

ESSENCES AND NATURAL KINDS

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1 Introduction

Essentialism as applied to individuals is the claim that for at least some individuals there are properties that those individuals possess essentially. What it is to possess a property essentially is a matter of debate. To possess a property essentially is often taken to be akin to possessing a property necessarily, but stronger, although this is not a feature of Aristotle's essentialism, according to which essential properties are those thing could not lose without ceasing to exist. Kit Fine (1994) takes essential properties to be those that an object has in virtue of its *identity*, while other essentialists refer (as Fine also does) to the *nature* of an object as the source of its essential properties. It is sometimes important to distinguish the essential properties of a thing and the 'full' essence of a thing. The latter is the set of the essential properties of a thing, when that set necessarily *suffices* to determine the thing's identity. One might hold that something has essential properties without agreeing that it has an identity-determining essence.

Essentialism was largely in abeyance during the first two thirds of the twentieth century thanks to the domination of analytic philosophy by anti-metaphysical logical empiricism and the linguistic turn. The rehabilitation of essentialism owes much to the development of a formal apparatus for the understanding of modality more generally, thanks to C. I. Lewis, Ruth Barcan Marcus, and Saul Kripke. Kripke's discussion of essentialism both about individuals and also about natural kinds brought essentialism to wider philosophical prominence. Natural kind essentialism, which finds its modern genesis also in the work of Hilary Putnam, claims that natural kinds have essential properties: to say that possession of property P is part of the essence of the kind K implies that, necessarily, every member or sample of the kind K possesses P. Essentialism about individuals has been linked to thinking about natural kinds by the contentious claim that one of the essential properties of any entity is that it belongs to the natural kind (or kinds) it actually belongs to.

In this chapter I shall first outline certain claims and arguments concerning essentialism concerning individuals (Section 2). I shall then (Section 3) introduce the notion of a natural kind in more detail before discussing natural kind essentialism (Section 4).

2 Essentialism concerning individuals

A simple account of essentialism concerning individuals takes **a**'s essential properties to be precisely those **a** possesses necessarily (reading ' $\Box p$ ' as 'necessarily p '):

(N) **a** possesses F essentially $\leftrightarrow \Box Fa$.

The implications in (N) may be challenged in both directions. Considering, the right-to-left implication, as Kit Fine (1994) emphasizes, it is not the case that if $\Box Fa$, then **a** possesses F essentially. Anything is such that $2+2=4$, and necessarily so, but being that way is not an essential property of every object; it is essential to the singleton set containing Socrates that it contains Socrates, but while it is a necessary truth concerning Socrates that he is a member of that set, that truth is not any part of Socrates' essence.

The left-to-right implication in (N) is rarely challenged in modern metaphysics, but, it should be noted, is not required by Aristotle's essentialism:

(A) **a** possesses F essentially $\leftrightarrow \Box(\mathbf{a}$ loses F \rightarrow **a** ceases to exist).

The Aristotelian idea that a property F is essential to **a** when **a** cannot lose F without ceasing to exist is consistent with the possibility that **a** might never have acquired F. Some properties are persistent, in that once acquired, they are possessed at all later times, so long as the possessor continues to exist: 'existing on 1 January 2008' is an example, 'being born in Boston' (cf. Brody 1967) is another, as is 'being a butterfly'. The persistent properties just mentioned can be acquired but might not have been: many things existent on New Year's Day 2008 might have ceased to exist during 2007; the mother of an unborn child might have decided to have her baby in Cambridge rather than Boston; the caterpillar may have died before metamorphosis (we are assuming here that metamorphosis involves a persisting individual). All persisting properties are essential according to (A), but as these examples show, they are not necessary properties of their bearers. The first two may suggest that (A) is too liberal in what it allows to be an essential property, and indeed (A) allows to be essential properties those which Fine rejects, since necessary properties are trivially persistent properties. Note that (A) also makes existence an essential property of any existing thing. While this may require some tightening up of the right-to-left implication of (A), for example, by reference to an entity's nature, the Aristotelian would still claim that an entity might acquire a nature that once acquired cannot be lost. Aristotle himself thought that an embryo is not itself a human but becomes a human; but once human something cannot cease to be human without ceasing to exist. Similarly, and less contentiously, the caterpillar becomes a butterfly, but once a butterfly cannot cease to be a butterfly without ceasing to exist.

