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### The Special Science Dilemma and How Culture Solves It

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# THE SPECIAL SCIENCE DILEMMA AND HOW CULTURE SOLVES IT

Marion Godman

I argue that there is a tension between the claim that at least some kinds in the special sciences are multiply realized and the claim that the reason why kinds are prized by science is that they enter into a variety of different empirical generalizations. Nevertheless, I show that this tension ceases in the case of ‘cultural homologues’—such as specific ideologies, religions, and folk wisdom. I argue that the instances of such special science kinds do have several projectable properties in common due to their shared history of reproduction, and that the social learning involved means that we should also expect these kinds to be multiply realized.

**Keywords:** multiple realization, special sciences, natural kinds, multiple projectability, homology thinking, cultural evolution

## 1. Introduction: A Dilemma for the Special Science Model

This is where many of us are at: the universe is physical and all that exists is ultimately made out of physical stuff. If physicalism seems to leave us with a rather drab ontology, then tough luck! Many physicalists do, however, continue to seek solace in the possibility that there is not just physics, but there are also special sciences that have kinds that are multiply realized [Fodor 1974]. Surely, non-reductive physicalists will insist, not all biological, psychological, and social kinds employed in empirical investigations and generalizations are reducible to physical kinds.<sup>1</sup> The ongoing appeal of multiple realization is then about squaring physicalism or materialism with some justification for there being special sciences (from now on, often abbreviated as ‘SS’). While multiple realization requires that *some* physical state or kind  $P_1$  realizes a given special science kind  $SS_1$  (such that any system containing  $P_1$  will necessarily also contain  $SS_1$ ), it also holds that  $SS_1$  is not type-reducible to an underlying physical kind. In other words, a disjunction of different physical kinds,  $(P_1 \vee P_2 \vee P_3 \vee \dots \vee P_n)$ , can realize  $SS_1$ .<sup>2</sup>

<sup>1</sup> Although Fodor never offers an outright definition of the ‘special sciences’, he tends to use the term descriptively to denote all sciences other than physics, with psychology as his paradigm special science (see, e.g., [1974: 97]). I stick to a descriptive use of ‘special sciences’ but mainly address the issue of multiple realization in the life, human, and social sciences (thereby not addressing the issue for the ‘non-living’ natural sciences, such as chemistry). It is sometimes tempting to think that Fodor simply uses ‘special sciences’ to refer to those sciences whose laws and kinds are multiply realized. This definition would, however, be unfortunate, as this is the substantial position that Fodor wishes to defend and hence not something that he should want to build into the definition of the term.

<sup>2</sup> The way to cash out the relationship of variable realization between the micro-level physical states or kinds and the SS kind has been described in various terms, such as identity, token identity, and supervenience. An anonymous referee has also suggested that it might be sufficient for a non-reductive physicalist to maintain that macro-level properties are merely correlated with disjunctions of lower-order physical properties. Although I doubt that correlation is sufficient here, there is no need for me to engage in the particulars of these debates, so I merely stick throughout with a neutral concept of realization.

Still, for putative SS kinds like, for example, pain, eyes, and Buddhism (about which more will be said later) to be worthy objects of scientific enquiry, the question of multiple realization seems less significant. More important for science is that the kinds should exhibit some macro-level stable properties that allow us to use make legitimate projections and generalizations over the kind's instances. But why think that the different physical bases of such kinds could end up producing such stabilities? For kinds to be projectable, there must be at least *some* stable properties amongst, say, instances of eyes, or individuals with pain. If the apparent stability does not have as a base a common physical kind, what's to stop us from thinking the apparent stability is merely illusory? This raises an important dilemma for the non-reductive physicalist about the grounds for the apparent projectability of multiply realized kinds.<sup>3</sup> The aim of this paper is to describe and refine the dilemma, and then to offer a novel response in terms of cultural homologues. In brief, I will argue that when cultural creatures stably reproduce information and content, this not only permits, but also encourages, multiple physical realizations of the same cultural kind.

The dilemma with which we will be concerned has been raised in slightly different ways by Jaegwon Kim [1992], Ned Block [1997], and David Papiineau [2009, 2010].<sup>4</sup> Yet they all press the point about whether a putative multiply realized kind, like pain, can truly also be projectable. The dilemma can be stated as follows:

### ***Projectability Dilemma***

- (1) At least some SS kinds (e.g. pain) are both (a) projectable and (b) multiply realized.
- (2) Kinds are projectable only if each is realized by a single physical kind.
- (3) Kinds are multiply realized only if each kind is realized by multiple diverse physical kinds, i.e.  $P_1, P_2, P_3, \dots, P_n$ .

Claims 1–3 thus form an inconsistent set of propositions. Since the non-reductive physicalist wants to maintain (1), she cannot also hold on to both (2) and (3); hence the dilemma—she has to abandon one of the two. Abandoning (3) is clearly not an option for the non-reductive physicalist. It is (2) that she must attempt to tackle. But what is the sense of winning the irreducibility for the special sciences, if it is at the cost of unsupported claims of projectability? Thus, (2) can only be rejected if the projectability of an SS kind can be explained in some way that does *not* depend on an SS kind being realized by a uniform physical kind or mechanism.

<sup>3</sup> Strictly speaking 'projectable' should be used to predicate linguistic items; still, I hope that I will be will forgiven for following common usage in using 'projectable' not only to predicate terms and predicates but also to predicate properties and kinds.

