The erratically fine-grained metaphysics of functional kinds in technology and biology

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Abstract

In this paper we present two arguments both directed against taking functional kinds as real kinds. The first argument focused on technology and aims at establishing that the technical functions of artefacts cannot be taken as their essences: this position violates on the currently available accounts of technical functions engineering intuitions about identity and persistence conditions for artefacts. Then we prove that this first argument can be transposing to biology, amounting to our second argument aimed at establishing that the biological functions of organs cannot be taken as their essences: this second position violates on the currently available accounts of biological functions intuitions in biology about identity conditions and persistence conditions for organs. The first argument poses a problem for Lynne Rudder Baker's constitution view of artefacts, the second poses a problem for David Wiggins' view on kinds of biological organs. Our more general conclusion is that the problems an ontological realist is facing in technology can also surface within biology.

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Functions seem to slowly find their way into the debate of ontological realism. Yet, the pace with which this is happening differs for two central domains in which functions are associated to entities: initially functions were in the biological domain considered as candidates of essences but not in technical domain (see, for example, D. Wiggins 2001). In more recent contributions to the debate functions are also granted this role in technology. L.R. Baker, for instance, when expanding her constitution view to the realm of artefacts, holds that "an artefact has its proper function essentially: the nature of an artefact lies in its proper function …" (2004, 102). Especially this latter development warrants an analysis of the arguments for and against taking functions as essences in technology, and possible ways in denying or circumventing them. We will do so to arrive at an alternative argument against taking functions as essences in technology that, moreover, can be transposed also to the domain of biology. Hence, taking functions as essences is equally unattractive in biology as it is in technology.

Wiggins' argument against taking functions as essences of artefacts follows from his anti-realist thesis for artefact kinds. For Wiggins, a way for distinguishing real kinds from other kinds is that real kinds possess an identity condition (or – as Wiggins says – a principle of individuation) for the objects belonging to that kind, or, more specifically, a persistence condition for those objects. He then holds that there are such identity conditions for objects belonging to natural kinds, showing that natural kinds are real kinds, but he argues that for artefacts identity conditions are not available. In particular, for Wiggins *functions* of artefacts cannot be considered as providing identity conditions for them; he denies functions to be essences of artefacts. (See Wiggins 2001, 87).

To escape this argument one may try to define the essence of an artefact as a conjunction of its function and some other feature of the artefact, say, its physical structure and/of its mechanism. Let us refer to this conjunction as the function^{+} of an artefact, where the "+" denotes whatever is added to the function. The thus acquired metaphysics of functional^{+} kinds may now produce a better fit with artefact kinds as they are regularly distinguished.

We argue that when the function of an artefact is taken as part of its essence, the kinds one obtains are sometimes too fined-grained relative to the usual division between artefact kinds: it leads to identity conditions that are unable to take artefacts that are technologically taken as of the same kind as being also of the same kind, and it leads to persistence conditions that does not reproduce the usual persistence of artefacts.

Wiggins did not raise his argument against taking functions as essences of biological items. On the contrary, biological functions of organs are by him taken as candidates of (part of the) essences of those organs (2001, 86-87).

Following up on our results on functions of artefacts, we argue analogously that when the functions of biological items are taken as part of their essence, the kinds one obtains are sometimes too fined-grained relative to the usual division between biological kinds: it leads to identity conditions that are unable to take biological items that are biologically taken as of the same kind as being also of the same kind, and it leads to persistence conditions that does not reproduce the usual persistence of biological items.

The point we are making is that from a metaphysical point of view, functional kinds are in technology and biology similarly erratic. Hence, if the erratic character of functional kinds is reason to deny artefact kinds the metaphysical status of real kinds in technology, this erratic character is also reason for denying organ kinds the status of real kinds in biology.

We first consider the position that functional kinds or functional$^+$ kinds are to be taken as real kinds in technology. Our argument that this position is leading sometimes to a too fined-grained metaphysics has two starting points.

