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tian has a right to make whatever commitment he pleases; and (3) therefore, no one has a right to criticize him for this."

Both of these strike me as much clearer examples of permissive parity arguments than the ones Penelhum discusses.

Each version of the parity argument turns on a crucial premise about justification and the rationality of belief. For example, the conformist argument uses the pyrrhonist premise that where we lack adequate evidence, we must suspend judgment, or, in matters unavoidable, believe moderately, and follow the conventions of our fathers. This principle, and those used in other two versions (which are harder to identify) need further elucidation and evaluation. I would like to have seen Penelhum turn his analytical skills to this task.

Finally, Penelhum's acceptance of the permissive parity argument is a major concession to the fideism which I take it he rejects. If his characterization of fideism as the view that faith needs no support from reason is his considered view, and if he accepts this argument with its conclusion that it is rationally permissible to hold religious beliefs without basing them on evidence, then it would seem that Penelhum is condoning a fideist position, contrary to his intentions.

From Aristotle to Darwin and Back Again: A Journey in Final Causality, Species, and Evolution, by **Etienne Gilson**. Trans. John Lyon, Notre Dame: University of Notre Dame Press, 1984. Pp. 209. \$22.95.

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The questions dealt with by the book—natural teleology, evolutionary biology, and metaphysics—are crucial issues in any philosophical reflection on biology, particular those undertaken in a religious context, and I was interested to see the contribution of Gilson's deep historical and philosophical insights to these questions. Initially I should note that the history and philosophy of the life sciences is no stranger to Gilson, although it has been many years since he last dealt with such problems. Among his many titles is his *Descartes, Harvey et la Scolastique*,¹ a work still worth careful study by Harvey and Descartes scholars. His reading of the primary sources of Buffon, Bonnet, Linnaeus, Lamarck, Cuvier, Darwin, and Spencer is interesting if for no other reason than that it turns Gilson's erudition onto this group of the founders of modern biology. His discussion of more recent biological theory and theorists—Walter Elsasser, Jacques Monod, and Georges Canguilhem—does not avoid all the pitfalls awaiting the non-specialist in these areas, but it shows a refreshing intellectual toughness

and clarity which have always been Gilson's identifying characteristics.

The main issues addressed by this set of essays center around an examination of natural teleology, and the viability of this concept in the face of the challenges posed by modern biology. Teleological purposiveness, and particularly the claims of a non-relative finalism of organic life, is not a popular concept in modern biology. The standard view among many theorists of biology would seem more to be that the development of modern biology has effectively destroyed the concept, not only in its Platonic-Stoic physicotheological interpretation, which affirms an external rationality or "Nature" designing organisms to pre-determined ends, but also in its immanent Aristotelian form.²

Gilson's undertaking is to examine the relation of teleology and biology in light of what he interprets to be the mechanistic challenge. The larger importance of this issue is transparent. The degree to which one can make some kind of appeal to an inherent natural teleology as grounding for a natural-law ethic, or to the organic world as showing some evidence of divine creation, would seem to depend at some point on the viability of some kind of teleological interpretation of life. As a Neo-Thomist, Gilson is predictably a realist about natural teleology. The deeper question is whether such a position can really be sustained in the wake of modern advances in the understanding of biology.

Gilson deals with this issue in a series of loosely connected essays. Opening with a discussion of Aristotle's notion of biological teleology, Gilson has followed this onto a discussion of the classic confrontation between "mechanistic" and "teleological" perspectives in the discussions of the Greek nature philosophers. This is succeeded by a chapter on Darwinian evolution and finality. Discussions of Bergson's views on teleology and an analysis of the modern confrontation between mechanistic reductionism and finalism close the book. Somewhat curiously placed, two appendices are given, one simply reproducing Linnaeus' first edition of the *Systema naturae* of 1735, and the second a discussion of Darwin's concept of organic species. I felt the latter belonged in the text proper.