<sup>4</sup> There are of course other famous dilemmas targeting the possibility of multiple realization in the special sciences, including an influential one due to Lawrence Shapiro [2000] (see also Zangwill [1992]; Shapiro and Polger [2012]). This latter dilemma is, however, mainly concerned with the putative individuation rather than with the projectability of multiply realized kinds; so it is at least in part distinct from the dilemma here and although I believe my response in section 4 can also be applied to this dilemma, it probably deserves a different treatment.

Before we proceed to the responses to the dilemma, I should say something about the scope of multiple realization that is at issue. Fodor's original model of Science (with a capital 'S') is arguably one where multiple realization is both pervasive in and distinctive of the different special sciences.<sup>5</sup> However, in more recent work on the topic a weaker version of the multiple realization seems to be addressed: namely, whether multiple realization is at least empirically possible and plausible for *some* kinds in the special sciences, thus not explicitly ruling out local reductions (see, for example, Richardson [2008]). It is this latter weaker thesis that existing responses to the dilemma and my own attempt to salvage.

The plan for the paper is this. Section 2 turns to the rejoinder that Ned Block and David Papineau themselves offer to the dilemma: namely, that a variety of different physical bases can all be selected for performing the same function. They believe that selection processes, natural or cultural, can explain the relevant stabilities and projectability exhibited by SS predicates. I then argue that this solution is ultimately unsatisfactory, which in turn prompts a refinement of the standard dilemma so that it is concerned with *multiple* rather than single projectability (section 3). The final section offers a response to the revised version of the dilemma (section 4). I argue that we should expect cultural homologues, such as specific ideologies, folk wisdom, and traditions to be both multiply projectable *and* multiply realized due to their instances being reproduced by means of social learning.

## 2. A Selection-Based Solution

Block and Papineau present a solution to the dilemma where the projectability (and multiple realization) of SS predicates is explained by appealing to certain selection-based processes or laws in the natural and social world. Block [1997] suggests that natural selection will be largely indifferent to the way in which beneficial results are achieved: if a particular effect or function is important enough for the fitness of the individual, natural selection will even ensure that there are several different physical realizers for achieving the effect. In a similar vein, Papineau [2009, 2010] suggests that *cultural selection* often guarantees that there are different ways for achieving certain cultural and social ends that are particularly important for groups and individuals (see also Kincaid [1990]). In other words, we have good reason to expect that neither nature nor culture is particularly discriminating when it comes to selecting the physical kinds required to perform a certain function. And, what's more, because these different instances have all been selected to perform a particular function, this guarantees their entering into specific selection-based laws or lawlike generalizations.

<sup>5</sup> Fodor himself famously argues in response that psychological laws and other SS laws are best understood as holding only *ceteris paribus*—with exceptions [1974, 1997]. But while it is of course true that *ceteris paribus* laws display a different pattern of regularity and stability than those states that are governed by, let's suppose, exceptionless physical laws, this simply postpones the problem. If *ceteris paribus* laws are truly laws—or at least *lawlike*, and not just accidental generalizations—there must still be some reason for trusting them to begin with [Millikan 1999; Papineau 2009]. And if there is no non-reductive explanation available for this non-accidentality, critics can always counter that the confidence we place in SS *ceteris paribus* laws is either unfounded or ultimately explained by underlying physical laws.

So it would seem that we can indeed have it both ways: on the one hand, selection processes can bring about SS kinds that are genuinely multiply realized; on the other, the very same multiply realized kinds are projectable in virtue of supporting a particular generalization concerning their shared selected function. Consider the paradigmatic SS predicate ‘pain’—allegedly multiply realized and referring to an Octopus state  $M_1$ , a human neural state  $N_1$ , a human neural state  $N_2$ , and so on. Papineau suggests that we can make sense of the predicate as denoting a naturally selected cross-species pain mechanism [2010: 186]:

It is widely supposed that pain is multiply physically realized across different life forms, yet nevertheless enters into laws mediating causes and effects, such as the law that bodily damage gives rise to pain and the law that pain in turn leads to avoidance of the source of the damage.

So, accepting Papineau’s thesis that ‘pain’ is understood to refer to a cross-species pain mechanism— $Pain_1$ —that enters into two selection-based and closely associated laws does give us a case of multiple realization. Crucially, any such selection-based predicate is projectable in a way that does not depend on uniform physical realizations. The stabilities amongst instances of  $Pain_1$  are just manifestations of common selective pressures operating in different contexts, rather than of the same physical mechanism. In one clean stroke, the appeal to selection looks to explain both multiple realization and why SS predicates can be projectable without being reducible to physical kinds.

Regrettably, there is good reason to restrain one’s enthusiasm regarding the selection-based account of multiple realization. The projectability of these selection-based predicates is precisely limited to the inferences concerning the selected function. After all, for something to count as an instance of  $Pain_1$ , the item in question merely has to exhibit a certain selected function. This leaves plenty of room for variability: a variety of states of different species and possible intelligent machines are likely to qualify as  $Pain_1$ , since it merely has to conform to a certain functionally specified role. At the same time, the very permissiveness in terms of how an item is allowed to perform a function suggests that there will not be many commonalities other than those that directly pertain to the selected function amongst those instances picked out by the predicate. Some non-functional resemblances amongst instances of selection-based kinds may of course exist, but this would be merely accidental. In other words, we are not licensed to assume that instances of  $Pain_1$  support any generalizations above and beyond those that are necessary for them to fulfil their functional role.

