An Intuitive Solution to the Problem of Induction

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Abstract

The subject of this essay is the classical problem of induction, which is sometimes attributed to David Hume and called "the Humean Problem of Induction." Here, I examine a certain sort of Neo-Aristotelian solution to the problem, which appeals to the concept of *natural kinds* in its response to the inductive skeptic. This position is most notably represented by Howard Sankey and Marc Lange. The purpose of this paper is partly destructive and partly constructive. I raise two questions. The first is: Are the natural kind solutions to the problem successful? The first thesis of this paper is that they are not, and I will show how and why they fail. And the second question I raise here is: Is there nonetheless some alternative Neo-Aristotelian solution to the problem which is successful and can overcome the shortcomings endemic to the Sankey-Lange account? The second thesis is that there is, and I'll attempt to sketch one. My stance here may be summarized by saying that, while I agree with Sankey and Lange that the problem of induction can be adequately resolved, and while I am on the whole sympathetic with the Aristotelian spirit of their account(s), I am, for all that, dissatisfied with the letter of them. Nothing short of a more thoroughgoing Aristotelianism about the epistemology of induction will do.

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Problem of Induction, Natural Kinds, Direct Realism, Substantial Forms, Nous, Epagoge, Contents of Perception, Concept Formation

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1. Introduction

The subject of this essay is the classical problem of induction, which is sometimes attributed to David Hume and called "the Humean Problem of Induction."[1] Here, I examine a certain sort of Neo-Aristotelian solution to the problem, which appeals to the concept of *natural kinds* in its response to the inductive skeptic. This position is most notably represented by Howard Sankey (1997, *forthcoming*) and Marc Lange (2004, 2011). The purpose of this paper is partly destructive and partly constructive. I raise two questions. The first is: Are the natural kind solutions to the problem successful? The first thesis of this paper is that they are not, and I will show how and why they fail. And the second question I raise here is: Is there nonetheless some alternative Neo-Aristotelian solution to the problem which is successful and can overcome the shortcomings endemic to the Sankey-Lange account? The second thesis is that there is, and I'll attempt to sketch one. My stance here may be summarized by saying that, while I agree with Sankey and Lange that the problem of induction can be adequately resolved, and while I am on the whole sympathetic with the Aristotelian spirit of their account(s), I am, for all that, dissatisfied with the letter of them. Nothing short of a more thoroughgoing Aristotelianism about the epistemology of induction will do.

To these ends, the order of the paper proceeds as follows. In section 2, I'll begin by presenting the problem of induction as I understand it, paying special attention to an implicit premise of the argument which often goes unnoticed in other presentations of it. In section 3, I'll then present Sankey and Lange's natural kind solution to the problem. I believe the account suffers from three major setbacks. In section 4, I'll discuss the first of the three major objections to the account. In section 5, I'll present Lange's *direct realist* response to the first objection, and the modified natural kinds account which results from it. In section 6, I'll then present the second major objection. In section 7, I'll present the third major objection, which is specific to Lange's modified account. And then finally, in sections 8 and 9, I'll show how using further and alternative Aristotelian-inspired resources can better address the problem, while at the same time avoiding the pitfalls in the Sankey-Lange natural kinds account. My account appeals, in particular, to Aristotelian *substantial forms* and *noetic epagoge* (sometimes also translated as *intuitive induction*). Section 10 will summarize all that is said here, before concluding.

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[1] I suppose that this paper's principle audience is epistemologists generally, to which it seems to me fine, if not perhaps a bit imprecise, to attribute this skeptical problem to Hume and call it 'Humean.' But I should say a word on behalf of Hume scholars too. Some Hume scholars deny that the Humean problem of induction is really Humean at all, and they may have good grounds for thinking so. See, e.g., Monteiro (2001). (Thanks to an anonymous reviewer from *Principia* for advising that I proceed cautiously in claiming this essay's paradox belongs to Hume.)

2. The Problem of Induction

The problem of induction is how best to respond to a certain paradox offered on behalf of the skeptic about induction.[2] The general skeptical worry can be stated as follows. There are many varieties of inductive inference: abductive inference, analogical inference, Bayesian inference, causal inference, direct inference, enumerative inference, inverse inference, inference to the best explanation (IBE), predictive inference, statistical inference, universal inference, and so on (cf. Climenhaga 2020). Commonsense intuition tells us that each of these sorts of inference have the potential to be *justification-conferring* and, in this way, possibly help us know the world around us. On the other hand, there are many ways of arriving at conclusions about the world non-deductively which we think are clearly *not* justification-conferring, such as counter-inductive inference and tealeaf readings. However, similarly in each case, we move from premises about some observed phenomena to conclusions about some unobserved (and possibly even *unobservable*) phenomena. The skeptic about induction challenges us to justify the commonsense belief that the former sorts of inference are justification-conferring, whereas the latter are not. No doubt both sorts of inference can sometimes lead from true premises to false conclusions. But as Samir Okasha (2001: 314-315) has pointed out, *fallibility* is not what's at issue here. What is at issue is *reasonability*: Why should we think that induction (of any of the varieties just enumerated) is a reasonable way of coming to know the world at all? Why is, e.g., predictive inference a sound epistemic procedure for forming beliefs about future events while gazing into a crystal ball is not?