The first consists of two consequences of taking functional or functional$^+$ kinds as real kinds and is that two artefacts that have different technical functions are not of the same real kind and that an artefact that has at two instances different technical functions is at those two instances not an artefact of the same real kind.

The second is that the position that functional or functional$^+$ kinds are real kinds lacks precision as long as it not spelled out what technical functions are. Hence, what is needed is an account of technical functions that is independent of the position considered. In the literature – specifically in the philosophy of technology and of biology – there are a number of candidate accounts available. The accounts of technical functions that we consider are:

1. the designer intentions account in which the technical functions of an artefact are the capacities for which agents designed the artefact;
2. the user intentions account in which the technical functions of an artefact are the capacities for which agents use the artefact;
3. the causal-role account in which the technical functions of an artefact are the capacities by which it causally contribute to capacities of larger more complex systems;
4. the etiological account in which technical functions of artefacts are the capacities for which they are reproduced in a long-term sense.

We argue for each of the accounts on this list that the position that functional or functional$^+$ kinds are real kinds leads to identity and persistence conditions that produce a too fine-grained metaphysics.

First, we consider erratic identity conditions. The consequences of taking functional or functional$^+$ kinds as real kinds, that two artefacts with different technical functions are not of the same real kind typically leads to divisions of the artificial realm that correspond to the regular ones. Two artefacts that have different functions, such as, say, an antenna and a hovercraft, are often also considered to be of different kinds. But in some cases, this consequence separates artefacts that are technologically taken as of the same kind as being of different real kinds. This holds for all the four accounts of technical functions listed above, although the cases may differ per account.
For instance, with the designer intentions account of technical functions the original phone designed by Bell has the function of aiding the hard-of-hearing, since history has it that

Bell designed his original phone for that capacity. Later phones designed by Bell or by others were however designed for long-distance communication and thus have this communication as their function on the designers intentions account. The original phone and any one of these later phones are thus of different functional or functional+ real kinds but regularly taken as technologically of the same kind. Given the later developments in telephone technology and design, the consequence that the Bell's original phone and a modern twenty-first-century cellular phone do not come out as being of the same real kind, may be taken as acceptable. Yet, on the designer intentions account already the direct successors of Bell's original phone may come out as being of a different kind than the original.

The second argument concerns erratic persistence conditions. The position that functional or functional$^+$ kinds are real kinds in technology has the consequence that an artefact persists as an artefact of its kind as long as it keeps the same function; if an artefact looses its function or picks a new one up, then it becomes an artefact of a different kind. For many cases this second consequence may again be taken as acceptable: when an artefact, say a plane, looses its function to fly by physical changes such as wear and tear, is seems acceptable to stop taking it as a (true) plane. But in some cases, and with two of the four accounts of technical functions we consider in the paper, this consequence makes that an artefact that is technologically taken as persisting as an artefact of its kinds, continue to exists as an artefact of a different real kind.
Take, for instance, an old-fashioned flatiron consisting of a flat wedged-shaped lump of iron onto which a handle is attached. As long as such a flatiron is not physically changed, it persists intuitively as the same flatiron. Yet, originally these artefacts may have been used solely for ironing. Many probably have not survived the moment at which they become obsolete due to the advent of more modern flatirons, but some still exist today and are currently used as doorstops. By this new use these latter flatirons have in the user intentions account and in the causal-role account of technical functions picked up a new function and lost their original one. Hence, on these two accounts these flatirons have not persisted as artefacts of the same functional or functional+ real kind.

Then, we consider the position that functional kinds or functional$^+$ kinds are to be taken as real kinds in biology. Our argument that also this position is leading sometimes to a too fined-grained metaphysics has by and large the same structure as the argument we gave for technology. The two consequences of this position that we consider is that two organs – we focus for simplicity on organs only – that have different biological functions are not of the same real kind and that an organ that has at two instances different biological functions is at those two instances not an organ of the same real kind. And we assume the position that functional or functional$^+$ kinds are real kinds lacks precision as long as it not spelled out what biological functions are.