As it happens, most contemporary discussions of essentialism assume (N)—which is not to say that contemporary arguments for essentialism cannot be transformed to support a more exacting notion of essence, such as Fine's. Kripke argues for F's being an essential property of **a** by eliciting our intuitions that **a** could not lack F. But since the relevant property F is in each case something that is plausibly part of **a**'s nature or is relevant to **a**'s identity, then F is at least a candidate for an essential property by Fine's standards.

Kripke argues for the essentiality of (a) origin; (b) composition or substance; and (c) character or kind. We will review these arguments in turn.

In responding to a passage from Timothy Sprigge (1962), Kripke raises the question, could a person, the Queen for example, have had different parents from those she actually had. Kripke is careful to distinguish (implicitly, Sprigge was not) this modal question, from an epistemic question, could we discover that the Queen's parents are not the people we thought them to be. The answer to the latter question might, perhaps, be *yes*, but that does not answer the modal question: given that it is in fact true that the Queen's parents were George VI and Elizabeth Bowes-Lyon, would it have been possible for the Queen, that very same woman, to have had different parents, say Mr and Mrs Truman (the thirty-third president of the United States, Harry S. Truman and Elizabeth Virginia Truman, née Wallace). Kripke's answer is that while we can imagine that the Queen never became Queen, we cannot imagine her having different parents or being born from a different sperm and egg. Thus, more generally, a person's origin, being born of those parents and from that sperm and egg, are necessary properties of that person. By (N), origin is essential to a person—and since origin, arguably, concerns a person's identity or nature, origin may plausibly be regarded as essential by Fine's more exacting standards. (For a defence and elaboration of the essentiality of origin, see McGinn 1976.)

Essentiality of origin is not limited to persons or even to living creatures. Kripke asks of a particular wooden table, could it have been made from a different block of wood or even from a block of ice from the river Thames. For example, the Presidential desk in the Oval Office is constructed from planks from the ship HMS Resolute. Could that very same desk have been constructed from wood from different planks from different trees or even from kevlar? The kevlar desk is intrinsically different from the actual presidential desk. But the desk made from wood from different planks need not be. Could that desk have come from material of completely different origin, even if intrinsically identical to the actual desk? (Likewise Forbes points out that we can conceive of scientists constructing an zygote (fertilized egg) intrinsically just like that which grew into Queen Elizabeth II. Given that she did not in fact come from such a zygote, could she have done? Essentiality of origin says *no*.)

Kripke's claim does not rest upon intuition alone—he does offer the following (much-discussed) supposed proof. Consider some source material suitable for a wooden desk like the presidential desk, say a certain selection of planks from the USS Rattlesnake. Could the very same presidential desk, the one now sitting in the Oval Office, have been made from the Rattlesnake planks rather than the Resolute planks? Here is an argument as to why not. Consider a world like ours except that in addition to the making of the presidential desk (call it 'P-desk') another, intrinsically identical desk is made from the Rattlesnake planks (call this 'Q-desk'). Clearly P-desk and Q-desk are different desks. Now consider a third world, in which no desk is made from the Resolute planks but a desk is made from the Rattlesnake planks. That would be Q-desk, and since Q-desk \neq not P-desk, the desk made from the Rattlesnake planks is not P-desk. So P-desk, the actual presidential desk, could not have been made from the Rattlesnake planks, nor, for the same reasons, from any other hunk of matter that is entirely distinct from the matter from which it was actually made.

The issues of the *substance* (composition) and the *kind* (nature) of an individual are clearly related to that of origin, but essentiality of substance and kind are not immediate corollaries of the proof just given. For the latter depends only on the *identity* of the originating matter. The presidential desk originates essentially from those planks in HMS Resolute, but if those planks could have had a different composition, such as kevlar, then the presidential desk would also have had a different composition. Kripke notes that it is the *original* composition and kind of the desk that is at issue here, not the Aristotelian question of whether it could change in certain ways. (Perhaps the same desk could fossilize over time and so no longer be made of wood, or it may, with some small adjustments consistent with retaining its identity, become some other piece of furniture and no longer a desk—yet it may still be true that it must have started out as a desk made of wood.) Kripke does not offer an argument for the essentiality of original composition. However, it is intuitively highly plausible that a plank of wood must have had as its source some tree or other woody material and could not have been made in a kevlar factory. So for the planks at least, it seems as of they must originate from a certain stuff (wood). And if the essentiality of the identity of origin is true, then the presidential desk must be *made* from wood (whatever it may subsequently become).

