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Are Sexes Natural Kinds?¹

1. What are natural kinds?

We classify biological organisms into many categories. Most obviously, we sort them into species (e.g. the common fruit fly, *Drosophila melanogaster*). We also group them into higher phylogenetic taxa, such as genera (e.g. *Drosophila*), families (e.g. Drosophilidae), orders (e.g. Diptera), classes (e.g. Insecta), and so on. There are plenty of other biological categories besides, which do not correspond either to species or to higher taxa, such as *herbivore* and *carnivore*, *viviparous* and *oviparous*, *larva*, *pupa*, and *imago*, *nocturnal* and *diurnal*, *altricial* and *precocial*, and *male* and *female*, among others. On what basis do we make these classifications? The short answer is similarity, but as many philosophers have pointed out, similarity is subjective and is not amenable to strict criteria (Quine 1969). In some sense, everything is similar to everything else.

A more promising answer is that we categorize individuals on the basis of shared properties, though that answer is also not without its problems. One deep philosophical puzzle concerns what to count as a property. We can conjure up negative properties (e.g. *non-green*), disjunctive properties (e.g. *green or blue*), and convoluted properties (e.g. *green if examined before the year 2100, blue otherwise*). But these do not seem like genuine properties, though it is a challenge to spell out what disqualifies them as serious contenders. Setting aside such philosophical puzzles about the nature of properties, we can say that observable or measurable properties of individuals are generally the basis for classifying them into categories, and that classification is indispensable for understanding the world, including the biological world. Without categories, we might conceive of the world only as a series of individuals and we would be hard pressed to make generalizations across individuals or propose systematic laws or theories.

Classification is central to many of our endeavors, including law, religion, and sports, but science is undeniably the enterprise with the most elaborate systems of categories, and most of them work impressively well for explaining and predicting various things. Scientists group

¹ Acknowledgments:

things into a multitude of categories and these classification schemes or taxonomic systems serve as the basis for scientific theorizing. As philosophers have long pointed out, some of these classification schemes seem less “natural” than others, at least with hindsight. The nineteenth-century philosopher of science William Whewell noted that a classification of plants on the basis of the numbers of pistils and stamens in their flowers, was “artificial,” not natural (1847, 489-490). His reason appears to be that this classification does not reveal any other similarities among the plants and it does not enable us to make significant generalizations (e.g. *All plants with two stamens are...*). It is a classification that does not do any work for us and, as such, has been discarded as science has progressed. The classifications that remain tend to be those that can be used successfully in inductive inferences and enable us to explain many features of the individuals classified. The reason that they are so successful is that they are based on properties that reliably indicate the presence of numerous other properties. If I classify a plant as an *angiosperm* (or flowering plant), I can infer that its stamens will have two pairs of pollen sacs, that the seeds will be enclosed within an endosperm, which is a nutritive tissue that provides food for the embryo, and so on. These generalizations enable us to make reliable predictions, for example, that if a hitherto unidentified plant is an angiosperm, its seeds will be enclosed within an endosperm, among other things. That provides a stark contrast from a classification based on the number of pistils or stamens, which does not enable us to make any generalizations or inferences. That is why categorization into *angiosperms* and *gymnosperms* persists in scientific practice, while classification on the basis of the number of stamens does not. We could say, following Whewell, that the successful classification schemes are the “natural” ones and are likely to persist.

It would be good to pause here and consider whether this classification is not merely predictive but also genuinely explanatory. Suppose you ask for an explanation of the fact that some plants have seeds enclosed within an endosperm, and I respond by saying that there is a simple explanation, namely that they are angiosperms. Have I really explained that fact? There may be contexts in which that would be considered an explanation, but there are surely others in which it would be a cop-out. As an explanation, it does not seem to go nearly far enough. One thing missing from this explanation is an account of *why* these plants have this property. A