The early moderns were especially troubled by this challenge. Gottfried Leibniz (1703: *Preface*), for example, worried about the reasonability of enumerative induction (i.e., upwards inference): I have observed *n* number of *F*s and found *N%* of them to be *G*s. And so, I infer that *N%* of all *F*s are (or are likely to be) *G*s too. About this sort of inference, Leibniz writes:

> The senses, although necessary for all our actual knowledge, are not sufficient to give it all to us, since the senses never give us anything but examples, i.e. particular or individual truths. Now all the examples which confirm a general truth, whatever their number, do not suffice to establish the universal necessity of that same truth, for it does not follow that what has happened will happen in the same way. (trans. Langely 1896: 43)

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[2] Note that there are of course many other problems of induction besides the one discussed in this article (cf. Goodman 1979). I will nonetheless continue to speak of *the* problem, to simplify my language.

Hume (1739/1740: I.iii.6; 1748: IV), likewise, worried about the reasonability of predictive induction (i.e., sideways inference): I have observed *n* number of *F*s and found *N%* of them to be *G*s. And so, I come to believe with *N%* credence that the next *F* will be a *G* too. But, Hume infamously asks, why in the world does the observation report that some *F* is a *G* make it reasonable to believe anything else about other *F*s and whether they are *G*s too? It would seem that the only way we could justify thinking that other *F*s are *G*s, or that the next *F* we observe will be *G*, is if we are assuming in the background some independent rule—some assumption about how observed *F*s are related to unobserved *F*s. But how can we ever justify *that* assumption? It cannot be justified *a priori* since induction is not *necessarily* justification-conferring, and nothing contingent can be known *a priori* (with, perhaps, very few exceptions, such as the *cogito* or Kripke's (1972/1980) one-meter stick). And it cannot be justified *a posteriori* either since any attempt to justify it *a posteriori* will mean relying on induction, which is circular. Therefore, it would seem that we have no good reason, nor could we possibly provide any such reason to the skeptic, for thinking that our ordinary inductive practices are any more justification-conferring than "guesswork, wishful thinking, necromancy, or superstition" (Lange 2011: 47).

Our skeptic's reasoning may be stated more concisely in premise and conclusion form as follows:[3]

1. If we are justified in making an inference from an observed case to a conclusion about an unobserved case, then we must have justification to believe the cases are similar. [Premise]
2. If this is so, then in order for the knowledge obtained from our observation of some *F* and that it is a *G* to have any evidentiary value about other *F*s and whether they are *G*s too, we must presume some independent rule, *R*, linking observed *F*s with unobserved *F*s. [Premise]
3. But now, if *R* is justified, then it is justified either a priori or a posteriori. [Premise]
4. *R* cannot be justified a priori, since even if true, it is a mere contingent truth, and nothing contingent can be known a priori. [Contention]
5. But *R* cannot be justified a posteriori either, since in order to justify *R* a posteriori, we would need to rely on induction, which is circular. [Contention]
6. Therefore, *R* cannot be justified at all. [From (3)-(5)]
7. Therefore, in every case, we are unjustified in making an inference from an observed case to a conclusion about an unobserved case. [From (1), (2), & (6)]

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[3] There are many ways of interpreting Hume on this point, that is, if one thinks it's genuinely Humean at all. (Prima facie, Hume's paradox speaks not of a priori and a posteriori justification, but of justification per "association of ideas" and per "matters of fact" (1748: V). Again, since this is not an exegetical paper, I will not here get into the hermeneutical controversy on this subject with the critical doxographers of Hume.

The problem of induction, then, is how best to respond to this paradoxical argument. None of us would like to accept its conclusion, but it is unclear how it can be rationally resisted.

3. Natural Kinds

Historically, epistemologists have responded to the problem by challenging the paradox's destructive dilemma—perhaps we can justify induction *a priori*, or perhaps the circular reasoning involved in justifying it *a posteriori* is virtuous rather than vicious. The results have not been encouraging.[4] Recently, however, some epistemologists have begun questioning a different set of assumptions of the paradox. It may be that the early moderns (empiricist and rationalist alike), as well as those who have followed them, have misrepresented our inductive practices. A crucial premise of the argument, often left implicit in its presentation, is, as Leibniz put it, that "the senses never give us anything but examples, i.e. particular or individual truths." Implied in a statement of this kind is a commitment to the following thesis: It is in every case possible to produce some observation report of the form that some particular *F* is *G* without its implying anything else about other, unobserved *F*s and whether and to what extent they are *G*, as well. To suppose otherwise is, as both Leibniz and Hume say, to presume some *independent* assumption about the relation between the observed and the unobserved.

Is this premise of the argument true? According to proponents of *natural kind solutions* to the early moderns' problem, it is not. Now, no doubt this is sometimes true. Leibniz and Hume are likely right on this point when the subject term designates an arbitrary or gerrymandered class. For example, suppose my friend has a bag full of colored beans. She pulls out a red one, then another red one, then another red one, and so on. There remain some beans in the bag, and now I am asked what color the next bean will be. Would I be justified in thinking it is red, or at any rate is at least likely to be so? I will, says Hume, only if I presume something like a *Principle of the Uniformity of Nature*, or, as Leibniz put it, that what has happened in the past will happen, or is likely to happen, again in the future. This is because the observation or judgment that any one of those beans is red implies nothing whatsoever about the entire class of beans in the bag or future observable beans in the bag. They are entirely isolable phenomena; absent some additional opinion about what the world is like, my inference really does amount to no more than *guesswork* (cf. White 2005: §2.1ff).