Hence, we draw again from the literature a number of candidate accounts of biological functions. The ones we consider are adopted from Arno Wouters (2005):

1. the systemic approach in which the biological function of an item are "the role of that item in bringing about an activity or capacity of a complex system of which that item is a part";
2. the goal contribution approach in which the functions of an item are its causal contributions to the maintenance of a 'goal state' of the organism of which it is a part;

3. the life chances approach in which “the functions of a trait [are] the effects of that trait that contribute to the life chances of its bearers being higher than the life chances of hypothetical organisms in which that trait is replaced by another one”;
4. the etiological approach in which “the functions of a trait are past effects of that trait that causally explain its current presence”;
5. the non-historical selection theory in which “the function of a trait at a certain time is the effect for which that trait is selected for at that time”.

We again assume that the different more definite meanings the position acquires with these accounts are acceptable, and then argue that the position violates intuitions about organs within biology and is leading to a too fine-grained metaphysics in the biological domain.

Again, firstly we consider erratic identity conditions. The consequences that two organs with different technical functions are not of the same real kind again typically leads to divisions in biology that correspond to the regular ones. Two organs with different functions, such as, say, an eye and a wing, are often also considered to be of different kinds. But with all five accounts of biological functions there are cases where this consequence separates organs that are biologically of the same kind.

Secondly, we consider erratic persistence conditions. It can also be shown that the position that functional or functional^{+} kinds are real kinds in biology leads on some accounts of biological functions to persistence conditions for organs that violate intuitions about those conditions. This hypothesis implies that an organ persists as an organ of its kind as long as it keeps the same functions. And it implies that an organ that looses a function or picks one up, becomes an organ of a different kind, even if it stays physically the same object. This second consequence seems to violate immediately intuitions about organ persistence.
Consider, as an example, the wing muscles of birds on the systemic approach towards biological functions. Assume that two birds are of the same species and assume that one lives at main land where it flies regularly, and that the second lives on an isle and does not have the disposition to fly. We are agnostic about how this case came about, a possible scenario being that the birds of the species considered initially lived at the main land only, that some birds were blown to the isle and then adapted in a number of generations to their new stormy environment by losing the disposition to fly – birds that kept on flying were blown into sea. The wing muscles of the bird on the main land then have a role in bringing about the bird’s activity/capacity to fly, and this role is thus a function of those muscles on the systemic approach. The wing muscles of the bird at the isle do not have this role since this second bird cannot fly, and thus have this role not as a systemic function. Hence the wing muscles of the two birds have different functions on the systemic approach and are thus of different functional or functional+ real kinds, whereas these muscles are still morphologically similar and thus biologically of the same kind.

More generally our conclusion is that the problems an ontological realist faces in technology can also surface within biology. Hence, quickly discarding these problems in the domain of technology by taking the position that ontological realism should not be defended in that domain in the first place, will not do: if the erratic behaviour of technical functional kinds in technology is sufficient reason for not taking technical functional kinds as real kinds, then the erratic behaviour of biological functional kinds in biology is equally

sufficient reason for not taking biological functional kinds as real kinds. Consider, for instance, the following three assumptions:

(i) Artefacts of the same kind have the same technical functions.
(ii) Artefact kinds are natural kinds.
(iii) Natural kinds are real kinds.

These three assumptions lead to the conclusion that artefact kinds are technical functional kinds and that the conjunction of these assumptions thus violate engineering intuitions about artefacts. This violation is easily avoided for an ontological realist since it seems not a problem to deny assumption (*ii*). But the same violation surfaces in biology, where the assumptions are now:

(iv) Organs of the same kind have the same biological functions.
(v) Organ kinds are natural kinds.
(iii) Natural kinds are real kinds.

Hence, if one holds on to the first assumption, as Wiggins (2001, 86-87) does, then one can avoid violating biological intuition about organ kinds only by denying that (*v*) organ kinds are natural kinds or (*iii*) that natural kinds are real kinds.

References

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