more complete explanation would surely be that it is because they are descended from other plants that have this same property and that this property was selected for over a very long period of time because of its adaptive advantage to the plants, in accordance with Darwin's theory of natural selection.² According to that theory, heritable variations in individual organisms that offer an adaptive advantage will tend to be transmitted to the next generation and preserved. There are two features of this explanation that deserve expanding. The first is its reference to a history of descent. Because natural selection, and the theory of evolution more generally, explains current properties of individuals based on the properties of their precursors, we often classify individuals in biology on the basis of a common history. Members of any given species are all thought to be descended from the same ancestors, and that is what explains why they have so many shared properties. Moreover, properties in the biological realm tend to be shared for a reason, namely their causal efficacy in survival and reproduction. Thus, a fuller explanation in this case would refer to the fact that all angiosperms are descended from ancestors that had this property *and* that the property itself was presumably instrumental to the survival of those ancestors. Indeed, this is the basis of the classification of plants into *angiosperms* and *gymnosperms*, not merely their causal properties but their etiology or causal history. Bearing all that in mind, it does seem as though classification can be explanatory when we supply the entire basis for placing an individual into a particular category, not just the category label.

A question that often arises is, just because some classifications are useful for explaining and predicting phenomena, can we conclude that they correspond to real divisions in nature? Or to put it more philosophically, can we go from an *epistemological* distinction (explanatory and predictive category) to a *metaphysical* one (natural kind)? One thing to say in response is that if our scientific inquiries do not reveal which categories correspond to nature's own kinds, then it is not clear how else we would go about determining that. Even though our current scientific categories may not be the definitive ones, science seems to our best bet for isolating natural kinds. Nevertheless, some philosophers tend to be more restrictive, distinguishing

² This is not meant to imply that all persistent biological traits are adaptive, since some traits are transmitted across generations for other reasons.

between those scientific categories that are merely useful and those that correspond to natural kinds. For them, a natural kind must have an essence or essential property, and categories that do not group things together on the basis of a shared essence do not correspond to natural kinds. But essences are not easy to come by in the natural world, especially in biology. Essences are supposed to be properties that are linked to kinds by way of necessary and sufficient conditions, but there are few if any such strict links in the biological realm. It was once thought that being a member of a species would be a matter of having a certain combination of genes, so that any individual who had those genes would be a member of some species *S* and no individual could be a member of species *S* unless it had that specific combination of genes. But things turn out to be far more complicated: there is no unique set of genes that is both necessary and sufficient for being a member of any particular species. Essences are also thought to be intrinsic, but at least some biological properties are relational or extrinsic.³ Finally, essences are commonly posited to be microstructural, but many biological properties are not. So the essentialist approach is not promising, at least when it comes to many biological properties and kinds.

A more auspicious approach is the theory that natural kinds are *homeostatic property clusters* (HPC) (Boyd 1989). The gist of this account is that properties cluster together reliably because they tend to be kept in a state of equilibrium (homeostasis) by a causal mechanism that ensures this. This theory accords better with some biological kinds, but it may also be too constraining in this context, since biological kinds are often in flux and do not persist in a state of equilibrium for long.⁴ Moreover, there is not always a single causal mechanism that generates the properties associated with a given biological kind (as we already saw in the case of species not being identifiable with a unique genotype). However, on a more liberal account of what natural kinds are, some loose combinations of properties tend to cause the instantiation of other properties, and these property clusters, which remain relatively stable

³ As we saw, members of a species are classified together based on their common origin, which is an extrinsic property. Some essentialists allow for extrinsic essences and argue that members of a species share a historical essence (e.g. Griffiths (1999)), while other essentialists deny this and maintain that members of a species share an intrinsic essence (e.g. Devitt (2008)).

⁴ For a critique of HPC theory as applied to species, see Ereshefsky and Matthen (2005).

over time, are what we designate as natural kinds. Individuals that have these properties are categorized together, and the usefulness of the categories stems from the fact that the properties cluster together reliably, not by accident but due to causal connections between them. On a “simple causal theory” of natural kinds, they correspond to clusters of properties that are causally linked to other properties (Craver 2009; Khalidi 2013). Thus, when we observe that one individual has some subset of these properties we can infer that it is likely to have the others. In other words, the epistemic utility of the categories is grounded in the causal clustering of the properties. In what follows, I will be operating with this more permissive understanding of natural kinds, in order to examine the plausibility of regarding the sexes, *female* and *male*, as natural kinds.