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[4] See Henderson (2020) for a summary of past responses to the problem of induction which try to blunt one or other of the two horns of the dilemma. See also Lange (2011: §§5, 7-11) for a critical review of objections to those responses.

In presenting his skeptical argument, our inductive skeptic supposes that this holds in general. But we should not generalize from cases such as this to all cases of induction. Leibniz and Hume's rule is false in instances in which our observation reports are couched in subject predicates designating *natural kinds.* The predicate 'bean in a bag' is not a natural kind term, and so, unsurprisingly, the relationship between a present example of one and other examples is, as Hume put it, "loose and separate." A predicate such as 'Cepheid variable star,' on the other hand, *is* a natural kind term, and to make some observation report involving an example of one does tacitly commit one to some claim about unobserved Cepheids too. This is because of what it is to be a natural kind, as well as what it would immediately imply to presume that a subject is a member of one.

Put succinctly, a natural kind is a kind of *homeostatic property cluster* (cf. Boyd 1991)—i.e., a naturally occurring "cluster of properties which, when realized together in the same substance, work to maintain and reinforce each other, even in the face of changes in the environment" (Kornblith 1993: 35). An example of a natural kind is an oak tree, a cat, a radish, and many of the other ordinary objects of experience we realize as being natural parts of the world. To help further elucidate this concept, consider the difference between a simple property like *having a mass of 2.4 grams* or *being red*, on the one hand, and *being an oak tree*, on the other. To be an oak tree is not to possess just one property, but rather to possess a cluster of them, such as *possessing leaves, having a height of such-and-such feet*, and so on. Moreover, these properties are not simply a randomly occurring bundle of attributes which the oak happens to possess. Rather, these properties enjoy a kind of *per se unity* with respect to one another (to use an old Scholastic phrase). This is to say that they relate to one another and maintain their continued relationship with one another according to a kind of internal principle—or essence—and not simply as the result of external pressure (*per accidens unity*), as in the case of paint arranged into an image on a painter's canvas.[5]

Natural kinds have a few other features which make them especially well suited to ground inductive inference. For example, natural kinds impose all-or-nothing inclusion criteria on their members. Something cannot be, e.g., more-or-less a photon or a Douglas fir. Natural kinds are the sorts of subject fit to figure into the fundamental laws of nature, and supposing they exist, so too do laws of nature.

And perhaps most significantly, natural kinds themselves not only have essences, but they are thought also to impart unto their members their generic essences, by virtue of which their members are similar to one another to a high degree. The sense of 'essence' here is not merely the contemporary *modalist* one, according

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[5] The subject of natural kinds seems to have peaked in popularity in the 1990s, but it's worth noting that it was also a point of discussion for much earlier analytics too, like Quine (1969).

to which for some property *P* to be essential to some object *a* is just for *P* to be necessary for the existence of *a* (i.e., *a* could not exist without *being P*) (cf. Bassford 2020a). It is rather the traditional *Aristotelian* notion, according to which, besides being necessary for the existence of their bearers, essences also play three important metaphysical roles. The first is that a thing's essence *makes it to be what it is.* Accordingly, we would say that it is in virtue of being NaCl that table salt is table salt. The second is that the essence of a thing places it into the *fundamental taxonomy of natural substances* (a.k.a., the Porphyrian Tree of nature). This is why the essence of a thing has historically been expressed in terms of its genus and differentiae, a basis upon which it is essentially similar and dissimilar to everything else in the natural order. And the third role essence plays is that it at least partly explains *why it is that something has all of the other, non-essential but characterizing properties that it does* (i.e., its *propria*, to use another classical Scholastic term). For example, we would say that it is because human beings are essentially rational animals (say) that they are capable of learning grammar or getting a joke. Socrates's *being risible* flows from his essentially *being human*, as an effect from a cause (cf. Suarez 1597: esp. DM XVIII.iii; Oderberg 2011; Bassford *forthcoming*). In this way, according to scientific essentialists, the laws of nature are grounded in the causal powers and dispositions of the individually occurring natural kinds in the world, not the other way around (cf. Ellis 2001).

The point is that many of our ordinary predicates are natural kind terms. And so, to make observation reports involving them is already to commit oneself to supposing that what is true of an arbitrary member of the kind is likely also to be true of other members of the kind. This is, furthermore, not some *additional*, independent premise added to the justification that unobserved instances of the kind will resemble the observed instances of it. It is rather a *dependent* premise—a conceptual presupposition—already baked into the judgment that the subject of the observation report exemplifies the natural kind property. "Hence, there arises no regress-inducing problem of justifying some independent opinions" (Lange 2011: 86). In this way, Lange says that observation reports involving natural kinds, or "taxonomic observations," are "thick with expectation." For just as it makes no sense to judge an action *brave* and then wonder in the next moment whether it is also *praiseworthy*, it makes no sense to judge that, e.g., lions have four legs and then wonder in the next moment whether other lions are likely to have four legs too: "I could not make observations categorizing things into putative natural kinds if I were not justified in expecting the members of those kinds to be alike in the respects characteristic of such kinds" (Lange 2011: 88).

