Etiological Kinds

Abstract

Kinds that share historical properties are sometimes dubbed “historical kinds” or “etiological kinds” and they have some important features that distinguish them from other kinds of kinds. In this paper I will try to characterize the phenomenon of etiological kinds in general terms and will briefly survey some previous philosophical discussions of these kinds. Then I will take a closer look at some case studies involving different types of etiological kinds. Finally, I will try to understand the reasons for classifying on the basis of etiology, putting forward some reasons that scientists may be interested in classifying phenomena on the basis of diachronic as opposed to synchronic features. In so doing, I will make a provisional case for considering at least some etiological kinds to be natural kinds.
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1. Introduction

Members of natural kinds are widely considered to share a number of properties. This is perhaps the most minimal condition on natural kinds, and one with which practically everyone writing on the topic would agree. This characterization remains neutral on some crucial questions, such as what type of properties need to be shared, why those properties are shared or co-occur, whether the properties are singly necessary and jointly sufficient for membership in the kind, whether they are shared in every possible world in which the kind exists, and so on. In particular, this characterization does not tell us whether the properties that members of natural kinds share are supposed to be intrinsic causal properties (or causal powers), or whether they can consist of historical properties, such as a common origin or shared history. Kinds that share historical properties are sometimes called “historical kinds” or “etiological kinds” and they have some important features that distinguish them from other kinds of kinds.¹

In this paper I will try to characterize the phenomenon of etiological kinds in general terms and will briefly survey some previous philosophical discussions of these kinds. Then I will take a closer look at some case studies, which will enable us to take into account a variety of types of etiological kinds and compare some of their features. Finally, I will try to understand the reasons for classifying on the basis of etiology, putting forward some justifications for the scientific interest in classifying phenomena on the basis of diachronic as opposed to synchronic features. In so doing, I will make a provisional case for considering at least some etiological kinds to be natural kinds.

2. Characterization and Historical Precedents

One way of characterizing etiological kinds in general terms, is as follows:

¹ For reasons that will emerge in due course, I prefer the term “etiological kind” to “historical kind” and will use it throughout this paper. The term “etiological kind” is not meant to carry a commitment to the claim that etiological kinds are natural kinds, which is a claim that will be examined in Section 4.
An etiological kind is one whose members share a (token or type) origin, history, or causal trajectory.

This characterization immediately gives rise to a distinction between those kinds whose members share a token history and those whose members share the same type of origin, history, or causal trajectory.\(^2\)

Token-etiological kinds have members that all originate in the very same event, or have followed the same token causal trajectory, or share the selfsame history. One of the most extensively discussed cases of this type is that of biological species. According to a widely accepted view of the nature of species, members of a biological species are classified together because they are all descended from the same set of common ancestors. Consequently, they have the same token origin and share the same token history. A common history is, of course, not the only thing that members of a species typically share, since for many species, the ability to interbreed and produce fertile offspring is widely held to be criterial for species membership. Members of a given species also often have many intrinsic features in common, so biological species are not what might be called “pure” etiological kinds. This observation gives rise to another distinction, that between pure etiological kinds, whose members share nothing but an origin or history, and impure etiological kinds, whose members may share intrinsic features too, and may be classified into kinds based on both etiological and intrinsic features.

As for type-etiological kinds, they do not share the very same token origin or history but rather the same type of origin or history. Their members do not originate in the same event or follow the very same causal pathway, but their origins or histories are tokens of the same type. For example, in geology, igneous rocks do not all originate from the same source but they are created by the same type of process, namely the solidification and crystallization of hot molten rock. This is a repeatable process in the history of the earth (and perhaps other planets) and has occurred a multitude of times, each time producing rocks with the same type of origin and causal history. Igneous rocks are classified as such on the basis of the process that led to their formation rather than their intrinsic or synchronic properties.

\(^2\) Franklin-Hall (2017) has drawn a distinction between two kinds of historical kinds on these grounds. She also puts forward a proposal as to why scientists individuate historical kinds, which I will not have space to discuss here.
To gain further insight into the nature of etiological kinds, it will be useful to look briefly at a few preceding discussions. Perhaps one of the earliest attempts to discuss classification on historical grounds, can be found in William Whewell’s *Philosophy of the Inductive Sciences*. Whewell delimited a class of historical sciences, as follows: “[…]the class of Sciences which I designate as Palaetiological are those in which the object is to ascend from the present state of things to a more ancient condition from which the present is derived by intelligible causes” (1847, 637). He explains that he dubs them “palaetiological” on the grounds that they are concerned with ancient or *historical* (paleo-) matters and with *causation* (etiological), in that they classify on the basis of *causal history*. Whewell elaborates that these sciences include geology, philology, archaeology, and astronomy, though he recognizes that these sciences may not be exclusively historical, since (for example) astronomy is concerned not just with etiology but with synchronic causal processes as well.³ Nevertheless, he holds that classification in these sciences is at least sometimes based on shared history.