As already seen, members of biological kinds are often grouped together due to a shared history of descent. This is true particularly of the higher taxa (e.g. genera, classes, orders, etc.). The order Insecta corresponds roughly to the common category *insect*, and every schoolchild knows that all insects have six legs, a three-part body (head, thorax, abdomen), compound eyes, and two antennae. But many biologists would say that they are classified together not just because of their shared causal properties, but primarily on the basis of having the same origin. Like many other biological kinds, they can be considered at once causal kinds, grouped together on the basis of shared properties, and etiological kinds, grouped together on the basis of a common causal history. Along these lines, Millikan has observed that many natural kinds in biology are “copied kinds”; members of these kinds share properties *because* they have been copied from a common template, and those properties are likely to be copied for a reason. Millikan (2005, 307–308) associates three features with individual members of copied kinds: (1) all members have been produced from one another or from the same models; (2) members have been produced by, in, or in response to, the same ongoing historical environment (including other copied kinds); (3) some “function” is served by members of the kind, where “function” is roughly an effect raising the probability that its cause will be reproduced. She also indicates that (1) is the primary characteristic of copied kinds, while (2) and (3) support it. Many biological kinds can be considered copied kinds in this sense. For instance, members of a biological species are descendants of the same ancestral population,

they are produced in response to the same or a similar environment, and the production of one member raises the probability of the production of others. Hence, they are individuated primarily by their etiology or causal history, but they also share many causal properties (morphology, behavior, and so on) as a result of that common history and the copying process that it involves. Copied kinds constitute a particular type of natural kind, which are individuated *both* by their synchronic causal properties and their causal history (etiology). Moreover, copied kinds are special because classification by causal properties and causal history tend to converge on the same individual members. (Sometimes individuals grouped together based on a shared causal history have few if any causal properties in common.)

2. A sex primer

One way of approaching the question as to whether sexes are natural kinds is by asking whether the categories *female* and *male* are on a par with highly efficacious biological categories like species categories (e.g. *Drosophila melanogaster*), or whether the distinction between the sexes is more like the “artificial” distinction between plants based on the number of stamens and pistils, which was mentioned in section 1. To address this question, it will be necessary to look more closely at the classification of organisms into *female* and *male*. To simplify matters and for reasons that will be explained in section 3, I will restrict the discussion to animals, setting aside the plant kingdom for the time being.

Many animal species exhibit *polymorphisms*, whereby there are several distinct types within the species. In many social insects like ants and bees, there are different castes, such as workers, soldiers, and queens, and indeed, in some species there are different types of workers (all of whom are female). These are perhaps the most striking polymorphisms in the animal kingdom, though there are numerous others. Some polymorphisms arise as a result of genetic factors but others are due to environmental ones, as when queen bees are differentiated from workers as a result of diet. The most familiar polymorphism is the dimorphism associated with sexual reproduction, which occurs in a wide variety of species across the animal kingdom. In English, the word “sex” can refer to the activity or process of reproduction as well as to the distinction among two types of organism, and while the two phenomena are closely linked,

they need to be distinguished. The sex differences that are found within many species are related to the existence of sexual reproduction. Living things originally reproduced asexually, as many organisms still do (e.g. bacteria, many plants, and a few species of animals). Sexual reproduction was a later innovation and there are many theories as to why it arose. It has some apparent advantages, since mixing genetic material in every generation has the potential to yield new alleles (alternative forms of the same gene) and new combinations of alleles, and some of these may have adaptive value. But it also has some disadvantages, such as decreased efficiency owing to the fact that every act of reproduction takes two individuals, not just one (setting aside self-fertilizing hermaphrodites). It is still a subject of lively scientific debate as to why sexual reproduction arose and what its pros and cons are, but we can say something about sexual dimorphism without settling that question.⁵

