TELEOLOGY AND THE ANATOMIST—II[1]

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TO continue this brief survey of some recent exponents of those final causes which, if they *are* dead, certainly won't lie down, here is a quotation from Professor Agar's *Contribution to the Theory of the Living Organism* (2nd edition, 1951). After discussion of the significance of organs of perception and their function he says:[2] 'The anticipatory aspect of perception compels us to recognize the reality of final causation in all perceiving organisms. Anticipation implies the power of directing action in accordance with that anticipation; otherwise it would have no function. The function of the capacity of anticipating future occurrences is to influence present action in relation to that anticipation. Causation in this sense is teleological or final causation. It is directed towards bringing about a situation which is not yet existent.' Once again the argument seems to depend on a prior assumption that living organisms are in some way essentially different from non-living, and such an assumption is unwelcome to those of us who have a natural sympathy with monist rather than with dualist interpretations of the things of nature.

Dr L. E. R. Picken, the Cambridge zoologist, writing in 1955 of the significance of final causes in the development of biological structures, says:[3] 'Claude Bernard expressed the opinion that science is not concerned with first causes (origins); he might well have added that scientists are also scared to death of final causes (ends). But it is clear that the biologist at least cannot be indifferent to final causes—to ends—any more than was Aristotle himself, whose entire analysis of types of causation is coloured by his biological studies.'

Just how scared scientists have been, and perhaps still are, of ends, was vividly expressed in 1876 by Emil Du Bois-Reymond. In a pamphlet entitled *Darwin versus Galiani* he says (in translation):[4] 'Here is the knot, here the great difficulty that tortures the intellect which would understand the world. Whoever does

1 The first part of this paper appeared in BLACKFRIARS for September 1957.
2 W. E. Agar, Melbourne University Press, 1951, p. 18.
3 L. E. R. Picken, 'The study of minute biological structures', *The School Science Review*, No. 131, Nov. 1955, p. 35.
4 Berlin, 1876, pp. 8-9. Quoted Henderson, *op. cit.*, p. 290.

not place all activity wholesale under the sway of Epicurean chance, whoever gives only his little finger to teleology, will inevitably arrive at Paley's discarded "Natural Theology", and so much the more necessarily, the more clearly he thinks and the more independent his judgment. . . . The physiologist may define his science as a doctrine of the changes which take place in organisms from internal causes. . . . No sooner has he, so to speak, turned his back on himself than he discovers himself talking again of functions, performances, actions, and purposes of the organs. The possibility, ever so distant, of banishing from nature its seeming purpose, and putting a blind necessity everywhere in the place of final causes, appears, therefore, as one of the greatest advances in the world of thought, from which a new era will be dated in the treatment of these problems. To have somewhat eased the torture of the intellect which ponders over the world problem will, as long as philosophical naturalists exist, be Charles Darwin's greatest title to glory.' Well, clearly the intellectual torture has gone on since Darwin. Darwin, in fact, solved only one part of the problem, and left the rest still in doubt. The confusion that lies at the heart of Darwinism is well illustrated in the passage just quoted by the use of the two phrases 'Epicurean chance' and 'blind necessity' as equivalents: when what is 'necessary' becomes equated with what is 'casual' there is a logical muddle indeed. As in so much that has been written on this sort of topic, expressions like 'blind necessity' and 'blind chance' are simply emotive in content, and in so far as they succeed in commanding assent they do so only by clouding the reason. Perhaps this was why Du Bois-Reymond was most concerned—though subconsciously, I am sure—over the particularly unhappy fate that would overtake those who think 'more clearly' as he puts it.

As a last example of recent biologists to whom the problem of teleology looms large, just a few months ago there was published a book by E. W. Sinnott, the botanist and geneticist, with the somewhat disconcerting title *The Biology of the Spirit.* I have selected a couple of passages to indicate something of his approach.[5] 'In simple terms', he says, 'the problem is this: Every living thing is an organized system, each part and function closely correlated with all the others. This is evident in many