Even if it is true that the presidential desk must have come from those planks and be made (originally) of wood, a further pair of questions are whether it must be a desk, and whether it must originally have been a desk. Thus we have considered so far (i) the essentiality of identity of origin, and (ii) the essentiality of composition and original composition; now we are considering (iii) the essentiality of *kind* and of *original kind*. Again the last two are distinct. It could well be that the desk could retain its identity without remaining a desk—perhaps some president might order it to be turned into a drinks cabinet with a few modifications. It might be correct to say, “that cabinet was once the presidential desk”. Still, it might also be true that the cabinet must have been a desk once. One might doubt whether the cabinet would be that very thing had it been fashioned directly from the planks of HMS Resolute. Although the claims of essentiality of (identity of) origin and the essentiality of (original) kind are distinct, in this case at least the driving intuitions may be related. For the discussion of the origin of the desk in those planks from HMS Resolute generated the result that the desk must originate with those planks, not simply that it must originate with those molecules (which need not be arranged as planks). Arguably therefore, the intuition that this item must have started life as a desk has the same source—it must have originated from that matter arranged desk-wise.

In the case of the desk, a change of kind seemed possible—it could become a cabinet and remain the same thing. In other cases, however, kind seems essential in addition to original kind. As noted, this is a different question from whether it is possible to lose one's kind. It may not be possible for Augustus to stop being a god once he has become one, although it was merely contingent that he became a god at all. A caterpillar need not have become a butterfly, but having done so, she must remain a butterfly until death. Of course, if belonging to kind K is essential to x then x cannot cease to be of kind K. Are there cases where it is essential to x that x is of kind K?

A very strong claim of this sort is that it is essential to every item x and for every *natural* kind K , that if x is of kind K , then x is essentially of kind K . The butterfly case may seem to be a counterexample. But in such cases there seems to be room for denying that ‘caterpillar’ and ‘butterfly’ are kinds at all—perhaps they should be regarded as *phases* along the lines of ‘child’, ‘adolescent’, ‘adult’ (to pass through puberty is not to change one’s natural kind). The intuitive case for essentiality of kind appears, at first sight at least, quite compelling. The human prince could not have been a frog; it seems that being human he must necessarily be human. Similarly for other kinds. Could this gem, a diamond, have been quartz, this nugget of gold have been a lump of lead, or the moon have been a star? Negative answers are at the very least plausible.

The fact that essentialism renders fairy tales and dreams of transmutation impossible is no objection, since the denial of an essential truth need not be incoherent. And in the transmutation case, what essentialism rules out is not the production of gold from lead but rather the continued existence of any items made of lead through the process of transmutation (they cease to exist and are replaced by gold items). However, to concede that x is human $\rightarrow \Box x$ is not a frog, is not to agree that x is human $\rightarrow \Box x$ is human. The process of speciation allows individuals to become members of new species—when a species divides into two species, the old species ceases to exist, hence its members change their kind. In an actual process of transmutation, such as beta decay, there is good reason to maintain that the individual nucleus retains its identity while changing the element it instantiates.

We have discussed whether individuals might have certain sorts of essential properties—we have not yet addressed the question of whether they have full essences, i.e. sets of essential properties that necessarily distinguish the individuals. One might think that although it is essential to Castor and Polydeuces that they have Zeus and Leda as their parents, and that they come from such-and-such an egg, if they come from one and the same egg (i.e. if they are monozygotic ‘identical’ twins), then there is no further property that distinguishes one from the other in all possible worlds. However, Graeme Forbes (1985) argues that in order to make sense of identity across possible worlds, we need essences. For without essences we could imagine a non-actual possible world where everything true in the actual world of Castor is true of Polydeuces and vice versa; intuitively, that would not be a different world at all. One could avoid this by appealing to basic facts about identity. But what sort of facts would these be? One might expect such facts to be grounded in some ontological feature of the world, such as the properties of things. Duns Scotus’ proposal for such an individuating property asserts that each individual has a *haecceity*—a non-qualitative property that is necessarily possessed by exactly that individual (e.g. the property of being Socrates). Forbes argues for a more attractive but more ambitious view according to which individual essences are grounded in non-haecceitistic qualitative properties.