From this, it would seem to be (an ironic) hasty generalization to suppose that it is in every instance possible to produce some observation report without taking what is true of the *F* under observation to have evidentiary value for whether other *F*s will be *G*s too. This is false when the subject of the observation report is couched in a natural kind subject-term. And if this assumption is false, then the inductive skeptic's destructive dilemma does not even get off of the ground.

4. The First Critique

I am very sympathetic with the natural kinds suggestion to the problem, and as I have indicated, I take it to be a welcome return to a kind of pre-modern epistemology and philosophy of science. Despite that, there are at least two problems with the proposed account, as it stands. I'll discuss the first now and then the second later. Both Sankey and Lange address the first objection, albeit in different ways. The first objection is that this proposed solution has not really carried forward the dialectic. For instead of attempting to justify a Principle of the Uniformity of Nature, Sankey and Lange have instead stuck us with a commitment to natural kinds. Positing natural kinds is no ontological free lunch. And now the argument may be run anew. How can we justify the belief in natural kinds? Again, it seems we have only two options. Prima facie, neither is very plausible. Our belief in natural kinds cannot be justified *a priori*, since it is not *necessary* that natural kinds exist, and nothing contingent can be known *a priori*. Nor can the belief in natural kinds be justified *a posteriori*, since in order to show that natural kinds exist, we would need to use induction (most plausibly *abduction*), which is circular. Therefore, it would seem that the natural kinds solution has only moved the bump in the rug, not flattened it.

In response to this paradox, the familiar positions emerge. A proponent of natural kind solutions could argue that the belief in natural kinds *can* be justified *a priori* after all, or otherwise that the kind of circularity involved in justifying it *a posteriori* is virtuous rather than vicious. Sankey (*forthcoming*) takes the second tack and offers two responses. I do not find either very convincing.

First, Sankey suggests that the proponent of the natural kinds solution utilize the distinction between *premise-circularity* and *rule-circularity*. An argument is premise-circular iff it contains as a premise a proposition which is logically equivalent to its conclusion. By contrast, an argument is merely rule-circular iff it relies on a rule that, if expressed, would be logically equivalent to its conclusion. What Sankey has in mind here is unclear, given that the proposition that there are natural kinds does not even remotely seem fit to serve as an inference rule (although the Principle of the Uniformity of Nature looks like it could). That notwithstanding, inductive justifications of induction are notoriously problematic. We want to justify our inductive practices and not those other, problematic non-deductive inferences. Now suppose we offered a demonstration of natural kinds by relying on a rule involving natural kinds. This would not establish anything, since we could similarly use counter-induction to justify counter-induction (cf. Henderson 2020: §4.1). And so, even if the thesis that there are natural kinds were made into a rule of inference, we would still need some way of justifying the inclusion of it in our non-deductive logic rather than a rule of counter-

inductive inference. I do not see any way of establishing this without also committing the fallacy of premise circularity too.

And second, Sankey insists that, even if we use induction to justify our belief in natural kinds, and even if we use natural kinds to justify our belief in the reasonability of inductive inference, it nonetheless does not follow that we are thereby using induction to justify our belief in the reasonability of inductive inference. To motivate this move, Sankey reminds us of the distinction between a theory's *context of discovery* and its *context of justification*. The context of discovery is the way in which ones arrive at a theory; the context of justification is the way in which the theory is justified. Here, Sankey writes:

> The initial inspiration or creative insight that gives rise to a theory need have nothing to do with the tests or experiments which provide empirical evidence on the basis of which the theory is to be accepted… IBE is employed to argue that the world has a natural kind structure, and that this structure underlies the reliability of inductive inference. This is the context of discovery. We employ IBE in the context of discovery to argue for an account of the natural ground of induction. But our use of IBE to argue for the account is not what provides the ground for induction. What justifies our use of induction is the fact that the world is a certain way. It is the natural kind structure of the world that makes induction reliable. In short, IBE is how we discover the ground of induction. It is not what grounds the induction. (Sankey *forthcoming*: ms p. 16)

But this reply isn't very plausible either, since if we have only used IBE to *discover* the theory of natural kinds without justifying the theory that they exist, we can still ask *what does* justify our belief in their existence? If our belief in natural kinds is justified, then it still must have some context of justification. If it has one, then we can again ask: Is that justification *a priori* or *a posteriori*? Either way, we're back in the soup. And if it hasn't one, then our belief in the existence of natural kinds has no justification at all, and we are simply taking their existence on faith. But that is not to solve the problem but instead to admit defeat.[6]

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[6] Sankey (1997; *forthcoming*: ms pp. 3-4) anticipates an objection of this sort and advises that the natural kinds proponents commit themselves also to a position of *reliabilism* about justification. But on this point, I think we ought agree with Lange (2004: 199): "[T]his approach simply fails to engage with the traditional problem of induction. It does not set out to persuade the inductive skeptic that she has a good reason to believe that a given inductive argument will likely yield the truth regarding unexamined cases. Rather, this approach changes the subject. Suppose the externalist can persuade the skeptic that to be justified in some belief is to arrive at it by reliable means. Then the skeptic is persuaded that *if* induction is actually reliable, the conclusion of an inductive argument (from justified premises) is justified. She is also persuaded that *if* induction actually is reliable, an inductive reasoner is justified in her belief (arrived at

5. Direct Realism

More plausibly, the proponent of a natural kinds account should follow Lange (2004, 2011) in responding to the novel dilemma. Like Sankey, Lange's response is to try blunting the second horn of the dilemma. However, unlike Sankey, Lange does not attempt to vindicate circular justification. Instead, he denies that the two horns of the destructive dilemma are exhaustive. There is a third option. Lange holds that the justification of natural kinds is indeed a posteriori, but it is also *non-inferential*. Our belief in natural kinds is justified by *perception*. Perception is a kind of direct, non-inferential, a posteriori justification.