5 London, Gollancz, 1956, pp. 15-16.

ways, but most conspicuously in the processes of growth and development. A plant or animal grows in an orderly fashion to a precise bodily form characteristic of the particular species to which it belongs, as towards a precise "goal". Growth is so nicely co-ordinated—faster in some directions, slower in others—that in all parts it keeps step until the final end is reached. Differences within the organism arise in orderly progression. Development is determined, we know, by thousands of inherited genetic units in each cell, but their actions are so nicely co-ordinated in timing and degree that only rarely do the normal processes become confused. All this is hard enough to understand, but the difficulty is greatly increased by the results of experiments in blocking or interrupting the usual course of development. Under these conditions the organism and its parts show a surprising ability to restore what has been lost, rearrange its normal processes of growth, and produce at last, often by circuitous courses, a whole and typical individual. The whole seems somehow immanent in all its parts. This regulatory capacity is present to a greater degree in some forms than in others, and varies with conditions. It is more evident in early stages of development than in later ones' (we might note here that R. S. Lillie says precisely the opposite) 'but it vividly demonstrates the action of a co-ordinating control of some sort, which guides development to a definite culmination. A living thing is an organized and self-regulating system, well named an "organism". This is a fundamental fact in biology, and the basis for regarding the life sciences as distinct from the physical ones.' It sounds as if he might be an uncompromising dualist, a teleologist with his feet definitely set on the slippery road that leads to Paleyism. But Professor Sinnott is in fact a great deal less naïve than was Archdeacon Paley. He says, for instance (*op. cit.*, p. 63): 'Biology has only recently won the right to be considered a true science in the modern sense, based on unvarying lawfulness, as physics is, and free at last from childish ideas that plants and animals have human qualities. Scientists have fought so hard to keep the insidious idea of purpose *out* of biology that they will not readily assent to a concept that puts this fighting word back at the very heart of the life sciences. Slipshod teaching has so often falsely appealed to "purpose" that the very word has become anathema to many. One reads in some texts, for example, that roots are "for the purpose" of absorbing water and nutrients

from the soil, or that the "purpose" of a fawn's dappled coat is to make him inconspicuous in the forest. A teacher often slips into terminology like this for ease of explanation, rather than discussing the more difficult ideas of natural selection or physiological mechanisms. The student thus gets the wrong conception that living things are *trying to adapt themselves* to their surroundings and succeed through some mysterious power to do what is best for themselves.'

Sinnott believes that the 'goal' or 'purpose' that he postulates is definitely capable of investigation by science, and that it must be so investigated. He says (*op. cit.*, p. 63): 'The . . . goal . . . may turn out to be as mechanical as the "goal" of a thermostat set for seventy degrees. If one wishes to carry this idea to absurdity he may suggest that a stretched bow has a "purpose" to shoot an arrow, or even that a stone has a "purpose" to roll downhill. It may be that purpose can be explained at last in terms of present physical concepts, as have so many other biological problems.' Now the examples which he chooses of a *telos* inherent in inorganic situations would not by any means have seemed absurd to Aristotle nor, *a fortiori*, to Thomas Aquinas. To these thinkers, as we have seen, final causes are *always* necessary for a complete explanation of *anything whatsoever*, living *and* non-living. Medieval scholars, following Aristotle, expressed the idea as 'Omne agens agit propter finem'. But most of the writers on this subject in the last three centuries have made the final cause very much something of an *extra*, something to be invoked (by those who allowed it at all) only when mechanical efficient causes seemed somehow inadequate. As Theodor Schwann put it in 1829:[6] 'Teleological explanations have long been banished from the physical sciences, and in biology they are only a last resort when physical explanations have proved incomplete'. Now once this position had been taken with regard to teleology, it is obvious that 'teleologists' were destined from then on to be always on the defensive, always retreating back into deeper recesses of biological obscurity before the advancing tide of mechanistic hypothesis and experimental testing. It is no wonder that teleology became a word of abuse for everything obscurantist and anti-scientific. Professor Sinnott himself, despite his lack of sympathy with the mechanistic biology of yesterday, seems to

6 Quoted E. S. Russell, *Form and Function* (London, Murray, 1916), p. 180.

look upon teleology as very much of an 'extra' rather than, as D'Arcy Thompson put it, being woven 'warp and woof' with mechanism in nature. Sinnott says,[7] in discussing teleology (which he understands in the most obvious of its 'moods'), 'There is always the possibility that "final" causes actually *may* be operative in nature and that a purpose in the mind may have a direct effect on physical events. For such a philosophy our concept of organic purposiveness would provide a biological foundation. Teleology still has its defenders, and among men of science there are some who are unable to account for all the facts of nature without invoking it to some degree. Perhaps the conflict between this concept and the mechanical determinism of science may never be resolved.' One would only comment here that philosophical realists of the Thomist school would say that it is a question not of accounting for *all* the facts of nature without invoking the teleological concept (in a different sense of teleology) but of accounting for *any* of the facts of nature without invoking it.

From all this it is clear that teleology is today very much in the air so far as biologists are concerned. If the anatomist is to play that central role we have suggested for him in the future integration of the biological sciences, it is essential that he be clear in his mind as to what teleology means, and what are its implications. Now from all the quotations I have given you, from general biologists, anatomists, biochemists and physical chemists, there does not emerge any clear single concept of the meaning of τέλος or 'end'. The question can only be answered by asking how the word is *used*, and every writer seems to have used the word in a way different from the others. It is no wonder there is conflict and no wonder that the conflict appears to many to be incapable of resolution. As in all philosophizing, the first essential is to clarify and specify the meaning of the terms you use.