In principle, the evolution of sexual reproduction does not necessitate the evolution of two and only two sexual morphs, and it does not entail that these two morphs correspond to what we commonly label “female” and “male.” In many sexually reproducing species, there are hermaphroditic individuals, which can be considered both female and male (or neither), and some species are entirely hermaphroditic. In these species, there is only one morph, even though individuals reproduce sexually. Banana slugs are a hermaphroditic species in which any individual can mate with any other, and in the absence of a partner, individual slugs can self-fertilize. In other species, there are more than two morphs, with different sex roles when it comes to courtship, mating, reproduction, child-rearing, and related functions (about which more later). Having said that, most animal species that reproduce sexually are sexually dimorphic, comprising just two distinct morphs. In sexually dimorphic species, one of the two morphs is usually labeled “female” and the other “male.” But given the vast diversity among living beings, what justifies the neat classification into *female* and *male* across species? Are there any recurrent objective differences that would warrant applying the same two labels in different species, and if so, what are the properties that constitute the basis for this distinction?

⁵ Some biologists have argued that sexual reproduction is more advantageous in changing environmental conditions and less advantageous in relatively stable conditions (e.g. Otto 2008). There is also some uncertainty as to whether sexual reproduction evolved only once among living creatures or whether it arose more than once.

At first blush, one might think that females and males are distinguished primarily by their sexual organs, but there are some species in which the female has a “penis” or the male has a “vagina” (or as one might expect, both). In *Neotroglia* cave insects, the penis-like female organ, called a “gynosome,” is used to suck out sperm and nutritious seminal fluids from the male, which has a vagina-like opening in its body. Closer to home, among mammals, the female spotted hyena has a structure like a penis, which is used in mating.

More fundamental than the sexual organs are the two cells (gametes) that combine together to form a fertilized cell (zygote) in sexually reproducing species. The vast majority of sexually reproducing species are *anisogamous*, which means that the gametes come in two varieties and are produced by two types of organs called “gonads,” which are the ovaries and testes. In these species, each of the two morphs has one type of gonad (ovaries or testes) and contributes a distinct type of gamete (ovum or sperm), which fuse together to produce a single zygote that combines genetic material from two parent organisms. In these species, one of the two types of gametes (ovum) is much larger than the other (sperm). While each gamete contains half the genetic material of the parent, the ovum is also resource-rich, providing nutrients for the embryo. Biologists label the morph that produces the larger gamete, *female*, and the morph that produces the smaller one, *male*. Thus, the basis of the female-male distinction in animals is the relative size of the gametes and the type of gonads that produce them. What remains to be seen is whether this distinction marks an important difference between two morphs across all these sexually reproducing species, and whether it serves as the basis of a “natural” classification scheme.⁶

Building on the discussion in the previous section, one way to go about addressing this issue is by determining whether the properties associated with these morphs (namely, their relative gamete size) correlate with any other differences, and whether they enable us to

⁶ It is not entirely clear why the gametes evolved such different properties in the first place. But it might be adaptive to specialize, with one gamete containing nourishment for the embryo as well as genetic material, while the other just contains genetic material. A recent collection of articles on the subject states: “The evolution of anisogamy, one of the major evolutionary riddles to remain unsolved in the nineteenth and twentieth centuries, emerges into the twenty-first century as potent a mystery as ever” (Togashi & Cox 2011, 4).

explain and predict a number of other properties besides. At least since Darwin, there has been a common view among evolutionary biologists that the disparity in the relative size of the gametes in sexually reproducing species causes numerous other differences in females and males across many species. As Darwin emphasized, sexual selection is a variant of natural selection applied to traits that are particularly advantageous with regard to sexual reproduction (rather than mere survival).⁷ In the *Descent of Man*, Darwin attempted to explain how gamete size might lead to different traits among males and females in many species. He reasoned that the larger gamete is not easily transportable, while the smaller gamete is more mobile (and indeed, often equipped with flagella that enable it to travel significant distances). The smaller gamete usually needs to migrate towards the larger one so that fertilization can take place. This means that, especially in the “lowly-organised animals,” where fertilization is external to the body, it is advantageous to the male to “acquire the habit of approaching the female as closely as possible,” and this habit has been preserved in other species, even where fertilization is internal (Darwin 1871/1981, 274). Therefore, according to Darwin, across a wide range of species, the small-gamete-producer (male) is more prone to seek out and pursue the large-gamete-producer (female), which is to say that there are different behavioral dispositions in males and females in these species.

