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

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This is a well-written and scholarly account of changing attitudes to ideas of purpose in biology, during the 19th and early 20th centuries. Haig argues that Darwin gave a mechanistic justification for teleological reasoning: natural selection gives the appearance of design, without any need for supernatural intelligence; this allowed Darwin to use teleological reasoning to understand evolutionary mechanism.

I had thought that this view is widely accepted, yet according to Haig, it has not been, and is still not. One example he quotes is Lynch's criticism of naive adaptationism, which Lynch contrasts with a greater rigour of quantitative population genetics. I think that this is not typical: whilst most evolutionary biologists (following Gould and Lewontin) appreciate the difficulty in actually establishing that particular features are adaptations, they are nevertheless primarily motivated by this quest. Personally, my fascination with evolutionary biology has been to understand the evolution of the extraordinary adaptive complexity that we see in organisms.

The article provides a rich collection of quotations from Whewell, Huxley, Darwin, and others, and gives a compelling account of the intellectual development of evolutionary thinking. I would like to have seen this extend to current thinking - although perhaps that would be another project. It seems to me that whilst evolutionary biologists are generally cautious in attributing function (leaving aside sub-fields such as evolutionary psychology), molecular biologists often assume that every molecular feature has some function. Examples include the use of "up-regulation" instead of "increase", or the assumption that molecular interactions function as "signals" (which Haig notes). A prominent recent example is Graur's critique of the ENCODE consortium's claim that most of the human genome has an adaptive function, simply because it is expressed in one way or another.

Indeed, it is hard to recognise molecular function. We can recognise when coding sequences are maintained by selection, though in most cases, we do not know how that selection is mediated. However, if functions are due to the combined effects of many regulatory sequences, the sequence may carry no detectable signal of selection. At the phenotypic level, some features seem clearly adaptive, and yet this may be very hard to show definitively: the long debate over whether sexual reproduction (in eukaryotes) is an adaptation for facilitating natural selection is a prime example.

The article is organised around the theme of final causes as "barren virgins", and teleology as a "secret mistress". This makes for an engaging text, but is not really central to the argument. I wonder how searching for these gendered terms has affected the focus of the enquiry?

Huxley's contrast between "morphology" (associated with form and structure), and "physiology" (associated with function) seems odd: both aspects of phenotype have been shaped both by descent and by selection. Nevertheless, one can still see traces of this distinction in modern research communities, with emphasis on constraint in "evo-devo", and on function in molecular physiology. Similarly, Burdon Sanderson's distinction between "Physiology" and "Ontology" corresponds to the modern division of biology into molecular versus organismal: both search for mechanisms, but of fundamentally different kinds.

Haig attributes the distinction between asking "How?" versus "Why?" to Mayr, though I imagine that this has deeper roots. From the article, I find it hard to understand Mayr's criticism of teleology (p27): of course, the evolutionary process itself is not goal-directed (though as Ruse has argued, this idea has lurked in the background); yet, the goal-directed behaviousr or organisms is not simply an "expression of the genetic program".

Much could be developed from the final paragraph: why indeed does teleology arouse such passions? Even as we now know so much more about biological mechanisms (both molecular and evolutionary), the debates described here continue to echo through the centuries.