As a general comment on the work, it cannot be considered to be an exhaustive analysis of any of the topics with which it deals. Certain problems of organization also render its treatment of the issues episodic rather than a smoothly integrated study. This is regrettable, because I found the book wandering too much from the central issues, and in the end I was wishing for more substance. Nevertheless, I found it useful for raising several central problems in a way that is rarely available in English literature.

The opening discussion of Aristotle's notion of organic teleology was brief, but pithy, and it served to clarify some important points concerning Aristotle's position on these questions. Gilson emphasizes that Aristotle's conception of natural teleology is neither properly assimilated under "vitalism," which Gilson views as a Platonic notion, nor is it deeply committed to the causal efficacy of

metaphysical entities, such as soul, which historically have formed components of Aristotle's biology. Gilson also clarifies, I feel, some of the complexities in Aristotle's positions. It is not clear that Aristotle himself was committed to a general teleology of "Nature" as distinct from the individualized finalism of specific instantiated "natures," at least if by "Nature" is meant some kind of Platonic Demiurge or World-soul.³ This is an important point, and it was one that could have sustained an extended discussion, since much of the confusion surrounding teleology and biology depend on the substitution of Platonic-Stoic meanings for those properly seen as Aristotelian. Gilson also clarifies, I feel, the point that Aristotle's final cause is not dependent on the notion that the future acts as a causal agency on the present to bring about its own realization—that is, a cause to be conceived as acting in the same way as material and efficient causes. It is more an empirically-given aspect of nature, a spontaneous activity, which is recognized in all our natural intuitions of the organization and subordination of heterogeneous parts to one another in organic beings (p. 7). Aristotelian teleology does not, on his analysis, involve a "conscious" intentionality on the part of organisms other than man, and it is not based on a naive anthropomorphism attributing to "Nature" the conscious artistry of human design. Nature for this reason does not imitate art. Rather, art is a *conscious* and *learned* analogue of the processes accomplished naturally in organisms without foresight and planning. The fertilized ovum becomes the adult chicken spontaneously, but directionally, through a series of identifiable stages which man, through his reflection, can imitate by positing rational ends for realization in the future (p. 11).

This does seem, if I read Gilson correctly, to imply that the Aristotelian is not committed to the view that one can simply read off, in an unproblematic way, the teleological purposes of natural things. The purposiveness of nature is grasped by analogy, and the intuitive experience of teleology is not necessarily even fully articulatable:

The analogy with art, then, assists us to recognize the presence in nature of a cause analogous to that which is intelligence in the operations of man, but we do not know what this cause is. The notion of a teleology without consciousness and immanent in nature remains mysterious to us. Aristotle does not think that this should be a reason to deny its existence. Mysterious or not, the fact is there. It is not incomprehensible because of its complexity, which we can only hope science will one day clarify, but because of its very nature, which does not allow it to be expressed in a formula. (p. 10)

Locating the issue of teleology at the level of an empirical intuition rather than at that of a causal explanation is clarifying, and it serves to eliminate many of the standard objections to the validity of the concept. The classic "mechanistic"

objection has centered on the issue of the fruitlessness of teleological explanations, and the history of the biomedical sciences since Harvey would seem to support the claim that the elimination of Greek teleological accounts of organic process was critical for the growth of modern biology. But the claim that teleological purposiveness forms an overarching, immediate intuition of the organic realm which cannot be eliminated by any analytic dissection of organisms into their component physico-chemical mechanisms, locates the issue at a different point. Gilson in fact seems to prefer the sharp separation of scientific from metaphysical issues here, acknowledging that science has little to say, for or against, the concept of teleology as he interprets the question. The issue lies at the level of the underlying foundations of natural philosophy (pp. 16,31).