The upshot is that selection-based predicates support only one-off generalizations or a very impoverished set of them. Mark Couch has made a similar point in his detailed review of the possible convergent evolution with respect to  $Eye_1$ , understood as a multiply realized selection-based property [2005: 1048]:

I have said that the structures can be classified as ‘light receptors’ if we need a way to group them together. But the problem with this is it is hardly informative to be told that the eyes all function to respond to light. Researchers in vision science are concerned to discover more interesting empirical generalizations than this. Their interest is with finding generalizations that can be used to explain a broad range of facts about the structures. The difficulty is that there is little more in common among the structures to be the basis of such generalizations. Given the differences that are present, there are only a limited number of generalizations about the eyes that hold across all the structures.

Couch’s point here is that, once we have classified items purely according to their selected function, there will be little else of interest for scientists to discover or uncover in terms of further similarities amongst instances of Eye<sub>1</sub>. It follows that there will also be very few—and unsurprising—generalizations associated with other SS kinds that are picked out by selection-based predicates alone.

### 3. The Real Dilemma

I take there to be a positive upshot in these limitations in the selection-based solution, which is that it highlights the importance of a solution targeting items that are held in esteem by the special sciences. After all, it is not clear why we should be interested in defending the non-reducibility or autonomy of just any projectable predicate. Now, a clue to what predicates are prized by science lies in the diagnosis of why the selection-based predicates are disappointing: they support merely single or one-off generalizations associated with a selected function. Predicates esteemed by science tend to be projectable in several respects: that is, able to support a variety of empirical generalizations. One of the first to pick up on this crucial point was John Stuart Mill, who insisted that what I will call ‘multiple projectability’ was the hallmark of natural kinds—or simply, ‘Kinds’, as Mill called them [1976 (1843): 703–4]:

By a Kind, it will be remembered, we mean one of those classes which are distinguished from all others not by one or a few definite properties, but by an unknown multitude of them . . . [T]he class horse is a Kind, because the things which agree in possessing the characters by which we recognise a horse, agree in a great number of properties, as we know, and, it cannot be doubted, in a great many more than we know. White horse, therefore, is not a Kind; because horses which agree in whiteness do not agree in anything else, except the qualities that are common for all horses, and whatever may be the causes or effects of that particular colour.

Following Mill, many have agreed that a central condition for classes to be kinds—or at the very least to form kinds who have their home in scientific

investigation and inference—is that their members or instances must have a variety of projectable properties in common with one another (see, for example, Gelman and Markman [1987]; Boyd [1991, 1999]; Griffiths [1999]; Millikan [2000]; Machery [2009]).<sup>6</sup>

The reason for thinking that this multiple projectability displayed by kinds is of a comparatively superior value for science than mere projectability (of, say, the just-mentioned selection-based categories) is not so much the *quantity* of generalizations itself but the fact that there are further valid generalizations over the kind's instances than those that are immediately obvious to us. Likewise, the problem with selection-based predicates is not really that they tend to support only few generalizations across their instances, but that we are *not* licensed to predict or project that they will share any other similarities with one another. The ability to predict further properties amongst instances, without having to first check whether the properties are in fact there, is on the other hand an important epistemic corollary of there being natural kinds. If we know that A, B, and C are members of the same kind, and that A has properties x, y, z, etc., we can, at least *ceteris paribus*, assume that B and C will have further instances of those same properties. The assumption here is that the properties of genuine kinds come together for some non-accidental reason, which in turn licenses further projections and scientific investigation. In fact, Ruth Millikan has on the basis of this argued that real kinds are a major source of *all non-accidental learning* [2000].

I hasten to add that the open-ended fecundity is entirely consistent with kinds varying across both dimensions of the *reliability* of the generalizations and of the *range* of inferences supported. Not all kinds are born equal in terms of inferential reliability or fecundity. And, as will become important later on, at least in the special sciences kinds also vary in terms of *scope*: namely, the distribution or range of 'systems' to which the kinds and relevant generalizations apply [Griffiths 1999; Raerinne 2013]. Yet, despite variations across these dimensions, I contend that multiple projectability or open-ended fecundity is a unifying feature of (natural) kinds in different special sciences. It is this feature that distinguishes kinds from mere projectable properties, thereby explaining their distinctive role in underwriting scientific investigation, generalization, and prediction.

Interestingly, the criteria for SS kinds to display open-ended fecundity rules out another recent defence of multiple realization in the special sciences. Daniel Weiskopf has suggested that an SS predicate might in some sense refer to a 'functional kind' that supports functional generalizations in virtue of playing a role in a range of well-confirmed models. But, as Weiskopf himself points out, whatever capacities and behaviour are present here must be 'necessary effects' for the model(s) to hold true [2011: 246–54]. Hence, although such models may in some sense ground functional categories in a way that allows them to enter into multiple lawlike statements, such

<sup>6</sup>Papineau also recognizes this limitation in the use of selection-based SS predicates: 'However, selection-based patterns might be argued to fall short of the requirements for a genuine "science" in a different respect. Paradigm examples of natural kinds enter into *lots* of laws, not just single ones' [2010: 188]. Nevertheless, he appears not to take this as being a decisive problem for the selection-based response to the dilemma.



statements will then have to be tied to the model deductively. Whatever the virtues of such ‘kinds’, they are not equivalent to the kinds in question here, since any lawlike generalizations supported by multiply projectable kinds are not licensed by models or conventions. However, the question of what grounds SS kinds do have is precisely what is queried by the dilemma and what I will address more positively in the next section.