This might sound a bit obscure, but the thought here, I think, is simple. Here's a quick proof that natural kinds exist: I look across the room and see my housecat. In seeing my housecat *as* a housecat, I am seeing that she is a cat. Now, cats are a natural kind. And perception gives me direct, non-inferential justification that some member of the kind exists. Therefore, by perception, I have direct, non-inferential justification in the existence of a member of a natural kind. Therefore, there are natural kinds. The dummy proof used here uses the example of a housecat, but it is entirely generalizable. We encounter natural kinds in our perceptual experience all the time. And so, we of course not only have all the proof we need that there are natural kinds, but also that there are natural kinds of various sorts with distinctive natures all their own: e.g., housecats, stars, Douglas firs, etc.

Two points are worth mentioning about this response before turning to further critical evaluation of it. The first is that this sort of move is available to the natural kinds solution proponent but is not similarly available to the Uniformity of Nature solution proponent. One can observe, e.g., a Cepheid variable star; one cannot, on the other hand, observe *a principle*. And so, whereas it really would seem that there are only two options available in the skeptic's initial destructive dilemma, there are not only two available in this novel one.

And the second point is that, in offering this sort of response to the skeptic, Lange has taken us another step away from early modern empiricism and back towards a kind of premodern, Aristotelian empiricism (more on this point later). Consider the dummy proof of natural kinds just given (viz., the one about my seeing my cat). One might be tempted to object to it by resisting the premise that I really see *a cat*. As Lange expresses the worry:

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inductively, from the frequent success of past inductive inferences) that induction will continue to be reliable. Nevertheless, the externalist has *not* persuaded the skeptic that induction is reliable." (A problem of this sort can be explored further in Beebee 2010.)

It might be objected: Let's concede that [e.g.] astronomers could not have identified a given star as a Cepheid without committing themselves to the existence of (as yet undiscovered) natural laws of certain sorts covering all and only Cepheids, and thus to examined Cepheids being (under certain circumstances) confirmationally relevant (in certain respects) to unexamined Cepheids. But then astronomers could never really have *observed* a given star to be a Cepheid... The more that is alleged to be packed into an observation report, the more remote that report becomes from what is truly accessible directly by observation. (2004: 217)

Why might one deny that one might observe, e.g., *a cat* or a *Cepheid variable star*? On this point, I think Lange offers the correct diagnosis: One would only doubt this if they were committed to thinking that *our knowledge of objects around us must in every case be inferred, rather than verified directly.*

Besides the problem of induction, we have also inherited from the early moderns a position from within philosophical psychology about the content of perception and in what way it grants us access to reality, which, following C. N. Bittle (1936), we can call *representative realism* (also "mediate," "hypothetical," "cosmothetical," or "inferential" realism). This is the theory which maintains that "the human mind is immediately aware, not of the external objects themselves, but of its own *internal 'representations' only*, from which it *infers* the existence of the external, non-Ego reality as their cause" (182). Representative realism comes in both an objective form and a subjective form (the distinction being whether one supposes that our representations of the world really resemble the objects in the external world or not, respectively), but in both cases, representative realists maintain that what is directly presented to the mind are so many "sense data, experiences, inner representations, sense impressions, colored surfaces, [or] the way things look or appear" (Lange 2004: 217). Consequently, according to the representative realist, it is strictly speaking false to say that we ever really perceive *objects* (such as cats and Cepheids) in the world at all. A commitment to this thesis can be seen, for example, in Locke (1689), who writes:

Whatsoever the mind perceives *in itself*, or is the immediate object of perception, thought, or understanding, that I call *idea*. (II.viii.8)... [T]he having of the idea of anything in our mind, no more proves the existence of that thing, than the picture of a man evidences his being in the world, or the visions of a dream make thereby a true history. (IV.xi.1)

Similar statements can be found in, e.g., Watts (1724), Hume (1739/1740, 1748), Reid (1764, 1785), Kant (1781/1787), Mill (1843), Spencer (1867), Peirce (c. 1900), Husserl (1913, 1929), and Sartre (1943), but interestingly not in Heidegger (1927). It is found

most strikingly in early 20th century analytic *sense-datum* theorists, such as Bertrand Russell (1912), who writes:

> [T]he various sensations… cannot be supposed to reveal *directly* any definite property of the table, but at most to be *signs* of some property which perhaps *causes* all the sensations, but is not actually apparent in any of them… Thus it becomes evident that the real table, if there is one, is not the same as what we immediately experience by sight or touch or hearing. The real table, if there is one, is not *immediately* known to us at all, but must be an inference from what is immediately known. (16-17)

And something of this sort was also presumed to be the correct analysis of perception by the early modern rationalists too, such as Descartes (1642) and Leibniz (1703)—they just denied that all of our concepts and knowledge are derived from experience (*of this sort*) *alone*.