This is all eminently sensible, I feel, but one is left with a difficulty. Simply removing the issue from the domain of science does not itself warrant the interpretations Gilson gives of the problem. Several philosophers have acknowledged Gilson's point about the necessity of a teleological perspective on organisms without accepting his conclusions, and Fr. Jaki seems correct in his preface in seeing the issue to be that of scientific Realism, which is ultimately to be grounded on the theological doctrine of creation. Without this as premise in the argument, it is difficult to see that the recognition of natural purposiveness implies the truth of a general teleological perspective. I couldn't help but feel that the author Gilson really needed to do more with in this discussion was not Bergson, but Kant and his detailed discussions of exactly these issues in the *Critique of Judgment*. Kant also endorses many of the points Gilson has recognized, and similarly denies the adequacy of a fully mechanistic biology, but with one important difference—the teleological judgement, while in fact necessary for the study of biology, is nevertheless not constitutive of it, and it leaves one with the notion of a regulative principle which is gradually eliminable by the success of mechanistic science. The importance of Kant's interpretation of the problem for the success of modern biology has only begun to be explored.⁴ It raises issues that those defending Gilson's teleological realism, and I would consider myself one of these, need to deal with more directly.

Too little account is taken of a second set of issues. Granting a realist interpretation of teleological purposiveness, one still must distinguish the admission of immediate purposiveness of organic function and structure from the conclusion of a non-relative finalism of life in general. This is the point at issue in the preference among many biological theorists for the concept of "teleonomy," which is an attempt to recognize both the purposive character of organisms, without a commitment to a more general teleology of nature.⁵ Rather than seeing this simply as linguistic trickery, as Stanley Jaki interprets it, there is a substantial issue here. One can surely acknowledge the functional subordination of parts, the close relation of form and function to conditions of life, and even the fact

that organisms clearly carry out goal-seeking activities, without implying a larger teleology of life sufficient for theological and ethical concerns.⁶ This is, as I understand it, the real issue facing Gilson and those endorsing his position. Gilson's approach to the question of teleology is, in my view, a generally good one. It must remain for others to deepen these arguments sufficiently.

I was particularly interested to see the application Gilson made of these arguments in his treatment of evolutionary biology. The title of the book will undoubtedly draw a readership from those hoping to find a Thomistic-Aristotelian solution to the issues raised by evolutionary biology, and those aware of the evolutionary literature are familiar with the fact that it is the anti-teleological implications of natural selection which are repeatedly summoned to deny theistic interpretations of evolution. Here I was somewhat disappointed, not so much by what Gilson concluded, but by the approach he took. For a small book, too much space was devoted to belabouring a well-known issue—the fact that Darwin never explicitly, except on one occasion, used the term 'evolution' to characterize his theory. Gilson's larger point is more interesting, and is one I would have liked to see him develop more fully—namely that there is a distinction to be made between the scientific theory formulated by Darwin to explain the variety of geological, paleontological, anatomical and biogeographical facts at his disposal, and evolutionary natural philosophies, particularly as formulated by Herbert Spencer and Henri Bergson. The latter theories comprise, on Gilson's view, modern "evolutionism," and Darwin's position vis-a-vis these claims is viewed as ambiguous. Gilson is correct, I feel, in seeing Darwin's interests as primarily those of a natural scientist, rather than being those of a natural philosopher, at least to the extent that he typically subsumed metaphysical and theological questions to those more properly scientific and empirical. Gilson was also refreshingly candid in admitting that the empirical issues being discussed by Darwin are often technical and not easily accessible to the lay reader.

While I found Gilson's discussions of Darwinism and evolutionary theory judicious and fair, I could not agree with his assessment on several points. Gilson's awareness of the Darwinian archive, beyond the published *Origin* and *Descent of Man*, is slight, and there is insufficient grasp of the complex issues which formed the context in which Darwin's theory emerged. He also relies too heavily on the claims of certain authors (Paul Lemoine) to represent an alleged scientific consensus on the deficiencies of evolutionary theory.⁷ The numerous reassessments of Darwin and evolutionary biology made in 1982 centennial commemorations, while surely not revealing a seamless cloth of scholarly opinion, would hardly support such a view.⁸