Since Whewell’s seminal treatment, philosophers do not appear to have paid the topic of etiological kinds in general much heed, though there has been a great deal of implicit discussion of etiological kinds by philosophers of biology in the course of the extensive discussion of the species category. Additional implicit discussions of etiological kinds, as well as the contrast between classification on the basis of intrinsic and historical features, can be found in various debates in both science and philosophy. The classic debate between pheneticists and cladists in biological systematics is largely about the virtues of intrinsic and historical classification, respectively. Pheneticists classify organisms into species and higher taxa based purely on their intrinsic characters. They treat all characters on a par and assess similarity without regard to lineage or a history of descent. On their view, “biological classifications should be made independent of any theoretical assumptions concerning evolutionary relations” (Ereshefsky 2001, 67). Cladistic classification, on the other hand, is based entirely on the attempt to reconstruct lineages in evolutionary history and capture phylogeny. For cladists, classificatory categories are etiological. These two approaches to classification, intrinsic and

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³ Compare Currie (2018), who argues that there may not be a distinct class of “historical sciences.”
etiological, are usually regarded as opposed rivals, but some biologists adopt an intermediate position, which takes into account both synchronic and diachronic considerations in classification. Thus, their taxonomic categories are impure or hybrid ones.

Perhaps the most explicit treatment of etiological kinds in the recent philosophical literature occurs in the work of Ruth Millikan, who seems to have coined the term “historical kind.” Millikan (2004, 20-21) associates three features with what she calls “historical kinds” or “copied kinds” (she seems to use the terms interchangeably). First, reproduction (or copying): all members have been produced from one another or from the same models. Second, environment: members have been produced by, in, or in response to, the same ongoing historical environment, including other copied kinds. Third, function: some “function” is served by members of the kind, where “function” is roughly an effect raising the probability that its cause will be reproduced. For instance, if organisms perform their function effectively, they survive and reproduce, thus raising the probability of the creation of another token of that type. According to Millikan, members of these kinds are copied or reproduced precisely because they share certain synchronic features, so her “historical kinds” or “copied kinds” are impure etiological kinds (in my terminology). Biological species are the most obvious example of Millikan’s copied kinds, but she also includes some artifacts (e.g. 1969 Plymouth Valiant) and social professions (e.g. doctor) in the class of copied kinds. In addition to being impure etiological kinds, I would argue that copied kinds are a distinct subset of etiological kinds since they are the result of a particular type of causal pathway: a copying process. As some of the examples mentioned in this section (e.g. igneous rocks) and the following section show, not all etiological kinds are copied kinds. Are all copied kinds token-etiological as opposed to type-etiological kinds? It would seem so, since Millikan thinks of the members of copied kinds as all being copied from one another, indicating a token historical process.

3. Etiological Kinds across the Sciences

In this section, I will consider a number of examples of etiological kinds drawn from a few different sciences, with a view to clarifying various features of etiological kinds, including the
distinctions introduced in the previous section between token- and type-etiological kinds, and between pure and impure etiological kinds.

3.1. Astronomy

Although astronomy is considered a physical science, and paradigmatic physical sciences are not usually thought to harbor historical or etiological kinds, it contains clear examples of etiological kinds, such as the kind meteorite in planetary astronomy. Meteorites are rocks found on a planet or moon that originate elsewhere in the universe. Terrestrial meteorites primarily share an extra-terrestrial origin and they have diverse structures and compositions. Perhaps the only intrinsic property that almost all meteorites possess is a “fusion crust” on the surface of the rock.\(^4\) If they are so different in terms of intrinsic properties, why classify them together as meteorites? In short, they all reveal information that enables scientists to reconstruct aspects of the history of the solar system and the universe beyond. Terrestrial meteorites that come from other parts of the solar system provide information about the history of the solar system, such as “clues to the timing and formation of the planets” (Voosen 2018). This allows scientists to understand better the early state of the solar system and the changes in orbits of the planets and the asteroid belt. Terrestrial meteorites are a type-etiological kind, since they share the same type of causal trajectory, having all been drawn to earth by the earth’s gravitational field.

3.2. Biology

As mentioned in section 2, many biologists and philosophers of biology consider species to be etiological kinds. They are impure token-etiological kinds, since members of a species originate from the very same set of ancestors and they typically share many properties in common (notwithstanding some extreme polymorphisms). Another case of an etiological kind in biology is homology. Homologous phenotypic features derive from the same ancestral structures in different species or higher taxa. Homologies are often contrasted with analogies (or

