

BOOK REVIEWS

Evolution, theology and the Victorian scientist

Stephen Jay Gould

UNFORTUNATELY, the important issue of evolution and its historical relation with theology has been badly distorted by the stereotype of crusading, modern hero versus pompous, superannuated windbag — Huxley and Wilberforce for the British, Darrow and Bryan for Americans. Yet anyone who has ever read the leading theological scientists — from Paley whom Darwin read with pleasure in his youth, to Sedgwick who taught him geology and later branded his great work as crass materialism, to Mivart whose critique inspired the only new chapter added to later editions of the *Origin* — knows full well that the actual debates could scarcely have been further from the image of bigoted Bible-thumping versus enlightened rationalism. For these men were not miracle mongers, asserting God's continuous intervention against the lawful regularities of science; they were not, despite Lyell's words, trying "to cut rather than patiently to untie the Gordian knot". To be sure, they found God manifest in His works (nature), but their tool was science, their commitment to regularity of law and 'knowability'.

Equally unfortunately, this striking discrepancy between stereotype and actuality has engendered the equally misleading myth that there never really was any conflict between science and religion, that the theme embodied in A. D. White's famous treatise, *A History of the Warfare of Science with Theology in Christendom*, is at worst a put-on, at best a *Scheinproblem*. It is the great merit of Gillespie's book that he steers the proper path between these fallacious readings and manages to explain so well how working scientists framed the issue of conflict between science and theology in Darwin's day.

Borrowing a phrase and concept from the most fashionable intellectual of the moment, the French philosopher Michel Foucault, Gillespie recasts the debate as a

Charles Darwin and the Problem of Creation. By Neal C. Gillespie. Pp.224. (University of Chicago Press: Chicago and London, 1979.) £11.55.

contrast between two "epistemes" or world views — creationism and positivism. (Foucault, like T. S. Kuhn, tends to view intellectual history as a set of rapid switches between contrasting world views, each sufficiently encompassing to form a system necessarily excluding its rivals.) Creationism and positivism do not represent religion versus science, but two styles of doing science. (Many positivists, including Darwin at one stage of his life, believed in a personal God who may once have made the world, but declined to muck about with it thereafter.) Positivists insisted upon a fully natural and knowable system of causes, based upon unaltered laws manifest in processes now acting on Earth. The positivist, Gillespie claims, "limited scientific knowledge, which he saw as the only valid form of knowledge, to the laws of nature and to processes involving 'secondary', or natural causes exclusively". Only this kind of knowledge could be called science; indeed, only this kind of knowledge could be called valid at all. Creationists believed that an understanding of nature would reveal the working of God's mind. "The creationist", Gillespie argues, "saw the world and everything in it as being the result of direct or indirect divine activity. His science was inseparable from his theology".

Ironically, the positivist creed triumphed largely because it limited the scope of legitimate questions that science could ask about nature. No ultimate meanings, cosmic purposes or universal designs. Yet, in eschewing such grand themes, positivism gained precision and knowability — its questions could be answered and its answers could win general agreement. The

issue was not science versus God, but the range of legitimate questions within science. (The nineteenth century, after all, was not an age of rampant atheism; few positivists doubted the existence of a personal God.) Positivism held that science could do less, but could answer with agreement and authority. The victory of positivism marked the triumph of fruitfulness over interminable wrangling about the unanswerable.

Thus, the pre-Darwinian creationists — the true 'scientific creationists', in contrast with the fundamentalist imposters now parading under that banner in the United States — did believe that each new species arose *ab nihilo*, but did not use this credo to argue for God against science, miracles against law, or caprice against uniformity. Instead, they searched for regularity in the pattern of creation, hoping to specify its laws, if not its mechanism. And they held an (admittedly vague) belief in the existence of some law-like mode by which the Creator might manufacture his products. Yet, despite the brave words, their actual programme of research held out no hope for specifying or understanding such laws; they bogged down in the unanswerable. The recognition of this dead-end helps to explain why so many creationists were willing to accept Darwin's argument (but to recast it in more congenial terms as the belief that evolution represented God's mode of ordaining the history of life). As Charles Lyell wrote: "It would be more natural to suppose an ass to give rise to a striped offspring with the other characters of a zebra than that a zebra should come into being out of nothing".

But if the creationist episteme entered Darwin's age via evolution as God's mode, then positivists like Darwin and Huxley could rightly ask what creationism had added to their inquiry beyond obfuscation. How did the statement that God worked via evolution help anyone to discover the

mechanisms and processes? In this sense, God had become Laplace's unnecessary hypothesis. Worse than that. Darwin's own mechanism of natural selection seemed so purposeless and heartless to creationists that they sought God's characteristic (anthropomorphic) mode of action in such putative phenomena as variation intrinsically directed towards improvement or saltational origin of fully adapted higher forms of life. These beliefs emasculated natural selection by stripping away its essence — its creative role in building new forms by accumulating small, random, favourable variants — and relegated it to the negative role of executioner for the unfit. Again, the remnants of the creationist episteme became the source of a debate *within* science: what role did natural selection play in the origin of species?