We now finally have a better appreciation for what is wrong with the selection-based approach to solving the dilemma. The selection-based solution in fact fails to save the possibility of multiply realized SS *kinds*. Since a central characteristic of kinds is that they support multiple empirical generalizations, it follows that those instances that are jointly projectable solely in relation to their selected function will not be kinds at all!<sup>7</sup> But it should now also be clear that the problem lies not merely with the selection-based solution, but instead with the dilemma itself (or at least with how it is typically presented in the literature). While it is still necessary to explain the alleged projectability, it is not sufficient. For the dilemma to concern genuinely useful multiple realization in the special sciences, the dilemma must address the open-ended fecundity (which allow us to investigate particular instances in view of making legitimate extrapolations to other instances of the same kind). It can be stated as follows:

***The Real Multiple Projectability Dilemma***

- (1) At least some SS kinds are both (a) multiply projectable and (b) multiply realized.
- (2) Kinds are multiply projectable only if each is realized by a single physical kind.
- (3) Kinds are multiply realized only if each kind is realized by multiple diverse physical kinds, i.e.  $P_1, P_2, P_3, \dots, P_n$ .

**4. How Culture Solves the Real Dilemma**

*4.1 Homology Thinking and Multiple Projectability*

The last section concluded that, in order to dissolve the real dilemma in favour of non-reductive physicalism, it is *multiple* projectability that must be explained. And, as before, it must be explained without reference to an underlying physical kind or stable physical mechanism. The reason why the appeal to selection-based proposal would be inadequate for solving this latter dilemma is then that mere selected function amongst instances typically rules out multiple projectability. Yet, while selection *alone* does not warrant expectations of multiple projectability, it is important to recognize that certain stable SS kinds pressures in the environment can and often do contribute to the projectability of some biological kinds whose members already share *common ancestry*. However, as I will try to demonstrate in this section,

<sup>7</sup> Fodor in his original special science paper suggests that we should indeed understand an SS predicate as a predicate denoting natural kinds: ‘roughly, the natural kind predicates of a science are the ones whose terms are the bound variables in its proper laws’ [1974: 102]. I add only that an important stress should be on the natural kind term being a bound variable in a *variety* of SS laws or non-accidental generalizations.

in such cases the multiple projectability in question is ultimately explained precisely with reference to the shared history of the instances (and it follows that shared selected function is neither sufficient nor necessary for multiple projectability).

To anticipate, it is for this reason that Marc Ereshefsky has argued that the case of homologues and what he calls ‘homology thinking’ (echoing Ernst Mayr’s phrase, ‘population thinking’), can be used to make a plausible empirical case for multiple realization in biology [2007, 2012]. I am not persuaded. I will argue that the particular developmental mechanism responsible for realizing instances of a biological homologue needs to be more or less stable across generations if those instances are also to be jointly multiply projectable in terms of physiological, morphological, and behavioural features. So, for multiple projectability for *biological* homologues to be achieved, one must assume at least a significant overlap between the physical kinds responsible for realization. In the next section, I will argue that it is instead in the domain of culture that we should expect some (cultural) homologues to be realized by various physical kinds.

But, first of all, how does a shared historical lineage license assumptions of multiple shared properties amongst instances of a SS kind? Let’s begin by observing the contrast that biologists adopt between characters that are homologous and characters that are analogous. A typical analogue is the wing, which occurs in a variety of animals such as birds, bats, and insects. It is an analogue, since it has been selected to serve the same function in distinct species. But just as in the case of the predicates that enter into selection-based laws (e.g. Pain<sub>1</sub> and Eye<sub>1</sub>), the different instances of the analogue—wing—are unlikely to have any other characteristics in common apart from their selected function and perhaps their conforming to some design constraints. This is due to the wings evolving independently of one another; they lack a common ancestor and a shared history. Homologues, by contrast, have a phylogenetic continuity with a common ancestor. Just like analogues, homologues can of course occur in different individual organisms of either the same or different species; but here it is the historical continuity with a common ancestor that is shared between instances of a homologue that licenses an expectation of projectable similarity amongst them.

Again we may take wings as a case in point. To be sure, the wings of moths and eagles have evolved quite independently of each other, since their last common ancestor did not have wings; but it is also true that each species’ wing represents a homologue. And this expectation is borne out in the projections we make about one moth’s wings that are likely to be true for other moths (and some for other insects) but likely to be false for the wings of a bald eagle—and *vice versa*. A character that is homologous supports a range of different empirical generalizations. This is also one of the reasons cited for homologues—in contrast to analogues—being of central importance to biologists [Wagner 1996; Brigandt and Griffiths 2007; Ereshefsky 2012].

Now the multiple projectability of a homologue does not come about simply through some pre-established plan or inertia. For a start, some stable

genetic mechanisms must be in place to buffer the development of new instances. Together with some stable ontogenetic or developmental mechanisms, they in a sense *reproduce* new instances of the same homologue—or new members of the historical kind—by ensuring that these share properties with their ancestors. And, as mentioned previously, recurrent pressures in the environment can also contribute to the stability of many homologues (e.g. by weeding out deleterious mutations)—which is why some homologues are also capable of entering into more specific functional generalizations. All the same, the reference to any single genetic or developmental mechanism does *not* explain the multiple projectability of a particular homologue, since none of these features on its own guarantees the range of inductive similarity that is found across instances (or generations) of a particular homologue.