Nowadays, this explanation is not widely accepted, since a male’s approaching the ova is not the same as pursuing the female, and anyway, it is unlikely that such a trait would persist in taxa in which it is no longer clearly advantageous due to internal fertilization. More recent evolutionary biologists have focused, not so much on the differences in mobility among the differently sized gametes, but the varying amounts of effort that it takes to produce them. Since female gametes are large and rich in resources, they require a sizeable investment of time and energy to produce, while male gametes are small and do not require as much. Hence, males can afford to produce many gametes and attempt to fertilize as many female gametes as possible, whereas females can only produce a small number and, given their investment, need

⁷ Prum (2017) defends the view, which he traces to Darwin’s later work, that sexual selection is not just the “handmaiden” of natural selection, but a separate type of process, which depends largely on aesthetic appeal rather than adaptiveness.

to ensure that they are fertilized by males with advantageous genes, resulting in a need for greater selectivity.⁸ This difference is posited to lead to different pre-mating and post-mating behaviors, leading females to be more selective in their mating habits, males to compete more intensely with other males for reproductive opportunities, and females to invest more resources in parental care. Another difference that is sometimes cited is that in many species in which fertilization is internal rather than external, the female, which contributes the larger gamete, also carries the fertilized zygote, which means that females put even more investment in child-bearing and child-rearing, leading to differential mating strategies and parenting behavior. Also, in these species, there is uncertainty about paternity due to the fact that sperm from different males can compete internally to fertilize the ova. This means that females tend to have greater assurance than males as to which offspring are theirs, which implies that the former are more likely to invest in parental care than the latter.⁹

For many evolutionary biologists, the relative size of female and male gametes is the causal factor that accounts for different morphologies, mating strategies, parenting behaviors, and other properties of females and males. The size differential among the gametes means that the larger gamete tends to be less mobile, more scarce, and require greater resources than the smaller gamete. Moreover, in the case of internal fertilization, the zygote tends to remain within the parent that contributes the larger gamete, thus providing less assurance of paternity for the other parent. Males tend to acquire greater strength and natural weapons to compete against other males, as well as forms of ornamentation to attract females. For females, it is an advantage to develop morphological and behavioral characteristics that aid in protecting and caring for offspring. Though these properties are not universally found in all animal species, the causal link between relative gamete size and a number of other properties, which are in turn causally linked to yet other properties, accounts for observed morphological and behavioral

⁸ An influential version of this argument was given in Trivers (1972), relying partly on work by Bateman (1948). But the argument has been criticized on various counts, see e.g. Kokko and Jennions (2008).

⁹ The claim is not that organisms engage in these behaviors consciously, but that they acquire behavioral dispositions that tend to be transmitted genetically, epigenetically, and via learning mechanisms, because they are adaptive.

differences among the morphs that contribute the two types of gametes.¹⁰ If these theories are right, then the classification of organisms into *female* and *male* across a range of animal species really does serve as the basis for a “natural” rather than an “artificial” classification scheme (in Whewell’s terms). Moreover, in accordance with the “simple causal theory” of natural kinds, possession of the different types of gonads that produce differently sized gametes is the causal property that brings about a number of other morphological and behavioral traits across a range of animal species. If these speculations are correct, the sexes can therefore be considered to be natural kinds.¹¹

The sexes also seem to be etiological kinds and copied kinds (in Millikan’s sense). Not only do females share causal properties with other females and males with other males, they are also reproduced from other females and males. However, they are not straightforward copied kinds, since it is obviously not the case that females only produce females and males only males (indeed, the whole point is that it takes one of each sex to produce one of either sex).¹² Nevertheless, all anisogamous animal species, those featuring dissimilar gametes, are likely descendants of the same anisogamous ancestors, so the presence of unequal gametes in a wide range of species has the same origin, as do the female and male morphs that produce them. Hence, female and male organisms are individuated across different species as a result

¹⁰ The causal links between gamete size and these other properties are not direct and proximal; rather, these properties come to be associated with each of the two morphs as a result of selection pressures over many generations. For example, members of the small-gamete-producing morph who have natural weapons tend to compete successfully for access to reproductive opportunities, which causes them to have more offspring, which in turn causes the trait to spread in that morph in the population. For a classic statement of the distinction between proximate and ultimate causes in a biological context, see Mayr (1961).

