idealization from only limited groups of phenomena. This is in fact not surprising since the concepts of natural language are formed by the immediate connection with reality; they represent reality.... On the other hand, the scientific concepts are idealizations; they are derived from experience obtained by refined tools, and are precisely defined through axioms and definitions.... But through this process of idealization and precise definition the immediate connection with reality is lost.... We know that any understanding must be finally based upon the natural language because it is only there that we can be

certain to touch reality, and hence we must be skeptical about any skepticism with regard to this natural language and its essential concepts. Therefore we may use these concepts as they have been used at all times. In this way modern physics has perhaps opened the door to a wider outlook on the relation between the human mind and reality.⁵

It is sometimes said that we should pay no attention to the scientist when he expresses himself in ordinary language; that in doing so he is merely popularizing; and any serious appreciation of his work, we are told, should remain confined to what he says in technical language. Eddington disagreed with this superficial view. Heisenberg goes so far as to say that "even for the physicist the description in plain language will be a criterion of the degree of understanding that has been reached."⁶ To achieve such understanding is wisdom as distinguished from mere skill. The scientist without wisdom is like the skillful rhymester who has nothing to say.

A fine example of wisdom I quote from Erwin Schrödinger's *Nature and the Greeks*:

I am actually cutting out my mind when I construct the real world around me. And I am not aware of this cutting out. And then I am very astonished that the scientific picture of the world around me is very deficient. It gives a lot of factual information, puts all our experience in a magnificently consistent order, but it is ghastly silent about all and sundry that is really near to our heart, that really matters to us. It cannot tell us a word about red and blue, bitter and sweet, physical pain and physical delight; it knows nothing of beautiful and ugly, good or bad, God and eternity. Science sometimes pretends to answer questions in these do-

mains, but the answers are often so silly that we are not inclined to take them seriously. So in brief, we do not belong to this material world that science constructs for us. We are not in it. We are outside. . . . For the purpose of constructing the picture of the external world, we have used the greatly simplifying device of cutting our own personality out, removing it; hence, it is gone, it has evaporated, it is ostensibly not needed.

. . . In particular, and most importantly, this is the reason that the scientific world-view contains of itself no ethical values, no aesthetical values, not a word about our own ultimate scope or destination, and no God, if you please. Whence came I? Whither go I? Science cannot tell us a word about this. Science is, very usually, branded as atheistic. After what we said, this is not astonishing. If its world picture does not even contain blue, yellow, bitter, sweet—beauty, delight and sorrow—, if personality is cut out of it by agreement, how should it contain the most sublime idea that presents itself to the human mind? . . . Whence come I and whither go I? That is the great unfathomable question, the same for every one of us.⁷

The endeavors of Eddington, Bohr, Heisenberg, Schroedinger, de Broglie, Born, to mention only a few, are far more philosophical than those of many a professional philosopher who, like some scientists, divorces common from technical knowledge as if they were in different worlds. They will appear to be in different worlds only when "life" and "lifeless" are declared to be meaningless just because our ability to name is not the same as our ability to define distinctly; and because confused knowledge, to put it bluntly, is not the same as that distinct knowledge which can be quite illusory.

The modern biologist who hesitates to relate his knowledge to that which we express in natural language has some

historical facts in his favor, which may help to explain his reserve. I will mention only Descartes' conception of body and soul. To him, plant and beast were no more than intricate machinery. Life was proper to man, but not in his body, only in his soul—a soul which to him was so intuitively known that there was no point in trying to make it plainer. Little wonder that this soul soon became no more than the legendary spook in the machine. It would be interesting to compare Descartes with Aristotle on this core. The latter attempts a general definition of the distinctive principle of life only in Book II of the *De Anima*, and this first definition tells us nothing about the proper principle of any particular kind of living thing. As to the life principle of man, of which Descartes thought he had an all-sufficient intuition, it is first approached well on in Book III. In Aristotle, this is only a first approach; the study will be carried on throughout his treatise on sensation, on animals considered in their wholeness, right down to the way they generate and move, leaving room for indefinite expansion and reappraisal.