Gilson's analysis of the issues posed by evolutionary biology are not detailed, and to the degree that they can be characterized, his points would generally fall in the category of what I would term "Cuvierian" arguments, meaning that they

repeat in general substance the arguments made by the French naturalist Georges Cuvier (1769-1832) against early versions of transformism. This is not surprising, since Cuvier also was deeply influenced by the analysis of form, function and teleological purposiveness developed by Aristotle, particularly in such works as the *De Partibus animalium*, and from these foundations Cuvier drew what for a time were seen as devastating critiques of the possibility of genuine transformism.⁹

Space will not permit a full analysis of the Cuvierian critique, and the responses to it. It is one which appears in sophisticated versions of "creation science," and it raises points that do need to be taken more fully into account by theorists of biology. However, it typically succeeds as a critique of Darwinian evolution only by a failure to take into sufficient account Darwin's actual arguments.

It is important to see more generally what is at issue in this critique. First there is the claim that because organisms are organized and harmonious wholes, rather than Empedoclean assemblages of dissociated parts, evolution becomes implausible because it seems to imply an accidental assemblage of parts in which the survival of the resultant forms becomes unimaginable. Gilson thus objects that "observable plants and animals can only subsist thanks to the accord of the parts of which they are composed." (p. 83). Those aware of the historical context in which evolutionary theory appeared in its Darwinian version, recognize that the standard objections against it entrenched in the reigning scientific opinion were all broadly Cuvierian, and Darwin realized that his theory needed to meet these kinds of objections to convince his critical audience of scientific peers. The working of Darwinian theory by evolutionary gradualism, slight variation, great expanses of time, and its use of precisely the same intimate coordinate relationships of form and function affirmed by Cuvier, were decisive factors in disarming scientific objections on these grounds to his theory. I will not seek to examine the problems which might be raised with these premises of Darwinian evolution here. It is important to be aware that Gilson raises no new lines of objection, nor are his objections ones which were not considered by Darwin himself in some detail. Once this is recognized, it is less easy to see these kinds of critiques as really decisive. Darwin was, it must be remembered, eventually able to convince even the most sceptical and knowledgeable members of the scientific community of his day, naturalists such as Lyell and Owen, of the plausibility of his theoretical account, at least in its main features.

Gilson's second broad line of objection is also "Cuvierian" in that he bases it, as Cuvier had, on a strongly "positivist" interpretation of science, meaning by this that science is conceived to be an inquiry concerned with necessary demonstration from strictly empirical premises (pp. 89, 93, 109, 149). Such criticisms need to be questioned. Gilson's conception of science in fact seems to exclude all hypotheses and theoretical leaps, all appeals to unobservable

entities, from scientific reasoning.¹⁰ Of course, when science is interpreted in this way, evolutionary biology is indeed not “science.” But this view of science reduces it at some point to a hypothesis-free summary of data and an exercise in deductive logic, and at least to this extent evolutionary theory is in no more difficulty than all of modern science, since nothing since Descartes’ failed attempt to construct a totally demonstrative physics from true and certain premises seems to be able to satisfy Gilson’s criteria. It is one thing to claim that Darwinian theory *violates* the empirical data, something which is yet to be shown conclusively, and another to claim that it *goes beyond* the given data by positing connections and relationships among the empirical data which are admittedly hypothetical and dependent on hypothesis and speculative leaps. It has been all too easy for critics of evolutionary biology to move from awareness of the latter to assertions of the former, and Gilson does not escape this fallacy.

On the whole, I was also disappointed with the degree to which Gilson dealt with the question of evolution and natural teleology in this book. He points out important issues that surely need to be reflected upon—for example that Darwin implied some belief in an inherent teleological purposiveness to “Nature” in many statements of the *Origin*. Gilson also sees that this could not be merely metaphor and accidental locution, since the validity of Darwin’s appeal at many points to the analogy between artificial and natural selection depends on the force of this intentional analogy. However, Gilson is unaware of the complex layerings of the development of Darwin’s argument from the *Notebooks* onward, in which Darwin moved increasingly toward a non-teleological interpretation of natural selection.¹¹ This represents more than confusion on Darwin’s part, because the admission of a *relative* finality of organisms, and a close subordination of form, function and activity to external conditions of life can be rendered intelligible without necessarily implying a larger purposiveness to organic life. Admittedly this development creates problems for Darwin’s use of the artificial-natural selection analogy. But Darwin’s move toward the “survival of the fittest” interpretation of natural selection leaves open the possibility of a purely relative finalism of life. Dinosaurs can be judged as “adapted” to a given set of environmental conditions, meaning by this that they can be asserted to have *de facto* possessed the necessary structures and functions for life under those conditions, and nevertheless became extinct as those conditions apparently altered.