But to follow the early moderns and endorse representative realism is to fall for what Wilfrid Sellars (1963) famously called *the myth of the given* (cf. also Hatfield 2021, James 1912, Austin 1946). It is not the case that perception presents us with mere blotches of color, pitches of sound, and tactile sensations from which we then construct by inference the existence and natures of the objects around us. This is both phenomenologically and epistemically inaccurate. Rather, Lange holds that we are first of all presented with ordinary objects, such as birds and plants and minerals. "Though a given neuron in the cochlea of our ears may be directly sensitive only to a certain pitch, it does not follow that a trained musician hears various combinations of pitches rather than, say, that the oboe is out of tune" (Hanson 1958: 17). In denying representative realism, Lange is therefore recommending that we commit ourselves instead to a kind of *presentative realism* (also "immediate," "intuitive," "natural," or "*direct*" realism—Lange's preferred designation; sometimes also "perceptionism"). This is the theory which maintains that "physical, external objects are 'presented' *directly in some form* to consciousness in sense-perception, so that their reality is perceived *as it exists in itself* 'out there' in nature" (Bittle 1936: 189). Presentative realism, likewise, comes in both an objective and subjective form, but in each case presentative realists maintain that what is presented to the mind are objects in the world themselves (such as cats and Cepheids).[7] If this is right, no inductive *inference* is

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[7] Lange (2004: 217): "Roughly speaking, direct realism holds that at least some of our observation reports must concern the 'external' world… Our knowledge of the outside world is not mediated by our knowledge of such interpolated, reality-neutral, phenomenal objects, states, or episodes. According to direct realism, we do not *infer* from the way things around us appear to the way they really are. Rather, after appropriate training, we become qualified to observe (in certain conditions) that facts of certain sorts obtain." It is surprising to see the presentative vs. representative (vs. *critical*) realism dispute resurrected in this contemporary context. This debate seems to have peaked in the early 20th century. (The representative

needed to establish the existence of natural kinds. *Perception alone* suffices to offer adequate a posteriori justification.

6. The Second Critique

I am very much in favor of the sort of response Lange offers to the first critique to the natural kinds account. Nonetheless, at least two significant objections remain. One is common to all natural kind accounts, and the other is specifically directed at Lange's direct realist modification. Earlier, I presented the first major objection to natural kind solutions to the induction paradox. The second major objection is that, even if the account stated so far is correct, it is far too weak to justify all of the inductive practices in which we engage, and of which commonsense assures us are reasonable: The scope of the solution is too narrow. For example, Sankey (1997) offers the example of inducing on cars: "[I]n the past, moving into the path of a rapidly moving car has been dangerous, hence in [the] future moving into the path of a rapidly moving car will also be dangerous" (250). This would seem to be a reasonable instance of predictive induction, and yet cars are not members of any natural kind. Therefore, we cannot ground all sound inductive inference on natural kinds alone.

In response to this objection, Sankey replies that there may yet be a way to make sense of the reasonability of this instance of induction which makes use only of natural kinds:

> What is dangerous about moving into the path of a moving car is not just that one may be struck by the car, but that one might get struck by an object with a large mass moving at a high velocity. The risks involved are not dissimilar to those involved in being run down by a charging buffalo, or struck by a boulder rolling down a hillside or a falling meteorite. Thus, it may very well be the case that one is only able to make reliable inductive inferences about artefacts and other non-natural kinds, to the extent that such inferences turn on facts about them which obtain in virtue of their being members of natural kinds. (1997: 250-251)[8]

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realists stole the election.) For important early works in this original dispute, see Strong (1903: Chapter 8), Broad (1914: Chapters 1-5), R. W. Sellars (1916) (i.e., W. Sellars' father), Balfour (1920: Chapter 11), Turner (1925: Chapter 2ff), Drake (1925: Chapter 6), Stout (1931: Bk. 4), Bittle (1936: Chapters 11-12), and Kurtz (1967: 314-353).

[8] What Sankey has in mind here is less clear than would be desirable. Earlier, we noted that the predicate 'bean in a bag' does not seem to be the sort of subject predicate on which one might reliably make inductions on the basis of a few members to other members of the class. Here, Sankey suggests that we induce instead on a subject designated with the predicate, e.g.,

However, this response is not especially satisfying. Sankey himself later notes as much:

> The problem with such an uncompromising stance is that there are cases of apparently sound inductive inference not underpinned by the existence of a natural kind. Apart from cases in which we infer inductively about items that belong to non-natural kinds, we may also make legitimate inductive inferences about singular items considered simply as individual things rather than as instances of a kind. ["For example, we may infer from the fact that a particular potted plant has thrived after being watered that it always thrives after being watered. Such an inductive inference need make no reference to the kind to which the plant belongs, and, indeed may be restricted specifically to the one plant under consideration" (Sankey *forthcoming*: fn. 10).] Because there are cases of reliable induction for which the existence of natural kinds does not appear to be responsible, a less uncompromising stance may be appropriate... It remains to be explained how and why induction is reliable in cases where the presence of natural kinds plays no apparent role. (*forthcoming*: ms p.14)

Therefore, *natural kind* is not a broad enough category to capture the sorts of subject about which we can make reliable inductive inferences. Some additional—or, better, some *alternative*—category is needed. I'll attempt to offer a more satisfying reply to the objection momentarily.