¹¹ It may be tempting to think of *female* and *male* as HPC kinds rather than simple causal kinds, with a causal mechanism that keeps the respective clusters of properties in equilibrium. But though it used to be thought that there was a single master gene, SRY, on the Y chromosome that controlled gonadal differentiation in many mammals, it turns out that matters are far more complex (Roughgarden 2013, 197-199; Ainsworth 2015, 298). Moreover, the genetic mechanisms are very different in many other animals, for example reptiles and birds.

¹² Richardson (2010, 836) considers *females* and *males* to be “dyadic kinds” on the grounds that “sexes are not autonomous, individual classes, but interdependent, permanently coupled, interacting, binary subclasses of species...” In this respect they are different from other biological kinds such as species, yet she still considers them to be natural kinds.

of having arisen from the same causal process (partly due to a common environment and similar selective pressures).¹³

3. Challenges to sexes as natural kinds

The case was made in the previous section that females and males can be considered to be natural kinds across animal species, both on the grounds that they share causal properties, as well as on the grounds that they are descended from the same ancestral types by means of a copying process. But this case is open to a number of objections, some of which will be considered briefly in this section.

The first objection points to the fact that there are some sexually reproducing species in which there are more than just two sexual morphs, including “masculine females” and “feminine males” (Roughgarden 2013). Rather than sexual dimorphism, these species can be said to exhibit sexual polymorphism (as mentioned in section 2), when it comes to morphology and to mating and parenting behaviors. But there are two responses that can be made when faced with such phenomena. One is to count them as exceptions that do not completely undermine the basis for considering females and males to be natural kinds. After all, generalizations in biology are rarely if ever ironclad, and so we should not expect generalizations about biological natural kinds like *female* and *male* to be universal among sexually reproducing animals. The other response is to say that species with multiple morphs do not constitute an exception at all, since the additional morphs appear to be sub-kinds of the kinds *female* and *male*. Indeed, labels like “masculine female” and “feminine male” tend to reinforce this conjecture, since they seem to assume that these morphs are sub-kinds of females and males respectively, rather than altogether different kinds. And just as the existence of the kind *Drosophila melanogaster* (species) does not undermine the existence of the kind *Drosophila* (genus), the existence of subordinate sexual kinds does not count against the existence of the superordinate kinds *female* and *male*.

Perhaps the most powerful objection to *female* and *male* being natural kinds is that the morphological and behavioral properties associated with gamete size are far more variable

¹³ Franklin-Hall (this volume) argues for a view of this kind.

across animal species than was acknowledged in the previous section, thereby undermining the very basis of the distinction (cf. Dupré 1986). According to some researchers, the causal pathways from relative gamete size to morphological differences, mating strategies, parental investment, and so on, are too diverse to ground any useful generalizations. For instance, though it is true that the morph producing smaller gametes tends to be more competitive in many species, this assumes a roughly equal sex ratio. But if males are, for some reason, much scarcer than females in a species or population, then they will tend to be less competitive than females. Similarly, even if females tend to invest more resources in parenting in many species, this obtains when offspring need care, but in precocial species, ones in which the young are relatively independent, females do not need to provide parental care. Once all such exceptions are taken into account, a critic might say, it will be clear that there is no clustering of properties associated with large and small gamete producers respectively, thereby undermining the presumed naturalness of the kinds, *female* and *male*.