Marc Ereshefsky [2012] has argued that one of the virtues of ‘homology thinking’ is precisely that it provides a better explanation for why a particular character has a particular set of properties than does, for example, a shared selected function or a particular developmental mechanism. The historicity of the explanation is truly ‘path-dependent’: it cites not merely the initial condition or a common ancestor, but multiple factors along the historical path or lineage (Ereshefsky [2012]; see also Matthen [2007]). The shorthand for the historical explanation is the historical path itself. Indulging in some Darwinian metaphysics of natural kinds, we might say that the historical lineage of the homologue or kind is its ‘essential nature’, in the sense that it is a particular relation or relational property that an instance could not lose without ceasing to be a member of the kind [Millikan 1984: 265; Okasha 2002]. The main point here, though, is that the proper explanation for any inductive fecundity displayed by a homologue is the shared history of the instances; and, conversely, knowledge of a shared lineage amongst instances of a kind licenses expectations of inductive fecundity.

Amongst the virtues of homology thinking, Ereshefsky singles out an explanation of multiple realization. He claims that it ‘provides a well-founded empirical account of why multiple realization occurs in biology: as the phylogenetic history of a homologue unfolds, the underlying factors that cause that homologue are substituted’ [2012: 395]. Ereshefsky argues that substitution of the proximate developmental mechanisms might lead to different instances of the *same* homologous character having distinct realizations. He cites Brian Hall’s [2003] example of how ontogenetic processes have been replaced in the case of tetrapod digits. The ancestral developmental mechanism for the interdigital spaces is genetically programmed cell death (apoptosis) that removes connective tissue from between the digit primordia, leaving interdigital spaces. In amphibian urodeles, however, there is a derived developmental mechanism for the interdigital spaces: differential growth of digits. Ereshefsky takes this possible replacement of genetic and ontogenetic mechanisms in distinct yet homologous lineages to suggest an empirical basis for multiple realization.

Alas, I believe that his case falls short of providing a case for a multiply realized *kind*. In the biological domain, the multiple projectability of certain homologues typically concerns structural, morphological, generative, and

behavioural properties. These projectable features do depend on some overlapping stability in terms of proximate physical mechanisms. Although substitutions in genetic and developmental mechanisms can certainly occur, such substitution undercuts the possibility of instances in that lineage having some *multiple* of those structural, generative, and behavioural properties in common. In other words, while extensive substitution in the genetic and ontogenetic processes underlying homologous traits may be possible, this typically does not preserve the rich amount of projectable features. So, while we should probably agree that the tetrapod limbs of amphibian urodeles and ducks are homologous (rather than a case of evolutionary novelty), the variation in the responsible developmental mechanisms has implied that they do not share vary many generative, morphological, and behavioural features with one another. For biological homologues, then, developmental replacement tends to be at the expense of an open-ended fecundity.<sup>8</sup>

A corollary of these concerns is, of course, that multiple projectability of biological homologues is not necessarily preserved for long stretches of evolutionary time as substitution and replacement does indeed occur in the developmental mechanisms. It is therefore worth stressing that my claim has only been that the historical-reproductive continuity between instances *prima facie* justifies the expectation of there being unexplored similarities amongst instances of the same homologue. Yet, as we have just seen, this justification is weakened when we know that the relevant developmental mechanism might be entirely substituted—as in the changes to tetrapod digits that occurred over long stretches of the phylogenetic tree.

#### 4.2 *The Multiple Realization of Cultural Homologues*

The reservations I submitted against applying the multiple realization thesis to biological homologues was also meant to anticipate the possibility that variation in the physical means of realization need not undercut the multiple projectability of a different class of homologues: those transmitted by *culture*.<sup>9</sup> In this section, I will argue that the historical-reproductive lineages that underpin the instances of certain cultural kinds *do* license assumptions of multiple shared features and that, due to the flexibility provided by both social learning and culture, the content is encouraged to be realized in various physical forms.

Let me first be clear on the cultural kinds I have in mind, especially as I am not the first to propose that certain kinds in the human and social sciences can be modelled on homologues and other ‘historical kinds’ in biology (see Hull [1988]; Millikan [1999, 2000: 18–23]; Ereshefsky [2007]; Bach [2012]).<sup>10</sup> The cultural-historical kinds or ‘cultural homologues’ that my argument

<sup>8</sup> Indeed, this seems to be why some biologists think that phylogeny and a stable developmental module go hand in hand when defining a homology [Wagner and Misof 1993].

<sup>9</sup> It should be noted that even if one is not convinced by my reservations against multiply realized biological kinds in the last section, one can still see the project that I engage with in this section—of explaining how cultural kinds are multiply realized—as an independent and hitherto unrecognized pathway to variable realization. I thank an anonymous reviewer for making this alternative salient to me.

<sup>10</sup> Although Richard Boyd [1999] has some reservations against grounding *biological species* in an historical-reproductive lineage, he also admits that an historical account might apply to some other kinds.

concerns here are those that contain *systematically arranged information or content*, such as certain kinds of ideologies, folk wisdom, and other cultural traditions. The information or content in question is typically a combination of factual knowledge about the world and prescriptive or practical know-how, like *social democracy*, *Sikhism*, *the folk wisdom of the Sami*, and so on.

I contend that anthropologists and other social scientists take an interest in such cultural items because they expect them to be able to afford at least some stable projections within and across certain human populations in time. These projections concern not only the content of such knowledge systems itself, but also predictions about the behaviour and social norms of individuals who adhere to the relevant content. These systems of knowledge can thus at least *prima facie* be treated as *kinds*, in the sense of licensing expectations of inductive fecundity. Moreover, the fact that the relevant generalizations occur mostly across different *time-slices* (or temporal instances) suggests that we assume that there is some relevant degree of historical continuity amongst the instances.