7. The Third Critique

The final objection that remains is directed specifically at Lange's account. Lange says that the reasonability of induction is grounded in direct realism and the existence of natural kinds. But the problem is that these two theses together are not enough on their own to block further reasonable grounds for skeptical doubt. The problem emerges once one realizes that, even if direct realism is true, it cannot be doubted that perception is nonetheless heavily conceptually mediated, and that it is through our concepts of the world that we structure our understanding of external phenomena. Perception may not be *subjectively* mediated, but it is *conceptually* mediated, especially in the cases of interest here. Now consider also that the concepts we use to make sense of our experience of the world are known to change over time, not only on a social scale but on an individual one too (cf. Kuhn 1957, 1962; Sankey 1998). As Aristotle says, at one point in time an infant sees all men *as* father, and it is not only until later that the child comes to apply that concept more discriminately and has created a new

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'boulder rolling down a hillside,' but that seems to be equally gerrymandered. I will, in any event, bracket this concern since there are more pressing issues to which we ought attend.

concept to refer to all men *as men* (cf. *Physics*: 184$^{a\text{-}b}$). So, here we have a case of new concept formation and extensional concept modification. Concepts are also, of course, often lost over time, such as when society stopped seeing a subset of women *as* witches entirely—the concept became defunct. Reflecting on these instances helps to motivate a question: Given that we have found our concepts are sometimes inaccurate—whether they be too broad, too narrow, insufficient, or entirely unnecessary for cataloging the world around us—are we currently justified in employing the concepts that we do or are we not? Granted that, *if* one has adopted a particular concept, they may be able to non-inferentially justify their belief in the concept's rightful extension via perception, we can still ask whether they were ever justified in adopting that concept in the first place, rather than, say, some other, extensionally equivalent but conceptually motley one.

To further illustrate the worry, consider the case of a medical student. At one point in time, a young medical student looks at an x-ray film and sees nothing much at all. Years later, having gone through medical school, she looks at the same film and now *sees*, say, inoperable lung cancer. What makes it possible for her to now perceive the lung cancer is that she has in the interim taken on the concept *lung cancer* (or at least significantly developed the concept's *comprehension*[9]) and now deploys it, consciously or not, when looking at the screen and seeing it as *a film depicting inoperable lung cancer*. The concept of lung cancer is of the concept of a degenerative disease. Consequently, as Sankey and Lange point out, one cannot make a judgment involving lung cancer as the subject without already tacitly committing themselves to supposing that those who have it will likely experience progressively worse symptoms, especially if left untreated. And so, it would look like the medical student might make reasonable inductive inferences about lung cancer, since it is a natural kind term. But our medical student might have taken on a *gruesome* counterpart concept instead, such as the concept of something which is characterized by the exact same properties as lung cancer before some arbitrary time *t*, but which after *t* then undergoes a transformation resulting in its possessing the exact characteristic properties of, say, a flamingo. Had the medical student taken on that concept instead, the same details of the film would still have stood out to her, such that some recognizable phenomenon would have presented itself with the same contemporaneous characteristic features as lung cancer; but in that case, she would not be tacitly committed to supposing that the person whose lungs they are is likely to experience progressively worse symptoms, and her inductive inferences about the phenomenon would be non-cogent. So, the question is: What justifies our medical student's adopting the concept of *lung cancer*, which nicely supports inductive inference, rather than its gruesome *flamingo-lung cancer* counterpart, which does not?

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[9] cf. Frege (c. 1880; cf. also Kenny 1995), Bittle (1935: Chapter 1ff), Gurwitsch (1964: Pt. 1), and Anderson (2010: Chapter 5ff).

Given just the belief in natural kinds and direct realism, it does not appear that the proponent of the natural kinds solution under examination has any resources for a satisfying response. We face a familiar sort of Humean dilemma: If the medical student is justified in adopting the concept of lung cancer, then her justification is either *a priori* or *a posteriori*. It cannot be *a priori*, since it is not *necessary* that lung cancer exists and flamingo-lung cancer does not, and as we said before, nothing contingent can be known *a priori*. But it also evidently cannot be justified *a posteriori* either. This is because it would seem that one could only justify the adoption of *lung cancer* over the gruesome concept by using induction (most plausibly *abduction* and an appeal to simplicity), which is circular, given that we are grounding the reasonability of induction in general on the assumption that our natural kind concepts are correctly carving up the world; and what we have said regarding the concept of lung cancer might be similarly said about any of our natural kind concepts. Hence, we have once again returned to where we began. What this shows is that, even if Lange has gotten the Neo-Aristotelian epistemologist partly out of the woods, his direct realist reply is still not strong enough to ward off significant skeptical concerns.[10] Some additional or alternative resources must be employed.

8. Substantial Forms

I have now finished the destructive task of the essay and so turn, next, to its more constructive one. The natural kinds account that we have been examining is one sort of Neo-Aristotelian solution to the problem of induction. I will now attempt to offer a similar, but importantly more defensible one. It is more thoroughgoingly Aristotelian than its predecessor. It takes two concepts straight from the Aristotelian corpus (with critical interpretation). The first is the concept of *substantial forms*, which I'll employ in response to the second major objection to the previous account. And the second is the concept of *noetic epagoge*, which will be employed to respond to the final objection, specific to Lange's direct realist version of the natural kinds solution. (More on that in the next section.)