Theology did not only invest science in the form of a lingering creationist episteme. It also influenced the outlook of positivists as well. Darwin became an agnostic in his later life and never (as a positivist) allowed his personal God any direct role in the daily operation of the Universe. But the *Origin* is studded with Darwin's theology; how could any great nineteenth-century work fail to record its influence? Gillespie argues cogently, for example, that the principle of natural selection itself can be viewed, in part, as Darwin's solution to the theological problem of evil. Buckland, and other creationists, had argued that predation was God's gift to prey because it ended their life swiftly before the pain of decrepitude set in. Darwin could not believe that a humane God would work in such a manner, especially when he considered such lingering forms of death as the living, but paralysed, caterpillar devoured by the larvae of wasps. Nature had its cruelties because God played no direct role. Darwin's concern with the problem of evil is evident in what may be the most striking, literary line of the *Origin*:

We behold the face of nature bright with gladness . . . We do not see, or we forget, that the birds which are idly singing round us mostly live on insects or seeds, and are thus constantly destroying life; or we forget how largely these songsters, or their eggs, or their nestlings, are destroyed by birds and beasts of prey.

Gillespie writes about these matters with commendable clarity and authority but without much verve. In many places, the book is little more than a series of quotations strung together with a minimum of connecting text — as if it had been compiled in the old style from index cards, one quote to the card and properly shuffled. One shouldn't condemn a colleague for excess of scholarly zeal, and a little learning may be a dangerous thing. But judicious selection larded with incisive commentary has its place as well, and *Parsifal* might have been even better an hour or two shorter.

More importantly, though I think that the conflict of epistemes is a better model for scientific change than old myths of inductive progress, I am not sure that it always serves Gillespie well. Although he admits that aspects of both epistemes can reside in single individuals, Gillespie does have a tendency to place scientists into one or the other camp. Creationists, pursuing old and unfruitful ways, therefore achieve the unconscious status of impeders. We assume, for example, that Mivart, whom Gillespie describes as dishonest or even odious (to Darwin at least), upheld old ways as a result of his theological bent. This may be an accurate description of his psychology — of his deeper motivation for attacking Darwinism in favour of quasi-theological, directed evolution. But his specific argument still has a logic that needs to be analysed in its own terms. Often, the logic is both cogent and potent. Mivart, for example, penned a brilliant (but forgotten) chapter on homology in *The Genesis of Species*. He argued that the development of serially homologous structures in single individuals obviously cannot be attributed to natural selection, but to "laws of growth". (The laws may be a product of selection, but this is a different matter.) He then claimed that homologous structures in related species often displayed the same morphological sequences as the serially homologous structures of a single individual. How then can homologies between species be attributed only to

natural selection acting upon plastic organic matter? Selection must be strongly constrained in its potential product by the same laws of growth that produce serial homologues in individuals.

Constraint of possible directions for evolutionary change by inherited patterns of development is just now emerging as an important theme in evolutionary biology; it also runs counter to the spirit of NeoDarwinian orthodoxy which exalted the power of selection and downgraded the constraints and consequences of development. Yet, if Mivart must bear the label of "creationist episteme", we may downgrade his message because we recognize its source.

As a scientist who also doubles as an amateur historian, I do appreciate the argument of historical colleagues that present status is an utterly inappropriate category for understanding past ideas, but I also believe that many rejected thinkers of the past appreciated great truths long forgotten by modern traditions. We must separate the logic of their argument from its psychology and genesis. I doubt that Gillespie will disagree, for scientists and historians approach the past both for different reasons and (or so it should be) with a common goal of appreciation in the broadest sense. □

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Perception model

Patrick Rabbitt

Decision Processes in Visual Perception. By D. Vickers. Pp. 406. (Academic: London and New York, 1979.) £23.80, \$55.

PSYCHOPHYSICISTS investigate regularities in human sensory discrimination in order to propose mathematical models for sense organs and neural structures which cannot, yet, be more directly explored in other ways. Their discipline demands a high level of ability, some mathematical sophistication, a detailed knowledge of a very large body of literature in physiology and psychology, and originality in the design and interpretation of experiments. Their work is not easily followed by most academic psychologists and is not followed at all by the public at large.

Douglas Vickers gives a novel and thoughtful account of the subject and attempts, as far as possible, to make it accessible to the general reader. The general reader must be patient and hard-working. Vickers believes that models for human brain function should be guided by what we can guess about the probable evolution of sense receptors and of their analytic backup in the central nervous

system. "Just as the ontogeny of an individual tends to recapitulate the evolution of the species . . . so the human visual system may be expected to embody a succession of progressively refined response sub-systems from [systems for] the most primitive discriminations up to the most complex and specific recognition . . ." (p. 17). This idea of the parallel, separate operation of series of separate systems of different degrees of complexity and subsuming different kinds of discrimination is a profitable one. It is not easy, otherwise, to make sense of recent results obtained from patients with occipital brain lesions who can make discriminations without, apparently, being 'aware' of the data on which they base their judgements. From the minimum perceptual requirements of a hypothetical primitive organism, Vickers attempts to deduce the various problems of discrimination and analysis of information which must arise, and to suggest the most probable mathematical and statistical techniques which the brain uses to solve them. He repeatedly returns to his main thesis that the separate component sub-systems jointly form "a kind of loose society of similar, though independent self-regulating units rather than a unified system of interdependent specialized functions such as are embodied in the