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\(^4\) “Almost all newly fallen meteorites may be recognized by the presence of a fusion crust. This is a layer of 1-3 mm thick that formed during atmospheric flight by the solidification of the melt on the surface when frictional heating ceased as the meteoroid slowed to subsonic velocity.” (Hutchison 2004, 13-14)
homoplasies), which are features that share synchronic causal or functional properties, despite having different ancestral origins. The difference between homologous and analogous features of organisms and species can be understood as a difference between classifying features together on the basis of historical origin and on the basis of synchronic functional properties. Classification on the basis of analogous features allows biologists to understand how similar selection pressures or environments might give rise to features that perform the same function across different lineages. For example, we might be interested in understanding how similar selection pressures gave rise to wings in the lineages of insects, birds, pterosaurs, and bats. Meanwhile, classification on the basis of homology helps scientists explain the evolution of phenotypical characters with those specific features. For instance, comparison of three homologous organs, a feline forelimb, a bat wing, and a dolphin fin, all of which are instances of the etiological kind, mammalian forelimb, can help us understand how different selection pressures and environmental conditions helped to shape the different structures despite their common origin. Once we know that these organs have a common (token) origin, we acquire a better understanding of the specific causal processes that made each of them different from the others. Homologies are token etiological kinds that are also copied kinds.

3.3. Psychology and Cognitive Science

One instance of etiological classification in cognitive science concerns episodic memory. Episodic memories are generally considered to be mental representations of events (episodes) in the lifetime of a cognizer. They are representations of personally experienced past events, which are also thought to have a distinctive “autonoetic” phenomenology (Tulving 2002). What makes something an episodic memory is commonly held to be (at least partly) the right kind of causal link to a particular episode that occurred in the past history of a thinker. It is notoriously difficult to spell out the precise causal condition that needs to be met in order to exclude

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5 Ereshefsky (2012, 391) explains the difference between explanation on the basis of analogy and homology: “An analogy explanation for the properties of insect wings explains the features needed for performing the function of flight. It explains through design analysis such general features as being aerodynamic, being rigid, and being made of a certain range of materials. By contrast, a homology explanation of insect wings explains more specific features of wings by citing their morphological, genetic, and ontogenetic sources. For instance, a homology explanation tells us why insect wings are membranous and supported by rigid veins, rather than being made of feathers supported by bones.”
various mundane and bizarre cases (see e.g. Martin & Deutscher 1966, Michaelian 2011). Nevertheless, according to many philosophical and psychological accounts of episodic memory, what distinguishes memories from other sorts of mental representations (e.g. beliefs, imaginations, delusions) is that they originate in a specific past event that is represented in the mind-brain of the thinker. Episodic memories are type- rather than token-etiological kinds, since they (obviously) do not all have the same causal origin or trajectory. What they have in common is that they have the same type of origin and trajectory, the right kind of connection to some past experience in the life of the cognitive agent. But specific episodic memories of some common event that was personally experienced by numerous people, such as the election of Trump as US President, could be considered token-etiological kinds that have the very same origin (but they are not copied kinds). Their instances are the mental representations in the minds of various individual thinkers, which are the individual memories of that event. Why do many inquirers insist that for something to be a memory of Trump’s election, it has to have the right history rather than a certain set of intrinsic features? Episodic memories are thought to be of a particular episode, so unless they have the right kind of connection to that episode they cannot be said to be memories of that very episode. A mental state is not an episodic memory unless it originates in an experience in the history of the individual and is transmitted by an uninterrupted causal chain. In this case, the need to assure accuracy or veridicality would seem to justify the etiological mode of classification.

4. Conclusion: Why etiological kinds?
After reflecting on the examples discussed in the previous section, a question arises as to whether classification by etiology is justified in science, and if so, on what grounds. Based on this brief survey, it would seem as though there are broadly three reasons for etiological classifications:
(a) Retrodiction (i.e. prediction of the past): When we classify something into an etiological category, this enables us to make a retrodiction about its past. For instance, if we identify a rock as a meteorite based on its fusion crust, we can infer that it had an extra-terrestrial origin and a certain causal trajectory through the earth’s atmosphere.
(b) *Explanation*: Classification in an etiological category can help us understand and explain the causal processes that led to its current state. For instance, classifying two phenotypic features as homologues can help us understand the selection pressures that led to their current forms, as with a bat wing that is classified as a homologue of a feline forelimb.

(c) *Tracking veridicality*: Classification according to etiology is sometimes in the service of securing an accurate representation of a past event, or indeed ensuring that a current phenomenon bears a mark or trace of some previous state of affairs. For instance, a mental state is classified as a memory based on a connection to a past event.

Do these reasons vindicate the use of etiological categories in science? Can they provide a justification for etiological classification? In the first two cases, etiological categories serve standard scientific goals of prediction and explanation. At least prima facie, etiological categories seem to be on a par with other scientific categories in this regard. Moreover, these two reasons align with features commonly associated with natural kind categories, namely that they enable explanation and prediction, thus suggesting that etiological kinds may be natural kinds. As for the third reason, securing the veridicality of a representation may also seem to conform with the scientific aim of truthful description. But when it comes to episodic memories, the representations in question are not those of the scientific observers but those of the agents being studied. Still, here too, it seems that the overriding purpose is the need to retrace and understand causal pathways, which is often considered to be the ultimate aim of science: to capture the causal structure of the world.
References