But a diversion of this kind does not provide the true alternative. The alternative is: Can life be finally and sufficiently explained in terms of what all the things of nature have in common? Or is the living being, over and above what it has in common with the non-living, a thing of a special kind? Can the laws of physics explain why elephants grow trunks? These organs are no doubt chock-full of physics and chemistry, and the mathematician would have something to say to account for their elegant flexibility. But if all there is to an elephant's trunk is what these sciences can tell us about it, we shall soon be forced to declare that he really has no such thing. We have in fact already reached this goal when we divest the living of its tools or organs. For there is no doubt that in the mind of some modern biologists the word "organ" has indeed become a meaningless term, which is easy enough for anybody who does not know that it simply means tool or

instrument. Anyhow, if there be no purpose in nature, what use can she have for tools?⁸

It is noteworthy that Aristotle first defines the intrinsic principle of living things as "the primary actuality of a natural organized body." "Natural" is taken here as distinguished from "artificial," and "organized" simply means "provided with tools." Just because we do not know exhaustively and definitively what an eye is does not imply that we cannot recognize it as a bodily instrument that allows us to see. The same for the hand; everyone knows that it is quite useful for grasping. This fact being evident, nothing we learn in advanced anatomy, physiology, or chemistry regarding these organs blinds us to what we already know. If we then recognize that it is good for a man to have eyesight and hands, that the latter are produced in us by nature (whereas spectacles and pliers are not), and that nature does not produce them utterly at random but in a determinate way, we also see that nature must be a proportionate cause of such good — another way of saying that nature acts for a purpose.

In other words, unless we grasp the organic character of our own bodies, or those of horses (Darwin's favorite example), of flies, of worms, etc., we overlook what should be obvious to any biologist. Still, as Professor Eugene Wigner, a physicist, observes: "Biologists are more prone to succumb to the error of disregarding the obvious than are physicists." Fortunately the most eminent biologists of all ages do not fall into this error. At any rate, no well-trained mind will assume that whatever cannot be explained in terms of measuring rods, weighing-machines, or clocks does not deserve attention.

IS THE WORD "LIFE" MEANINGFUL?

¹ *Modern Science and the Nature of Life* (New York, 1957), p. 186.

² *Ibid.*

³ As Aristotle observed: "Nature proceeds little by little from things lifeless to animal life in such a way that it is impossible to determine the exact line of demarcation, nor on which side thereof an intermediate form should lie. Thus, next after lifeless things in the upward scale comes the plant, and of plants, one will differ from another as to its amount of apparent vitality; and, in a word, the whole genus of plants, whilst it is devoid of life as compared with an animal, is endowed with life as compared with other corporeal entities. Indeed, as we just remarked, there is observed in plants a continuous scale of ascent towards the animal. So, in the sea, there are certain objects concerning which one would be at a loss to determine whether they be animal or vegetable" (*Historia Animalium*, VII, 1. Oxford trans.).

⁴ Lord Russell observed: "All nominal definitions, if pushed back far enough, must lead ultimately to terms having only ostensive definitions, and in the case of an empirical science the empirical terms must depend upon terms of which the ostensive definition is given in perception. The astronomer's sun, for instance, is very different from what we see, but it must have a definition derived from the ostensive definition of the word 'sun' which we learnt in childhood. Thus an empirical interpretation of a set of axioms, when complete, must always involve the use of terms which have an ostensive definition derived from sensible experience. It will not, of course, contain only such terms, for there will always be logical terms; but it is the presence of terms derived from experience that makes an interpretation empirical. The question of interpretation has been unduly neglected. So long as we remain in the region of mathematical formulae, everything appears precise, but when we seek to interpret them, it turns out that the precision is partly illusory. Until this matter has been cleared up, we cannot tell with any exactitude what any given science is asserting." *Human Knowledge: Its Scope and Limits* (London, 1948), p. 258.

⁵ *Physics and Philosophy* (New York, 1958), pp. 200-201.

⁶ *Ibid.*, p. 168.

⁷ *Nature and the Greeks* (Cambridge, 1954).

⁸ I do not wish to oversimplify the issue of "action for the sake of something" in nature. The very notion of an end as a cause, outside of human making and doing, is of a baffling kind, even though, as Sir Julian Huxley writes, "At first sight, the biological sector seems full of purpose. Organisms are built as if purposely designed, and work as if in purposeful pursuit of a conscious aim. But the truth lies in those two words 'as if.' As the genius of Darwin showed, the purpose is only an apparent one."

