Tim Lewens, ***Organisms and Artifacts: Design in Nature and Elsewhere***. Cambridge and London: The MIT Press (2004), xi + 183 pp.

Tim Lewens starts his *Organisms and Artifacts* with the observation that biology is unique among the natural sciences in the use of terms like 'function', 'purpose', 'problem', 'solution' and 'design'. Like many philosophers, Lewens is convinced that this kind of talk indicates that biologists approach organisms as if they were designed artifacts. The book investigates the model underlying this approach. What exactly are the features of the living world that support artifact talk? In which ways is the analogy fruitful and in which ways is it misleading? Is the analogy strong enough to support the uses to which it is put in biology and philosophy? The main conclusion is that it is a severe mistake to look for an analogue of the intentions of a designer in organic evolution.

Lewens starts his project with an examination of the process that is central to the assumed analogy: the process of natural selection. The artifact model depicts natural selection as a force exerted by the environment that slowly improves the population (just as the artisan shapes objects). Lewens distinguish two ideas that are too easily confused. One is that of selection and drift as forces at the population level. Lewens emphasizes that in this sense selection is a very strange force. For example, selection is presumed to be exerted by the environment on the population, but it acts only if there is variation in the population. A second idea is that of selective forces determining individual survival and reproduction. Lewens argues that although these forces influence the population, what happens to the population cannot be reduced to these forces.

The highlight of this chapter is a discussion of the creative power of selection. Lewens' important insight is that selection explains the increase of adaptedness due to the fact that the selected entities have a better chance that the rejected ones to produce variants that are even

better adapted. This means that selection only increases adaptation if the nature of the entities to which it is applied is such that the fitter ones have a better chance of producing even fitter ones. Hence, it is the combination of selection and the nature of the objects that are subject to selection, rather than selection alone, that explains gradual increase in adaptedness.

One main application of the artifact model is the adaptationist research program. This program views organisms as solutions to adaptive problems; solutions that are subject to certain constraints. Adaptationism is contested in biology, but it is often unclear what exactly the point is of the different criticisms. Lewens' discussion of these issues is highly illuminating. He shows that the most common criticisms (evolutionary skepticism) point to severe methodological difficulties but do not threaten the artifact model. He identifies the real weaknesses of the adaptationists's use of the artifact model (such as failure to deal with drift and exaggeration of the independence of the different traits of an organism), pins down the sting of more radical criticisms (structuralism and constructionism) and successfully separates apparent from real disagreements.

Another application of the artifact model can be found in the discussion of the notion of function in philosophy. According to Lewens biologists use teleological terms like 'function', 'purpose' and 'design' as a heuristic tool to draw conclusions about likely effects of selection. The main connotations of the notion of function when talking about artifacts are the idea that function ascriptions are explanatory and normative and that function attributions distinguish functions from accidents. Lewens argues that there are several ways to construct the analogy between biological and artifact function but none of them perfectly matches these connotations. For example, if the size of a uniform but initially badly camouflaged population of orange moths increases because (due to a new chemical plant) the trees on which these moths rest become covered with orange powder, the dominant theory of function (according

to which functions are the effects for which a trait was selected in the past) fails to depict the effect that explains the increase (better camouflage) as the function: since there was no variation, there was no selection.

I have doubts about Lewens' views on how biologists use function talk. The main application of notions like function and design is not to be found in evolutionary biology, but in (the name says it) functional biology. Functional biologists appeal to function to understand organization and it is the organized character of organisms that explains the utility of function talk (Wouters 2005). The analogy (if any) between the *processes* of artifact design and organic evolution plays no role.

Interestingly, Lewens seems to come to a similar conclusion in the next chapter, where he discusses the question why the artifact model is widely used in biology, but not in physics and chemistry. An obvious answer refers to natural selection. Lewens points out that in the cases of clay crystals, selfish-DNA and segregation distorter genes there is selection, but no function talk. In the case of sorting processes (for example when new drugs are discovered by putting millions of randomly generated complex molecules through a series of tests for desired functions) function talk can be helpful even though there is no selection. He draws the conclusion that it is the internal constitution of biological entities rather than selection that explains the utility of function talk. I don't understand why he still seeks to define function in process terms, rather than in terms of the *products* of the process.

The last chapter is concerned with the claim that artifacts evolve by selection. Lewens argues that many of the issues as they are currently stated are misconceived and indicates what the real problems are. In addition, he suggest ways in which an evolutionary approach may improve the process of technological innovation.

I found Lewens' book refreshing and well worth reading. It breaks with the habit to discuss everyday intuitions about function in the service of the philosophy of mind. Instead it focuses on substantial issues with regard to biology. It presents many new and important insights. I recommend it to anyone engaged in the areas that according to Lewens apply the artifact model. Yet, in the end I was left dissatisfied. I am not convinced that so-called teleological language is derived from artifact talk and Lewens does not present much argument for this assumption. More importantly, Lewens himself is unclear about what is left over from the analogy between organic evolution and artifact design. He suggests that there are important similarities between the two but does not list them. He seems to hesitate between two possible roots of artifact talk: sorting processes and the structure of the objects involved. He says that much of his argument rests on an understanding of the nature of natural selection as a population-level, statistical phenomenon, but this insight is not explicitly worked out after the second chapter. Finally, the last chapter is off-topic and stirs up a discussion that deserves a whole book.

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## REFERENCES

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