The claim, then, is that the reason why social scientists typically get away with this is that they are indeed dealing with *cultural homologues*.<sup>11</sup> The instances of such cultural knowledge are jointly multiply projectable, not due to a particular functional role (nor does it depend on a uniform physical mechanism—or so I will argue), but because of their shared historical lineage of reproduction. Just as in the case of biological homologues, the historical-reproductive lineage is explanatory in the sense that it abbreviates multiple factors along a particular spatial-temporal trajectory. Amongst the features of the historical path there will be some relevant reproductive mechanisms and also external pressures that stabilize the projectable properties of cultural kind over time. Yet an important difference between biological homologues and cultural ones is of course that in the latter case the type of reproductive mechanisms requisite for generating an historical lineage of cultural knowledge is not going to be mainly genetic or even ontogenetic. Instead, the reproduction in question is generally explored under the heading of ‘social learning’: e.g. teaching, imitation, symbolic learning between subjects, or simply observation of others’ behaviour [Richerson and Boyd 2005; Mesoudi 2011; Heyes 2012].

Using a model of reproduction sketched by Peter Godfrey-Smith [2009: 69–87], we might take an historical-reproductive lineage amongst instances of a cultural homologue to be created by (1) an instance of a certain kind (in this case, an instance of cultural knowledge) standing as a model or template, and (2) some mechanisms (in this case, for the most part, social learning) reproducing the features of the model, thereby also (3) producing a new instance of the kind. Social learning thereby has a parallel role to reproduction by means of genetic and developmental mechanisms, in that it facilitates

<sup>11</sup> The social sciences are of course often interested in precisely the change and variation amongst different temporal instances of cultural knowledge; but to explore such differences means presupposing some underlying notion of historical continuity in order to get a comparison off the ground in the first place.

an historical lineage amongst the instances of a kind, ensuring that there is also shared projectable content.<sup>12</sup>

It is these cultural homologues whose instances are reproduced by means of social learning that are genuinely multiply physically realized. Recall that the reason why we should not expect multiple realization in the case of *biological* homologues is that any variation in the developmental mechanisms that are responsible for stabilizing an homologous trait comes at the expense of overall similarities. Not so in the case cultural homologues. The same trade-off between, on the one hand, variation in underlying mechanism for realization and, on the other, the inductive richness is not present here. This is because social learning is capable of reproducing the relevant cultural information in question in several flexible and interchangeable ways. Although cultural information in question is typically expressed in terms like ‘belief systems’ or ‘oral traditions’, the truth is that it does not really matter in which physical manner such knowledge is realized. In fact, social learning exploits the possibility that cultural information is the kind of information that can be expressed by a variety of means like artefacts, skills, gestures, texts, beliefs, and linguistic utterances. This variation of physical realization occurs without sacrificing precisely the projectable content that interests social scientists and others.

Before developing the argument for multiple realization of cultural homologues in slightly more detail, let’s make the idea a bit more concrete by means of an example of a specific cultural homology. In communities in the northeast of Brazil, one finds a collection of folk syndromes, including blood-boiling bruises, *nervos* (nerves), *sustois* (shock sickness), *mal olhado* (evil eye), and *peito aberto* (open chest). Linda-Anne Rebhun, an anthropologist who studied this interrelated group of syndromes, argues that these syndromes all come about due to culture-specific knowledge about the distinctive physical and psychological features of each illness and their social and emotional causes [1994: 375]:

The syndromes connote different things about the sufferer. *Sustois* is a state of emotional vulnerability caused by one or more shocking events. It can lead to *nervos*, or the frazzling of a person’s ability to remain calm through repeated worry, grief, anger, and sadness. *Peito aberto* occurs when a woman’s heart expands to encompass all those for whom she feels compassion and, combined with the seething of her

<sup>12</sup> Two worries one might have about the analogy between biological and cultural homologues: first, it is going to be much less obvious how we should count instances or members of the same kind of cultural knowledge than in the case of biological homologues (or organisms that are members of a species); and second, the multiple projectability of such cultural knowledge will be (far) less than perfectly projectable, as in human culture there is always room for plenty of ‘mutations’. Yet the growing amount of literature on cultural evolution is devoted precisely to exploring how cultural traits due to social learning are reproduced *despite* the threat of being washed out by individual learning and innovation [Mesoudi 2011]. Thus, the issue is not one of *whether* culture can be reliably retained, but instead one of *how* best to explain its being reliably retained. These concerns thus represent not just general, but also tractable, worries about cultural evolution: e.g. that cultural reproduction lacks a clear bottleneck and is of less high fidelity than genetic reproduction. Those concerns also matter less for the purposes of this paper, as the argument here does not depend on cultural evolution mirroring biological evolution in every sense.

own suppressed anger, pushes open her chest, allowing negative influences to enter. Evil eye is caused by the envy and anger of others, victimizing the sufferer.

The culture of this region thus stipulates—perhaps correctly—that there is a strong connection between the experience of negative emotions and illnesses of various kinds: the emotions or their suppression have a sort of sickening power (*engolir sapos* or ‘swallowing frogs’). The fact that it is almost solely women who experience the syndromes in this region is also predicted by the culture’s gender-specific prescriptions for emotional appraisal and suppression. For example, the practical know-how stipulates that it is much more acceptable for women to contain and suppress negative emotions than it is to express them directly; however, if women are unsuccessful with suppressing their emotions, there is also a recognition, and often even approval, of the ailments in question [1994: 363–4]. The cultural homologue of the region thus offers stable projectable information about the nature of the syndromes as well as further projectable properties: for example, what the emotional triggers are, the means of healing, and the treatment that is recommended.