3 Natural kinds

We find it intuitively natural to classify objects and samples of stuffs into kinds. Many such classifications seem to us to be natural, corresponding to divisions that exist in nature, distinguishing, for example, bees from wasps, bits of gold from bits of silver, and perhaps also cases of cholera from cases of (bubonic) plague. One might maintain that the appearance of naturalness is merely appearance, and that the classifications in question are no more objectively natural than say divisions of motor vehicles by manufacturer, engine size, or style. The latter view is *conventionalism* about kinds and is related to constructivism (constructionism) more generally in the philosophy of science.

Those who take the more intuitive, naturalistic approach, agreeing with Plato that such classifications do, sometimes at least, ‘carve nature at the joints’ are faced with the question: what is it in nature that makes such classifications genuinely natural? It cannot merely be that the members of a kind are objectively similar, by sharing some natural property. For it is possible for objects to share a natural property without forming any kind: the class of positively charged objects is too heterogeneous, including as it does all protons and positrons, sodium ions and hydronium ions, balloons that have been rubbed on a jumper, and so on. Likewise the class of objects of mass 1kg all share a natural property without forming a kind. J. S. Mill makes this point, remarking that white things do not form a kind. Mill and others have allied kinds to induction—natural kind classifications are those that permit induction. But that again does not, as it stands, distinguish natural kinds from the sharing of some natural property—we can make inductions concerning positively charged objects, objects 1kg in mass, and white objects, respectively.

More promising is the idea that natural kinds are particularly *rich* sources of inductive knowledge—they are marked by the confluence of several natural properties, such that membership of the kind can be inductively inferred from knowledge that a particular possesses some subset of those properties, which in turn permits an inductive inference to the remainder of the properties associated with the kind. An organism may readily be identified as a tiger—a member of the species *Panthera tigris*—on the basis of casual visual inspection. That allows one to infer that the organism is a vertebrate, carnivorous, sexually reproducing, viviparous, and so forth. According to Richard Boyd’s (1999) *homeostatic property cluster* view of kinds, kinds involve clusters of properties as just described, and for good reason. Natural mechanisms ensure that individuals frequently have most or all of the properties in the cluster, but infrequently or never have just several of the properties.

Biological species were, until Darwin, the paradigm of a natural kind. However, deeper understanding of species, especially in the light of evolution, has cast doubt, for many philosophers of biology, on the claim that species are natural kinds. First, there is no set of intrinsic properties such that possession of these properties is necessary and sufficient for species membership. Almost any characteristic property of a member of a species can be lacked by some member or other, and this goes even for genetic properties—there is no genotype all and only common frogs (*Rana temporaria*) have. Furthermore, a creature may have all the characteristic properties of a kind yet fail to be a member of that kind—a creature that evolved on another planet

to be the intrinsic duplicate of some common frog but will not be a member of *Rana temporaria*. Thus species membership is not an intrinsic property of an organism.

Many philosophers of biology have responded to this fact by denying that species are natural kinds, asserting instead that species are individuals (Ghiselin 1974; Hull 1976). Furthermore, this allows one to say that species evolve, since individuals can change, but natural kinds, being abstract entities cannot. But these reasons need not be taken to be decisive. Perhaps the membership of some natural kinds is not an intrinsic matter. It may be that the belief that it is intrinsic stems from the view that natural kinds have essences, and that essential properties should be intrinsic. But as we have seen above, the essential properties of individuals need not be intrinsic; perhaps they need not be for kinds either. As regards the point about evolution, the evolution of species is a matter of changes in the frequency of certain genotypes within the population, which is consistent with a variety of views about the ontology of natural kinds. Note, for comparison, that the frequency of various isotopes of an element may change over time without that showing that the chemical elements are not natural kinds.

The discussion of the preceding paragraph assumed that natural kinds are abstract objects, and furthermore implicitly assumed that natural kinds have essences. I shall now address the first of these two matters and then turn to the issue of natural kind essentialism in the fourth and final section of this chapter.

