Review of: "Femmes finales: natural selection, physiology, and the return of the repressed"

David Depew[1]

1 University of Iowa

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Remarks on David Haig, “Femmes fatale, natural selection, physiology, and the return of the repressed.”

David Depew

University of Iowa, *emeritus*.

At first blush, this is a study of the history of the Baconian trope about final causes as virgins consecrated to God and for that reason honored but explanatorily barren. (Bacon was referring to nuns, but somewhere down the line they morphed into vestal virgins). David Haig goes on to show how this trope became fused with the figure of teleology as a mistress without whom a biologist can’t live but with whom, in a scientific world dominated by mechanistic causes, he can’t be seen in public. The connection presumably is that, unlike wives, mistresses don't bear offspring. Haig shows that the figures were brought together in discussions of what might be called the philosophy of physiology. One of the field’s seminal figures said that teleology is so important that his fellow physiologists should make an honest woman of her and marry her. And, I suppose, have offspring.

When I first read its title, I thought the paper might have been written by an English professor. It is certainly a tour through some glories of English prose from Elizabethan to Victorian and Edwardian times. In fact, Haig is a biologist, and the thrust of his paper is to show that, although the figure of teleology as mistress is “quaint and old-fashioned,” it deserves to be aired because the issue it addresses is still there in physiology. Let’s hope he's right because the figure is more than “quaint.” It's sexist, and so itself shouldn’t be seen in public, or even entertained in private, without a good reason.

Haig points out that terms like final cause and teleology are not “univocal.” Most of my remarks are about this subject because these terms are so equivocally related that, unless the difficulty is diagnosed, they get in the way of valid and sound argument. I will argue that they mean different things.

‘Final cause’ has an ancient pedigree. For Aristotle, organic parts (*moria*) dispositions, (ethe) and actions (*praxeis*) appear in a regular sequence in ontogeny in order to perform functions and achieve goals that sustain the life and lifestyle (*bios*) of organisms and, by their success in doing so, the species lineage to which they belong. They are irreducibly “for the sake of” (*hou heneka*). “Teleology,” by contrast, is an 18thcentury word. In the post-Leibnizian scholasticism most closely associated with Christian Wolff it referred to the way in which lower-level kinds serve the ends of higher species in ecological systems. This was a noteworthy phenomenon in a world in which material and efficient causes by prior events

were *de rigueur*. The Wolffian meaning persists in Kant's example of rain regularly washing fertile soil down to the Baltic littoral so that farmers can grow crops (*Critique of Judgment,* paragraph 63). Kant's resolution of the antinomy between teleology and mechanism was to think of the former as a requisite heuristic that enables us to identify the e*xplananda* of cycles that can be broken down into a sequence of straightforward "when-then" causes. The idea certainly fits the example. It's easy to resolve the rain cycle into linear causes that make no claim on a future end. Kant, however, took the same point to apply to the parts and processes of organisms, which are much more tightly integrated than ecological cycles. There's no way in which farmers play a causal role in sustaining the cycle, but as Kant himself pointed out in organisms every part is both cause and effect of itself. In that way, I think, the final cause of each part of an organism remained conceptually tied to Wolffian teleology. No wonder Kant concluded that we could never get a constitutive teleology. There would never be a Newton of a blade of grass.

Cuvier knew his Kant, and concluded from his digging in the Paris chalk that organisms are in fact so integrated that from the evidence of a single bone you can reconstruct how an entire extinct species is put together to meet its "conditions of existence." For Cuvier, comparative anatomy and morphology rely on functional explanations, final causes, and teleology all the way down, and not just heuristically or, as in Kant, as symbols of God's presence in creation. In England, the Aristotelian polymath William Whewell agreed. In *Philosophy of the Inductive Science* (1840), he maintained that, "Our discovery of laws cannot contradict persuasion of ends; our morphology cannot prejudice our teleology" (Whewell, *Philosophy of Inductive Sciences*, Vol. 1, Section 9, subsection 6, paragraph 14). As David Haig shows, however, in England the comparative anatomist Thomas Henry Huxley flipped the script, arguing that it is mechanistic causes, and hence structure over function, all the way down.

At this point Darwin enters the picture. In *Origin of Species,* he claimed that natural selection integrates Cuvier's functionalism with the contention of Cuvier's colleague Geoffroy that there is a unity across all phyla and that it moves in the direction of complexity. What had been a synchronic Great Chain of Being is turned into a diachronic history in which higher kinds evolve from lower. Huxley looked to Darwin's theory of descent with modification from a common ancestor for an evolutionary interpretation of Geoffroy's unity and as support for his own structuralism. He did so, however, at the expense of Darwin's stress on natural selection as the cause of functionality. Late in life Huxley wrote of a "wider sense of teleology." But close inspection of the text shows that he thought perhaps even more strongly than ever that everything in the universe is as determined by prior material and efficient causes as Laplace had claimed. He was merely remarking that determinism is logically compatible with imagining an inspecting intelligence who sees everything as having a purpose after all. That's all there is to Huxley's wider teleology.