Whether Darwin did in fact show this is not the problem here. I am entirely in sympathy with anyone who has difficulty seeing how something which does not as yet exist can already be a true cause, and how an organism without consciousness can act for a purpose. Philosophy, from its inception, bears witness to this difficulty. Of all causes, the "final" one was also the last to receive the name "cause." Meanwhile, Sir Julian has plainly grasped that "if"

nature acts for a purpose, it must do so with dependence upon a conscious purpose, namely, as Aquinas puts it: "*si natura operetur propter finem, necesse est quod ab aliquo intelligente ordinetur.*"

To Sir Julian's mind, however, utterly irrational, blind, purposeless forces can be made to account for the rise of the only animal that acts for a purpose. "The purpose manifested in evolution, whether in adaptation, specialization, or biological progress, is only an apparent purpose. It is just as much a product of blind forces as is the falling of a stone or the ebb and flow of the tides." A corollary to this view is that we are saddled with all the intellect there is. This is no doubt the way some people want it.

⁹ *De Anima* II, 1, 412 b 5. *Ennelechia*, taken by itself, does not mean "soul," lest the definition become part of the definition; it means "soul" only *quia* "primary actuality of an organized body."

Index

- Adam, 43.
 Adalard of Bath, 17.
 African, the monk, 14, 17.
 Albert the Great, 17.
 Almageon, 16.
 Alexander the Great, 12.
 Alexandria, 12-13, 16.
 Anaxagoras, 9.
 Anaximander, 9.
 Anaximenes, 9.
 Aquinas, cf. Thomas, Saint.
 Aristophanes, 9.
 Aristotle, on anatomy, 11, 14; as classifier, 11-12; on dignity of biology, vii; as experimenter, 10, 16; on life, 82, 89, 90; on method, 10, 89; and nature, 56 ff.; on reproduction, 11-12; and the West, 14, 15.
 Arnold of Villanova, 17.
 Athens, 12, 13, 14.
 Augustine, Saint, 13.
 Bacon, Roger, 17.
 Basil, Saint, 13.
 Beck, 80, 81, 84.
 Beckner, 32, 45, 50, 51.
 Belon, 17.
 Bergson, 51.
 Bernard Silvester, 17.
 Biology, and chemistry, 2, 19, 20, 21, 67 ff., 78 ff., 89; and method, 1 ff., 77 ff., 86 ff.; and physics, vii-viii, 2, 19, 20, 21, 67 ff., 78 ff., 89.
 Biopocesis, 36 ff.
 Blood, circulation of, 18.
 Bohr, 88.
 Bondi, 34.
 Borelli, 18.
 Born, 88.
 Boyle, Robert, 18.
 Brisbois, 51.
 Brosm, 43.
 Camerarius, 19.
 Cartesianism, 84.
 Cato, 13.
 Cell-theory, vii, 70 ff.
 Cesalpino, 18, 19.
 Chance, 57, 60, 62.
 China, 7.
 Clark, 24, 33, 39, 40.
 Cockayne, 1.
 Collin, 46.
 Collingwood, 56.
 Columbo, 18.
 Columella, 13.
 Constantine the African, 14, 17.
 Cosmogony, 23, 28, 33 ff.
 Cratylus, 15.
 Crick, 72, 73.
 Critchley, 43.
 Dalton, vii.
 Darwin, 20, 26, 33, 37, 51, 61, 90.
 de Broglie, 88.
 de Chardin, 51.
 Definition, 84 ff.
 Descartes, 18, 89.
 Diogenes, 9.
 DNA, 72-75.
 Dobell, 70.
 Dobzhansky, 24, 47, 49.
 Dollo's law, 46.
 Eddington, 87, 88.
 Egypt, 6, 7, 13, 14.
 Emiliani, 40.
 Enzymes, 3, 69.
 Erastriatus, 12.
 Evans, 38.
 Evolution, 23 ff.; and causes, 31, 52 ff., 59; and culture, 40 ff.; as fact, 24 ff., 33 ff., 44 ff., 52; and law, 43 ff., 48 ff., 54; of man, 38 ff.; and nature, 54 ff.; and permanence, 51 ff.; and philosophy, 49, 51; prime analogue, 29; and theory, 33, 45; as unifying theory, vii, 54; various theories of, 31.
 Experiment, viii, 16, 17, 18.
 Fabrizio, 18.
 Fact, 10, 24 ff., 33 ff., 52.
 Final cause, 11, 47, 62, 90.
 Fisher, 32.
 Fixism, 52.
 Frederick II, 16.