The strength of this objection depends largely on the empirical evidence and the extent to which generalizations concerning females and males are manifested across a wide range of species. Biologists themselves seem divided over the scope of these generalizations and their utility. But the preponderance of evidence currently suggests that there are some important and interesting generalizations that hold across a wide variety of species, and moreover that some of these differences evolved independently in separate lineages (e.g. relative size of females and males, male ornamentation, courtship displays by males, and parental care by females). Moreover, even though these generalizations may be riddled with exceptions, that is because there are other causal factors that intervene, interacting with gamete size to issue in a range of effects. It is not that *female* and *male* do not represent important causal properties, but they interact with other causal factors in such ways as to lead to somewhat different outcomes in different species, populations, or even environmental circumstances. This means that some generalizations only hold within more restricted domains. Even those biologists who are somewhat skeptical that many generalizations can be made about females and males across all animal species acknowledge, for instance, that there is a “mammal model” of female-only care for offspring, and an “avian model” of biparental care (e.g. Kokko & Jennions 2008). This

suggests that at least some generalizations about females and males hold within taxa like mammals or birds, rather than across all taxa. This would not be a vindication of the claim that *female* and *male* are natural kinds, but it would give support to the view that *female-bird*, *male-mammal*, and so on, are. Thus, even if it turns out that *female* and *male* are not natural kinds across animal species, they may enter into subordinate natural kinds within certain taxa.¹⁴

There are other objections to the view that the sexes are natural kinds, which may be worth considering in brief. It was already mentioned that some individuals, and indeed entire species, are hermaphroditic, combining both female and male gonads and sex organs in the same organism. If we were to consider these organisms both female and male, it may be objected that *female* and *male* cannot be natural kinds, since one mark of a natural kind distinction is that no individual can simultaneously be a member of two natural kinds. But that does not necessarily rule them out as natural kinds, it would just mean that *female* and *male* are not mutually exclusive kinds. Moreover, it may be more plausible to consider such individuals to belong to neither kind rather than to both, which would defuse the objection entirely. A related objection would refer to the fact that in some species, sex determination results primarily from environmental rather than genetic factors, such as temperature or population density, meaning that the same individual can be sequentially female and male. (This is referred to as sequential hermaphroditism, by contrast with simultaneous hermaphroditism.) But that would not necessarily be a deal-breaker, since there are arguably other natural kinds such that individuals can belong sequentially to different kinds (e.g. atoms of chemical elements that undergo radioactive decay). It may also be objected that femaleness and maleness constitute endpoints of a spectrum rather than two sides of a dichotomy, since in some species (e.g. humans) there are individuals who fall along a continuum between female and male. “While male and female stand on the extreme ends of a continuum, there are many other bodies... that evidently mix together anatomical components conventionally attributed to both males and females” (Fausto-Sterling 2000, 31). But this again would not disqualify them from being natural kinds, at least if we allow species to be natural kinds. Species themselves

¹⁴ This seems to be the view advocated by Dupré (1986), who makes a powerful case for not considering *female* and *male* to be natural kinds across animal species.

evolve from other species and there are often individuals intermediate between distinct species, at least around the time of speciation events. Finally, it may be said that *female* and *male* crosscut other natural kinds such as *species*, in the sense that individuals *a* and *b* can both be members of species *S*, and individuals *b* and *c* can both be members of the kind *female*, yet *a* and *c* may belong neither to the kind *S* nor the kind *female* (since *a* is male and *c* belongs to some other species *S**). But here again, it appears that many good candidates for natural kinds crosscut other natural kinds (Khalidi 1998).

One could also question the claim that that *female* and *male* are natural kinds in the sense of etiological kinds or copied kinds. If it turns out that sexual reproduction or anisogamy evolved more than once in the animal kingdom, then the morphs *female* and *male* would not be copied kinds, since they would not all derive from the same templates. But even so, they may yet be natural kinds on the basis of shared causal properties, just as long as we allow analogous biological structures to belong to the same kinds, such as *wings* and *eyes*, which evolved multiple times in different animal lineages, not just homologous ones like *vertebrae* or *femurs*, which have the same origin (Weiskopf 2011; Ereshefsky 2012).