The hypothesis, then, is that social learning can flexibly employ various means for realizing the projectable cultural content in question. In this example, for instance, we see it realized in *verbal representations*, either by the syndromes being referred to in passing or elaborated in discussions and stories; by being embodied in *the gestures and behaviour of individuals* who take themselves to be a victim of a syndrome or have been diagnosed as such; and finally in the *instruments and skills* of expert faith healers.

To be clear, this account is compatible with there being considerable social and psychological constraints (cognitive and motivational) for social learning itself. Indeed, most people working on cultural evolution assume that there are; they just disagree about the nature of these constraints and hence about the key psychological and social means for stabilizing cultural homologues over time (see, for example, Sperber [1996]; Richerson and Boyd [2005]; Sterelny [2006]; Heyes [2012]). The key point here is rather that, no matter what the psychological and social constraints for social learning are, none of them also constrain the physical realization of the *product*: i.e. the physical manifestation of the cultural information. What has been physically modelled in an utterance can still be reproduced and expressed in the skills, beliefs, artefacts, and so on. Thus, neither the social learning mechanisms of observation, imitation, and teaching, nor its psychological components typically place constraints on the content being reproduced in the same physical manner as it has been modelled.

Indeed, considering the abundance of physical resources that social learning and human culture has at its disposal in reproducing content, it would be strange if it did not also use multiple physical means. Take the information concerning the diagnosis of *Peito aberto* (performed by measuring a string twice against the patient’s forearm and then looping it around the chest to see whether it closes securely around the chest—it never does [Rebhun 1994: 369]). It might originally be conveyed by a verbal self-report

and then be transmitted in the narratives of the next generation, to then be instantiated in the medical practice and instruments—or any other combination of the above. In fact, in order to understand, explain, and perhaps also treat the syndromes that result in part from such knowledge, it makes sense for anthropologists, psychiatrists, and others to collect cultural knowledge about the syndromes from various different sources, such as self-reports, narratives, medical journals, tools and skills of healers, etc. Conversely, it does *not* make much sense to pay attention to the particularities of the physical manifestations of the cultural homologues, as the chances are that there will not be much projectability at the physical level of the kind. Increasingly, the cultural content in question is inferred from texts disseminated on the Internet. So social scientists have yet another physical realization of the relevant content of a cultural homologue—but by all means not one that replaces all others.

So I want to suggest that what unites such diverse things as religious practices, political ideologies, culinary arts, and musical genres is that new instances (of information and practical know-how) tend to be reproduced by various different physical means. Yet the historical-reproductive lineage in each case also grounds the assumption of multiply projectable content across an historical trajectory. It is worth stressing that ultimately, however, the empirical generalizations associated with such multiply realized cultural homologues will only ever be ‘local’ in character, precisely because the kinds are underwritten by a particular spatial-temporal pattern of transmission. This means that the kind in question is useful only when its projections are applied to the very same culture that is responsible for reproducing the content. We should, for example, only expect that information about extremist right-wing ideologies supports projections to the behaviour of individuals who adhere to and stand as models for this movement, and we should only expect information about Dadaism to generate projections about the artists, critics, and appreciators of the movement. This is, however, not the same as these projectable properties being necessary or analytic features of the cultural kind in question. The projectable properties are synthetic features of the kind and they can undergo change without the identity of the kind necessarily being threatened.

Even some of the central information attached to the cultural homology is capable of changing over time and also of varying between different historical branches. Hence, the details about the degree of reproductive continuity and the branching of lineages may imply some adjustments with respect to what kinds we intuitively pick out as relevant for the special sciences. Take *Buddhism*.<sup>13</sup> According to Buddhist scholar Cathy Cantwell [2010], there is a commitment amongst all Buddhist traditions to the three Jewels (the *Buddha*, the *Dharma*, and the *Sangha*), the particular initiation rite *Going for the Refuge*, as well as a few other ethical, ritual, and meditative practices. Still, she claims that there are probably many more features that vary *between* different Buddhist traditions than are shared amongst them, with the diversity in Buddhist traditions representing ‘different historical trajectories of

<sup>13</sup> I thank an anonymous referee for raising this important issue and for the instructive example of Buddhism.



separate lines of descent' [2010: 4]. Hence, although all branches of Buddhism share common ancestry, Buddhism *per se* might not be that inductively fecund because the different traditions have retained in common only a small proportion of the original features.

Homology thinking in this domain also gives us some guidance as to the principles for projectability.<sup>14</sup> We can think of Buddhism as parallel to the case of *primates*. There are, of course, some central characteristics shared by all primates in terms of morphology and behavior, but individual primate species (e.g. lemurs, orangutans, hominids) are each bound to represent much more inductively fecund kinds for primatologists. As in the case of biological evolution, we should expect there to be more reproductive fidelity, and hence an increased multiple projectability, the more spatially-temporally proximate the instances are in the *cultural* evolutionary tree. This means that there will typically be a trade-off between *scope* of generalizations, on the one hand, and *inductive fecundity* on the other, such that typically with cultural homologues increased scope (i.e. the generalizations govern more instances) comes at the expense of fecundity. For the case of Buddhism, this means that we should expect East Asian Buddhism (mostly Mahayana tradition) to be more inductively fecund but less global than Buddhism, but also less fecund and more global than a tradition like the Soto Zen variety (introduced around the 12<sup>th</sup> century in China and Japan). Indeed, anthropological research on Buddhism tends to bear out these expectations.<sup>15</sup>

Thus, homology thinking in the domain of culture has the capacity to guide our expectations about the scope of our generalizations and how inductively fecund our kind might be. Attention to the actual historical details can also open up to revising some intuitive projectability judgments. So far, the virtues are in parallel with biological homologues, but in contrast to them cultural homologues have a multiple projectability that is neither weakened nor strengthened when we know that different physical kinds have been used to realize the relevant projectable content. The nature of physical realization simply does not matter in terms of cultural projectability.