One should, *prima facie*, distinguish two claims: (i) there are natural divisions among things into kinds; (ii) there are entities that are the natural kinds. The latter is an ontological claim about the existence of certain things. The former is a claim about the grouping and differentiation of things in a natural fashion. A much older and more prominent debate over the nature of properties divides realists who think that properties are certain entities, universals, from nominalists who think that there are no such entities. Most (property) nominalists think that there are genuine and natural similarities and differences between things. Likewise a natural kind nominalist may reject conventionalism without buying into the analogue of realism for natural kinds, a belief in natural kinds as entities. One reason why the distinction between (i) and (ii) has not been so prominent for natural kinds as for properties, is that it is common to express the rejection of conventionalism by saying 'there are natural kinds', which has an implicit quantification over natural kinds, and hence an ontological commitment. Another is the fact that the term 'realism' in connection with natural kinds has tended to be used to denote the rejection of conventionalism. In both respects the impression is given that positive answers to (i) and (ii) are to be conflated. (For these reasons I suggest that we differentiate between *strong realism* which is the ontological commitment to the existence of natural kinds as entities, and *weak realism* (or *naturalism* about natural kinds), which is the view that there are objectively natural divisions of things into kinds).

Given the analogy between ontological strong realism about natural kinds and realism about universals, one might wonder whether arguments for the existence of universals can mutate into arguments for the existence of natural kinds. It seems not, however. Arguments for realism about universals claim that without universals we are unable to explain the similarity and difference we find between things. The analogous argument for natural kinds would claim that we need the existence

of natural kinds to explain the perceived natural groupings of things. But there does not seem to be any explanatory deficiency here. For example, the homeostatic property cluster view of natural kinds is able to explain the groupings of things into kinds by appealing to properties alone, and without the addition of kinds also.

A commitment to natural kinds as entities requires, therefore, a different argument. One such argument, I suggest, starts from the observation that natural kinds are widely regarded as having essences. As was remarked at the outset, essentialists typically take essential properties to concern the identity or nature of a thing. But only genuine existents have an identity or nature. In which case essentialism about natural kinds commits one to their existence. In the next section we examine the claim that natural kinds do indeed have essential properties.

4 Natural kind essentialism

Natural kind essentialism may be understood in a stronger form that implies strong realism about kinds: there are entities that are natural kinds and these have essential properties (and possibly full essences also); or in a weaker form that is *prima facie* compatible with natural kind nominalism: there are *a posteriori* necessary truths concerning the extensions of natural kind predicates. Most discussions of natural kind essentialism have assumed only the latter. Above I mentioned the view that the natural kind to which an individual belongs is an essential property of that individual. This claim is not implied by essentialism about the natural kinds themselves. One might think that an individual may change its kind from K to L, yet hold that so long as it is a member of the kind K, then it must also have certain properties that are non-trivially entailed by membership of K. For example, it may be necessary that a frog has certain (possibly extrinsic) properties in virtue of being a frog, but that may not prevent some creature ceasing to be a frog as the result of some speciation event (e.g. were *R. temporaria* to split into two daughter species).

Recent discussions of the view that natural kinds have essences have the work of Kripke (1971, 1980) and Putnam (1975) as their origin. Their arguments are intertwined with arguments in the philosophy of language concerning reference and designation. I shall briefly discuss this context partly in order to make it clear that the arguments for essentialism are not in every case corollaries of the arguments in the philosophy of language and can be stated independently of them.

One of Kripke's central concerns is to refute a conception of the reference of proper names and natural kind terms which maintains that reference is achieved in virtue of the referent satisfying a certain content (e.g. a description or sense) that constitutes the meaning of the term in question, in such a way that this content is grasped or understood by a competent user of the term. With respect to proper names—let one such name be **a**—Kripke proceeds by taking some plausible content for the meaning of **a**—let that content be Φ —and then shows that $\Phi\mathbf{a}$ is (i) not necessary; (ii) not analytic; and (iii) not knowable *a priori*. Hence Φ cannot be the meaning of **a**—and by extension all other candidate meanings will fail these tests too. Kripke's diagnosis of the failure of candidate meanings to pass the test of necessity is not simply that the proper name has no meaning but also, more positively,

that a proper name functions so as to designate the same individual in every possible world where that individual exists. Because a particular can, across possible worlds, lack the properties of the sort that would make up Φ , Φa is not necessary. A term that designates the same individual in every possible world is a *rigid designator*. If 'a' and 'b' are rigid designators, then ' $a=b$ ' asserts a necessary truth.