It is surely as possible to interpret this in the non-teleological sense of Hume’s “prolific Mother creating beings to no end” as it is to see in it a larger teleological purposiveness. Darwin’s mature views increasingly tended to Hume’s position, and critiques of natural teleology by evolutionary biologists do likewise. This is surely not to say that such arguments are unanswerable. I do not feel they bear in the way often asserted on the question of divine creation. But it does mean that sufficient treatment of these questions needs to consider a broader set

of issues and texts than is done in this book. The greatest danger would be to consider Gilson's discussions as more than question-posing reflections, a prolegomena to a deeper discussion that hopefully someone will choose to undertake.

As a final comment, I found the text well-prepared, the translation clear in most parts, and the notes useful. John Lyon has done an admirable job of locating English editions and page references for Gilson's citations, and has pointed out some nagging errors in citations of sources in Gilson's text.

NOTES

1. *Publications de la Faculté des Lettres de l'Université de Strasbourg* (1921), reprinted in Gilson, *Etudes sur le rôle de la pensée médiévale dans la formation du système cartésien* (Paris: Vrin, 1930), pp. 51-101.

2. A good statement of this is in Ernst Mayr, *The Growth of Biological Thought* (Cambridge, MA: Harvard University Press, 1982), p. 516.

3. See W. Wieland, "The Problem of Teleology," in J. Barnes, M. Schofield, and R. Sorabji (eds.) *Articles on Aristotle* Vol. 1 (London: Duckworth, 1975), pp. 141-60.

4. See Clark Zumbach, *The Transcendent Science: Kant's Conception of Biological Methodology* (The Hague: Martinus Nijhoff, 1984); and Timothy Lenoir, *The Strategy of Life: Teleology and Mechanics in Nineteenth Century German Biology* (Dordrecht: Reidel, 1982).

5. For the origins of this concept see Colin Pittendrigh, "Adaptation, Natural Selection, and Behavior," in Anne Roe and George Simpson (eds.), *Behavior and Evolution* (New Haven: Yale University Press, 1958), pp. 391-4.

6. See Francisco Ayala, "Teleological Explanation in Evolutionary Biology," *Philosophy of Science* 37 (1970), pp. 1-15.

7. Paul Lemoine, "Conclusions generales," *Encyclopedie francaise* t. V (Paris, 1965).

8. Three main conferences in the 1981-82 period should be consulted. The proceedings of the international Cambridge centennial conference, drawing together primarily biologists, is published as D.S. Bendall (ed.) *Evolution From Molecules to Men* (Cambridge: Cambridge University Press, 1983); The Berlin conference, with several papers from a morphological perspective, is published as M. Grene (ed.) *Dimensions of Darwinism: Themes and Counterthemes in Twentieth-Century Evolutionary Theory* (Cambridge: Cambridge University Press 1983); The Florence conference, drawing together primarily historians of evolutionary theory, is published as David Kohn (ed.) *The Darwinian Heritage* (Wellington: Nova Pacifica, and Princeton: Princeton University Press, 1985).

9. See the classic discussion of Cuvier's critiques in E.S. Russell's *Form and Function* (London: 1916; reprinted Chicago: University of Chicago Press, 1976).

10. "But just as the indemonstrable is the contrary of science, so the inobservable is the contrary of the factual" (p. 89).

11. I have discussed changes in Darwin's concept of natural selection in my "The Question of Natural Purpose," in: *Evolution and Creation*, ed. E. McMullin (Notre Dame: Notre Dame University Press, 1985).