Some remarks of clarification about the proposal are due before I conclude. First, I am not claiming that *all* beliefs and behaviour are reproduced by means of social learning. I take it that some types of beliefs, for example, are more plausibly understood as a product of natural selection or individual learning. I rather doubt that *single* beliefs can carry the rich amount of content requisite for being thought of as kinds; but if they do, it is due to their biological transmission rather than to cultural transmission. Whether in fact such kinds of belief (or behaviour, etc.) would also be multiply realized would require a different argument entirely, since mine has hinged on how social reproduction of cultural content encourages multiple realization. In fact, my claims have not been about the nature of belief realization *per se*.

<sup>14</sup> I am inclined to think that some of the same moral applies to other religions like Islam and Christianity and their respective branches—although Buddhism also has particularly decentralized organization as compared to them.

<sup>15</sup> See Cantwell [2010] for references.

Instead, I have been concerned to show that cultural *kinds*, whose instances share a rich set of projectable content, can be realized in various physical manifestations—not just in different token belief states.

Second, one might worry about whether there is a clear separation between properties of the kind and the projected behaviour in these instances. In particular, I have allowed that the cultural content of the kind might be represented and realized as part of human behaviour; at the same time, I have suggested that kinds support generalizations and predictions about behaviour that is not itself part of the kind. For this type of reason, the cultural evolution theorist Alex Mesoudi [2011] has recently suggested that behaviour should not be thought of as being part of culture information, since if we want culture to *explain* behaviour we should not make behaviour part of culture. But, as Tim Lewens [2012] rightly points out in a response to Mesoudi, it seems unfortunate to leave behaviour out of culture, as behaviour seems to be precisely the sort of thing that can be socially learned and so is transmittable between individuals. Instead, Lewens suggests we should simply specify that there is some *other* behaviour, which is not itself directly culturally transmitted. A similar move seems possible here. Not all behaviour that is predicted as being based on a kind is itself in fact transmitted behaviour, and so part of the kind. Returning to the example of the folk syndromes: while it is quite plausible that the behaviour of seeking out help from a faith healer when one experiences *Peito aberto* may itself be transmitted (by means of imitation or observation), the fact that such a behaviour only offers a temporary relief, and over time can develop into a more serious condition, is a (putative) projection that we discover to be associated with the cultural kind, but not one that is itself transmitted. There will probably be some remaining vagueness about which behaviour and norms count as being part of the kind and which do not; but in so far as one is troubled by this, one will probably also be troubled about the boundary conditions for many more proto-typical natural kinds where similar issues arise.

## 5. Conclusion

I have argued that particular kinds of cultural homologues (ideologies, folk wisdom, religious traditions, etc.) are multiply realized. The literature on cultural evolution and more traditional social sciences already operates under the assumption that the content of such cultural homologues might be represented in various physical items such as institutions, artefacts, verbal and non-verbal behaviour. I have justified their assumption by arguing that, in contrast to biological homologues where multiple projectability seems to depend on the physical constraints on realization, the social learning responsible for reproducing new instances of cultural homologues does not abide by the same constraints. In fact, the beauty of the content of knowledge being socially transmitted is that this is creative: it encourages the reproduction in whichever physical means are available in culture. Since social learning and culture thus jointly conspire to encourage the multiple realization of content of such kinds, it makes perfect sense for social scientists to make use

of various different physical realizations of the same content in their investigations. I have also explored how homology thinking in the domain of culture gives us some guidance about the scope of generalizations, and what degree of projectability to expect from cultural kinds.

Thus, we have arrived at a response to the dilemma where the multiple projectability of the kind in question proceeds not via a reduction to physical kinds, but via historical-reproductive continuity of a cultural kind. The quest to find multiply realized kinds in the special sciences has also taken us far afield from the usual suspects suggested by exponents of non-reductive physicalism: e.g. ‘pain’, ‘eye’, and ‘thought’. To be clear, I am not denying that the items that fall under such predicates may be multiply realized and even projectable in some loose sense; it is just that they will not make the cut in terms of multiple projectability. This also means that I doubt there will be a science of such a domain at all—although evidently there will be a *philosophy*, by its continuing to inspire a great deal of philosophical probing. On that note, some will undoubtedly take issue with the scientific utility of those cultural kinds that I have proposed as a solution to the dilemma, because they have additional requirements for either scientifically useful kinds or multiple realization (e.g., if multiple realization is taken to be a phenomenon that is independent of historical or ancestral influence, then of course my solution will not do). My argument here has simply been that some cultural kinds of knowledge at least fulfil the non-trivial condition of scientific utility in terms of supporting multiple generalizations and predictions. Kinds are thus not reducible to physical kinds across the board, and culture makes physicalism a much less dreary ontological thesis.<sup>16</sup>

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