Now let us turn to natural kinds. As Kripke points out, many interesting discoveries in science are theoretical identities concerning natural kinds, for example that water is H_2O , that gold is the element with atomic number 79, that lightning is electricity, heat is molecular motion, light is a stream of photons, and so forth. According to Kripke, these theoretical identities should be understood as identities involving rigid designators and so are necessary truths. Arguably they tell us the essences of the relevant kinds: the essence of water is that it is H_2O . This approach raises a number of questions. What does rigid designation amount to for natural kind terms? What are the referents of natural kind terms such that they can be involved in identities? What shows that ' H_2O ' and 'element with atomic number 79' are rigid designators given that they look like descriptions? Can 'lightning is electricity' really be an identity given that not all electricity is lightning (and likewise for the claims about light and about heat)?

However, not all grounds for natural kind essentialism flow from the rigidity of the terms in theoretical identities. One may appeal to certain modal intuitions we have. Thus in Putnam's famous Twin-Earth thought experiments we are asked to consider Twin-Earth, a planet like Earth except that where Earth has water, Twin-Earth has a substance that has every superficial appearance of water, but a radically different molecular constitution, XYZ. Although XYZ appears to be very much like water, it would not *be* water. Although Putnam's account concerns the extension of thoughts about water, the core appeal to intuition and its metaphysical import are independent of semantic considerations. The metaphysical import is that having molecular constitution H_2O is, necessarily, a necessary condition for being water. Since the considerations in question are those that concern what it is to *be* water, this necessary truth asserts an essential property of water. Whether being constituted by H_2O is *the* essence of water depends on whether being thus constituted thereby suffices for being water, and Putnam's thought experiment does not yield an answer to that question. The answer rather depends upon whether one is willing to regard ice and water vapour as water and whether a single molecule of H_2O is water. One complication for such discussions is that 'water' is vernacular term as well as one that seems to pick out a natural kind and discussion of the latter can be infected by considerations emanating from the former.

Earlier I considered a criticism of the view that species are natural kinds that assumed that natural kinds have intrinsic essences, whereas species do not. Kripke does mention biological kinds. He does argue that a creature with a very different internal constitution (e.g. a robot) could not be a cat, even if it was very cat-like in appearance and behaviour. Nonetheless, having some intrinsic essential properties is consistent with having others that are not, in which case the essence of the kind would not be intrinsic. Kripke does also argue that some creature could lack many of the superficial properties that we take to be characteristic of being a tiger, yet could be a tiger nonetheless. It may be implied that the creature is a tiger in virtue

of some hidden internal properties, such as genetic constitution—but we saw above that this is biologically and metaphysically implausible. Cladism in biological taxonomy takes biological taxa to be defined by shared common ancestry. Thus membership of a taxon, such as species, is an extrinsic property. As discussed in Section 2, Kripke himself argues that individuals can have extrinsic properties essentially—origin for example. Cladism, when allied with essentialism, extends this to biological kinds also (cf. McGinn 1976; LaPorte 2004).

5 Further Reading

The classic text of modern essentialism is Kripke's *Naming and Necessity* (Kripke 1980), along with Putnam's "The Meaning of 'Meaning'" (Putnam 1975). Kripke's origin essentialism is developed by McGinn, while individual essences are promoted in Forbes's *The Metaphysics of Modality* (Forbes 1985). An excellent recent discussion of essentialism is Penelope Mackie's *How things Might have Been* (Mackie 2006). Joseph LaPorte gives a very clear introduction to the key issues surrounding natural kinds and kind essentialism in *Natural Kinds and Conceptual Change* (LaPorte 2004). Brian Ellis develops a metaphysics for science based on essentialism in *Scientific Essentialism* (Ellis 2001). For a general introduction to natural kinds and to natural kind essentialism see Alexander Bird and Emma Tobin "Natural Kinds" in the Stanford Encyclopedia of Philosophy <<http://plato.stanford.edu/>> (Bird and Tobin 2008).

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