Finally, this discussion of the sexes has been restricted to animals, mainly because it is difficult to make the case that (some) sexually reproducing plants also come in two sexual morphs, *female* and *male*. While it is true that many plants are anisogamous and plant gametes also tend to occur in two varieties, one of which is larger than the other, individual plants tend to produce both gametes and generally self-fertilize as well as cross-fertilize. Even in species where individual “female” and “male” plants exist, the fact that they are not mobile in the ways that animals are, means that the causal consequences of anisogamy are very different. Without going into further detail, suffice it to say that there are few, if any, morphological (much less behavioral) commonalities among “female” plants and animals or among “male” plants and animals. Hence, the claim being defended here is merely that *female* and *male* constitute natural kinds in the animal kingdom, not among all living organisms.

4. Enough about sex, what about gender?

In the past several decades, it has become commonplace to distinguish sex from gender, and to say that *sex* is natural, while *gender* is social or “socially constructed.” The first part of that claim would seem to accord with the argument being made here. But this claim is also sometimes taken to imply that *sex* is real whereas *gender* is fictitious or imaginary. However, a more plausible interpretation is that *sex* (the female-male distinction) is a kind that pertains to the biological domain, with causal links to biological phenomena, such as morphology, reproduction, hormones, secondary sexual characteristics, basic behavioral patterns, and so on. Meanwhile, *gender* (the feminine-masculine or woman-man distinction) is a kind that belongs to the social domain, with primary reference to the human species. This means that gender categories feature mainly in explanations in the social sciences and the kinds *woman* and *man* pertain to those disciplines. That does not mean that gender is not real, just that its causes and effects relate to the social world and social phenomena, such as employment, discrimination, exploitation, and so on. This widespread viewpoint is lucidly expressed by Friedman (1996, 78):

In the familiar terms of the sex/gender distinction, “sex” is the biologically given basis of sex identity and sexuality. Biological sex comprises external and internal genital anatomy, anatomically secondary sex-characteristics, and certain hormonal and chromosomal combinations. The words “female” and “male” identify persons in terms of their biologically sexed natures. Gender, by contrast, encompasses traits and behaviors which mark, and are traditionally thought to express, those biological givens in cultural practice. Gender includes psychological qualities, intellectual traits, social roles, grooming styles, and other modes of self-presentation. The words “feminine” and “masculine” identify persons in terms of their genders.

Like some other social kinds, gender appears to have an underlying biological basis (with which it is often confused). Though I have argued that *sex* is a real kind, *gender* depends in part on the *perception* of sex, so whether or not gender is real or not does not depend on whether sex is, since we often perceive what is not there. (To compare, many biologists do not consider *race* to be a real biological kind, yet that does not rule out the possibility that *race* is a real social kind, which may depend on a mistaken perception of biological difference.) Moreover, even though *gender* may be a real social kind in many societies in the present, due to a

widespread perception that biological differences among females and males have social implications, it may cease to be one in the future as the social consequences of biological sex diminish. After all, humans are also categorized by biologists according to blood type, but this does not seem to have (and ought not to have) any social repercussions.

Some theorists have argued not only that *gender* is a social construction, but that *sex* is too (e.g. Fausto-Sterling 2000). As I've already suggested, this is sometimes taken to mean that *sex* is fictitious or unreal, but that would be misguided, since it seems to assume that social phenomena are less real than biological ones. However, it could more plausibly be taken to mean that *sex*, like *gender*, is primarily a *social* phenomenon and that we have misconstrued the nature of *sex*, mistakenly thinking that it pertains to biology when it doesn't. If that is right, then the argument that I have been making in this chapter, that *sex* is a biological natural kind, is wrong. Since I have already presented some evidence to the contrary, I will not recapitulate it here. Having said that, it may be true that we sometimes exaggerate the effects of *sex* and think that some properties are biologically based, when in fact they are a result of social processes. Just because *female* and *male* are real biological kinds that does not mean that they are associated with a number of wide-ranging and unchangeable psychological or behavioral properties. For example, it may be mistaken to think, as some researchers have, that there are cognitive differences associated with these kinds (cf. Fine 2010). And even if there are such differences, they may be swamped by the effects of learning and culture to the point that they are negligible in the human species. Hence, we should take the claim that sexes are natural kinds in the animal kingdom with a grain of salt; it does not imply that the biological differences among female and male humans do and should have social consequences, even though they have had such consequences in most societies for all of recorded history.

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