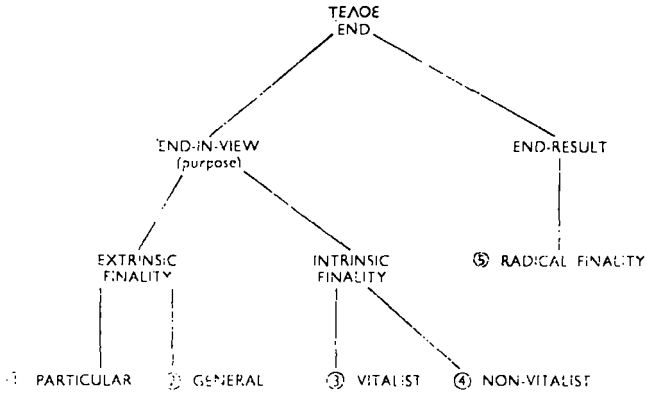
Now with regard to the words 'end' and 'final', ambiguity is inherent from the very beginning. When for instance students work towards entry into one of the professions, they come eventually to sit for what is called a 'Final Qualifying Examination'. The word *final* here has two distinct but intimately interwoven ideas, first that of the 'last-in-time' examination, what one might call the 'end-result' of the years of study; but secondly, and in addition, there is implied the idea of a 'purpose' achieved, in

7 *op. cit.* p. 67.

that it was with this 'end-in-view', as one might call it, that the study was originally and continually undertaken. Again, when one writes 'Finis' (*telos*, end) at the end of a paper or a book, one does so in two distinct senses, first to satisfy oneself that this *is* in fact the end-in-time or end-result of one's labours, but also to give oneself the very natural satisfaction of having achieved one's purpose or end-in-view.

These two notions, *end-result* and *end-in-view*, are obviously very distinct from one another. But in virtually all authors right from Aristotle himself the word 'end' is used, as it is still today in common speech, now to imply the one thing, now the other, but most often in a mixture of the two in varying proportions. Misconstruction on the part of the reader is inevitable. The history of civilization is full of bitter conflicts about issues which prove on analysis to be merely verbal; fictitious or non-existent differences of real opinion.

In the discussion which I hope will follow this paper, I want us to be clear always as to which of several categories of meaning we intend the word teleology to have for our particular argument. These I would suggest might be analysed as follows:



Extrinsic finality implies purpose introduced into the universe from without. *Intrinsic* finality is the purpose which many writers, as we have seen, see as peculiarly evident in and indeed confined to biological systems.

Category 1 is the 'design' of Paley, in which every single manifestation of nature occurs as the result of a specific purpose

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in the mind of the deity. Every event has its celestial blue-print as it were. This, in my opinion, is a primitive, magical view of nature, in which the Designer plays the part of magician. The idea is, however, constantly cropping up in otherwise intelligent works, and for a certain type of mind it has obvious attractions.

Category 5 implies that every complex of efficient causes produces a result which is inherent in the physical set-up and is therefore reproducible. There is order and not chaos. This idea was the greatest single contribution of the Ancients and the Schoolmen to the development of modern science. The world is governed not by chance but by law. This notion forms the basis for Aquinas's fifth way of arguing towards the necessary existence of something which, as he puts it, 'we call God'—often called the 'argument from design', but better the 'argument from order'.

Categories 3 and 4 include all those theories of the last hundred years of 'emergent' and 'creative' evolution, the notion of an inner entelechy (the word is Aristotle's) directing biological processes, a force which many biologists regard as necessary to account for biological 'adaptation'. Amongst modern exponents of the 'new' *directiveness of organic activities* we might, I suppose, have to include Russell and Lillie as exponents of Category 3, and perhaps Muller and Sinnott in Category 4. But it will of course be realized, from what was said earlier, that it is not easy to pin down the meaning which any particular author intends the word 'end' to have, and Sinnott, as we saw, seems to combine vitalism and non-vitalism in a remarkable way.

The last, Category 2, implies that there *is* some overall divine end-in-view or purpose in the universe, but that the purpose works in and through the operation of scientific law (except in so far as miracles are concerned). It seems to me that Henderson and possibly D'Arcy Thompson argue in an inductive way towards this conclusion, and I find their accounts intellectually compelling. But this category of meaning of teleology could be arrived at logically, I think, from analysis of the implications of Category 5.