Darwin's American pen pal Asa Gray, a botanist, picked up the other end of the stick. In a review of *Origin,* he backed Darwin on the power of natural selection to evolve adaptations. Riffing on Whewell's remark without saying so, or perhaps without realizing it, he claimed that natural selection integrates morphology and teleology. Desperate at the time for allies, Darwin appreciated it--so much so that in a passage Haig quotes he told Gray, "What you say about teleology pleases me especially… I had always said you were the man to hit the nail on the head." Still, subsequent correspondence between Gray and Darwin shows that by teleology Gray had in mind more than what Darwin took him to mean. He meant not only that traits have life-preserving effects in particular environments, but also that evolution shows directionality from monad to

man. His argument for this view was *ad hoc*. To make his teleology consistent with natural selection he supposed that God rigs the variation out of which selection evolves adaptations so that it moves in a progressive direction. Darwin disagreed and the two sparred about it for the rest of their lives.

One effect of this encounter was to intensify Darwin's effort to prove that chance variation is so pervasive in nature that there is usually enough of it to evolve adaptations wherever they are needed, including those as subtle, beautiful, and unexpected as the ones he found in orchids. If that was true, Darwin would be able to dismiss any need for what John Dewey, in a rare moment of wit, called Gray's providentialism "on the installment plan." The importance of an almost endless supply of variation has been central to Darwinians ever since and has largely been confirmed. Seen in this light, Michael Ghiselin's idea that Darwin's book on orchids should be read as a send-up of the natural theology of the Bridgewater Treatises is ridiculous. As Jim Lennox demonstrated in an exchange with Ghiselin, Darwin approved of final causes throughout his life. However, after his debate with Gray he seldom, if ever, used 'teleology.' Adaptation and overall directionality are two different things, and the first, understood as the result of natural selection working on a vast sea of natural variation, obviates any need for the second. One of the oddest ways in which the ghost of teleology still haunts evolutionary biology is the conceit that without an overall goal natural selection is aimless and pointless. Really? What's so aimless about adaptation by natural selection? My suspicion is that biology, whether evolutionary or what Ernst Mayr called "functional," doesn't need teleology at all.

Haig suggests that, while structure-oriented morphology can be fully naturalized, its function- and process-oriented counterpart, physiology, is still dogged by need for teleology and at the same time by a need to repudiate it as unscientific. It's in connection with its relevance to physiologists that Haig so nicely traces the history of the intersecting barren virgin and disreputable mistress tropes. What is needed, I think, is a modern version of final cause that applies equally to morphology and physiology.

I wonder whether Haig may be underestimating the effect of the mid-20th century cybernetic revolution in exorcizing the ghost of teleology. He does mention it, but I don't hear him saying as categorically as I would that until that time it was difficult, if not impossible, to separate both functions and overall direction not only from each other but from somebody's purposes and intentions, as the testimony of Gray's guided variation and Huxley's "wider teleology" both demonstrate. With the notion of feedback, however, both negative and positive, everything changes. A new vision of organisms as homeostatic feedback systems—I would add thermodynamically dissipative systems deeply tied to their environments —simultaneously obviates intentional notions like "intelligent design" and the mechanistic view that arose as its antidote and rival and seduced Huxley. Walter Cannon registered the change at the moment of its creation.

Philosophers of biology, who take their job to be analyzing the concepts used by biologists, especially evolutionary biologists, have taken advantage of the shift in how we think of organisms to construe natural selection as damping down the reproductive success of Mendelian populations in unfavorable circumstances and ramping it up in favorable ones. On the so-called consequence-etiological or selected-effects interpretation 'adaptation' refers to traits that feedback-driven natural selection has evolved to enhance reproductive success in a particular environmental situation. That, I submit, is an up-to-date, post-Malthusian, genetic-Darwinian conception of final causation.

Some philosophers, including myself, have used the concept of adaptation by natural selection to naturalize the concept of biological teleology. The argument is that one can rightly say not only that adapted traits have a certain reproduction-enhancing effect, but also that they come to be over multi-generational time *because* they have this effect. That seemed reason enough to call adaptations teleological. I have come to believe, however, that the absence of overall directionality in this analysis precludes such explanations from being called teleological. My own error--I can't speak for others—was to pay too much homage to the commonplace notion that Aristotle was the father of teleology. He was not. He was the father of final causality, which much later Darwin attributed to evolution by natural selection.

What's so embarrassing about that?[1]

[1]A more difficult question is whether on the consequence-etiological or selected effects approach to adaptations should also be taken as an analysis of biological functions. Adaptations, the argument goes, are what functions amount to in a life world brought about largely by natural selection. It was immediately objected that people like Harvey and even Aristotle were able to identify a function without knowing a thing about evolution or natural selection—and that present day biologists, including physiologists, can do it too. The standard alternative is to separate functions and adaptations and to identify the former with the role a part or process plays in sustaining the whole to which it belongs in the environment with which it is coupled. Theoretically an adaptationist of the school of Richard Dawkins could enumerate all the adaptations that go into an organism and not know how they all go together to make a functioning whole. He even admits it when he says that organisms are no more unified than clouds in the sky. Surely this is wrong. Moreover, it is increasingly likely that in addition to non-adaptive agencies like genetic drift there are agencies of adaptation in play at the level of the dynamic environment-organism-ecology relationship. I am referring to self-organization in at least some of its forms. These too depend on feedback, but not in the way adaptive natural selection of particular traits does. So I admit I'm rather sympathetic to objections to identifying functions and adaptation by natural selection.