Now how might anatomists in general be expected to react to each of these categories (I can, of course, speak only for myself)? How far should we be inclined to say that the detailed structure of our bodies (and the human anatomist knows a lot of detail) is evidence of heavenly blue-prints? How far is it the achievement of an *immanent* purpose working in and through the physical,

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drawing on the developing body towards an end foreseen and somehow desired? How far the inevitable end-result of that particular complex of causal chains and causal networks that have contributed, throughout the ages of evolutionary development and throughout the months of embryological development, to the formation of the human being as we know him, through the operation of scientific laws which surely await elucidation by our scientific descendants if not indeed by us ourselves to some extent? With this last he will certainly, as would any scientist, find himself in sympathy. Indeed it is to the elucidation of the laws that govern the development of anatomical structure (the science of morphogenesis, as it is called) that the main research-work of the anatomist is directed. Now of course, as can any scientist, he can content himself with just this work if he wishes, and never even question his underlying assumption that there *are* causal laws of morphogenesis to be discovered. As Henderson has said (*op. cit.*, p. 310): 'The chemist puts his mind at rest regarding the existence of life, just as the physicist calms his regarding the existence of matter, simply by turning his back on the problem. Thereby he suffers nothing in his practical task as a man of science.' But if we want not only to *know* something about nature but also to try to *understand* it, in so far as this is possible, then we must take the plunge, as we have done here, into philosophy.

As for Category 1, there would surely be few anatomists (the late Professor Wood-Jones perhaps amongst them) who would find themselves in sympathy with this form of teleology. The degenerate eyes of the mole are not, so far as we can see, exquisitely planned, as Paley supposed, but are degenerating because they no longer have survival value to the species (or as a result of some other as yet unknown causal factor in evolutionary development). If even the human eye, about which exponents of this sort of teleology are wont to enthuse, were planned by a Divine Designer then one would have sympathy with Helmholtz in his views on what a defective instrument it is even at best, and profound sympathy with all those who happen to have been supplied with what in industry today would be classed as 'export rejects'. Now the anatomist, as we have said earlier, is very much a part of the medical profession, and it is our job as doctors to know something not only of physiology but of pathology. The realization that human beings and other living organisms have a *pathology*

as well as a *physiology* is second nature to the anatomist who fathered, as we said at the beginning, both these sciences. The pathologist, or morbid anatomist, is not nearly so inclined to wax enthusiastic about the 'immanent purpose' in living things (Categories 3 and 4)—he knows too much about the obvious *lack* of immanent purpose in the disease-processes that bring his subjects to the post-mortem room. Now until very recently there has been virtually no science of general as distinct from human pathology. General biologists, who have grown ecstatic over the seeming purposiveness of the creatures they have studied, are in for quite a surprise when they come to realize how expertly nature has hid from their view its failures, and showed them only its successes. Again, take embryology. The general biologist may radiate confidence about the wonderful purpose he sees continually at work in the developing embryo of the frog. But whenever a human embryologist is studying his serial sections through his microscope, he cannot help but be conscious that here on the slide is or was a fellow human being who, for one reason or another, had insufficient of this supposedly all-pervading purpose or will to live. It is reliably estimated that of all fertilized human ova at least one in three, and perhaps one in two, is destined, from natural causes, to live out its brief life without ever achieving independent existence outside the maternal womb. In addition, there are those hundreds of different kinds of congenital abnormalities, leading to death or severe disfigurement, which the anatomist is continually being asked by his colleagues in the department of pathology to help elucidate from the embryological point of view. Categories 3 and 4 begin to look a little different in the light of these figures. In his Terry Lectures[8] entitled *Ourselves Unborn: an Embryologist's Essay on Man*, Professor George W. Corner has said, at the conclusion of a moving chapter on 'Pre-natal Fate and Foreordination', 'Those of us who survive are truly the elect, chosen from a larger multitude. In this fact we may take a melancholy pride, like soldiers who close the ranks and march on when their companions fall. Let us make all we can of this life; we are fewer than we thought.'

Now it has been said that *all* scientists have a secret passion for teleology but that, like a mistress, teleology has to be kept out of sight of polite company. For myself, I would be happy to take

8 New Haven, Yale University Press, 1944, p. 122.

her into public as a respectable married woman, and call myself openly a teleologist, provided that I am allowed to specify in what senses I am using the term. As to specific divine purposes as manifested in particular structures and events in nature, I would say (so far as philosophical enquiry is concerned) with René Descartes,[9] 'In the admirable purpose assigned to each part, both in plants and animals, it is proper to admire the hand of God who made them, and by an inspection of the work, to know and praise the Author; but we cannot surmise for what purpose He created each particular thing.'

9 Descartes, *Principles*, I, 28.

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