The second major objection to the natural kinds solution under examination was that the concept of natural kind is too narrow to ground the reasonability of the entirety of our inductive practices, since we (apparently) can also make reasonable inductive inferences involving non-natural kinds as subjects, such as cars. The substantial forms part of the alternative solution which I am proposing can be stated simply. Instead of using the concept of *natural kinds* to ground the reasonability of

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[10] A friend has expressed to me the doubt that human concept formation and adaptation are perhaps not processes requiring rational justification, akin to inference, as I am suggesting in this critique. I cannot respond here to every form of skepticism: This is one form of skepticism to which I have no reply in this essay.

induction, I suggest we use the broader concept of *substantial form*. The extension of the concept of substantial forms covers both natural and non-natural kinds, while still excluding other gerrymandered classes of things. And so, it is neither too broad nor too narrow. I then propose, for the time being, that we simply allow substantial forms to substitute for, and perform the same work as, natural kinds within the Sankey-Lange account. We have already said that natural kinds have essences, which is ultimately what makes natural kinds a suitable class to ground the reasonability of induction. Other substantial forms are like natural kinds in this way—they also have essences. And so, it would appear substantial forms can do all of the same work as natural kinds without failing in the same way.

This is the first part of how my alternative response to the problem of induction would work and why it is more defensible than the natural kinds solutions. Now I need to say more about substantial forms and then show why the class is extensionally adequate. The concept of *form* comes from Aristotelian philosophical cosmology, which is classically hylomorphic. In summary, Aristotle held that the ultimate composition of material objects in the world is dualistic in principle. Material objects are ultimately composed, first, of some *matter*, and second, of some *substantial form*. A thing's matter is of what material it is made. A thing's substantial form is what it essentially is; a statement of it is the proper answer to the question, asked of the thing, "What is it?" With this notion of form, we can now also distinguish between a thing's *proximate matter* and its *prime matter*. A thing's proximate matter is its most immediate *informed* matter. In a bronze statue, the thing's proximate matter is the bronze. By contrast, the prime matter of a thing is the most general raw material of which it is composed, which is fundamentally formless. This notion is similar to the early modern notion of pure extension. A thing's prime matter is that which *ultimately* distinguishes it from every other material object, especially those that share the selfsame form(s) as it (for otherwise there would be nothing to distinguish the lot). This is abstract; consider our example of an oak tree. The proximate matter of the oak is its specific bark, leaves, soil, wood, water, and so on. The form of the oak is its *oakness*, that by virtue of which it is an oak and essentially similar to every other oak. And the oak's prime matter is that by virtue of which it is ultimately distinguished from every other oak tree, once we bracket off the forms of oak, leaf, bark, and every other form. In this way, Aristotle sought to explain the ultimate composition of material objects and their individuality conditions.[11]

The extension of the concept substantial form is indeed broader than that of natural kind. Aristotle held that there are two kinds of substantial forms: the natural

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[11] This is just intended to be a very brief explication of substantial forms. For more on substantial forms and the hylomorphic form-matter distinction generally, see Bittle (1950: Chapters 12-14), Feser (2014: 160ff), Ainsworth (2020), Johnson (2006), Loux (2014), Fine (1999), and Koons (2014). And of course, see Aristotle's *Physics*, *Metaphysics*, et al.

ones, but also the artificial ones, though he conceded that artificial forms have less *per se* unity than natural ones.[12] Examples of artificial kinds might include: table, car, iPhones, etc.—any definite kind of man-made material object, usually such that its matter is arranged according to some definite purpose or end. (Another way of putting this is that artifacts usually have an identical formal and final cause—cf. Bittle 1939: Chapter 11.) But notably, it is not so broad as to make possible reasonable inductive inference where we know there is none to be had. For example, the previously examined predicate 'bean in a bag' designates no substantial form in the world, natural or artificial. This is because the class lacks the kind of *per se* unity which is necessary for formhood: The properties had by *beans in bags* are not clustered into a state of homeostasis such that they work to maintain themselves in the environment in the same way as genuine substantial forms. The problem is therefore resolved.[13]

9. Noetic Epagoge (Intuitive Induction)

We've now introduced the first part of the alternative Aristotle-inspired solution. Now let's introduce the second part. Lange held that natural kinds could be observed in nature directly, unmediated by inference. We do not simply receive various raw sense data in experience and then infer the existence of external objects of different sorts: we open our eyes and just *perceive* them directly. And so, in this way, the skeptic's challenge to justify the inference whereby we establish the existence of natural kinds becomes a moot point; there is no inference in need of indirect, inferential justification here. However, we also found that Lange's account faced a problem. The skeptic can grant that, *once* we adopt the concept of, say, pelican, we can observe pelicans and verify their existence directly, but she can still ask what it is that justifies our choosing the concept of pelican over, say, the gruesome one of schmelican, to begin with, given that perception is clearly conceptually mediated. Presumably, were we to adopt the

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[12] Earlier I defined *natural kinds* as naturally occurring homeostatic property clusters. Aristotle would not have understood natural substantial forms in the same way. Nonetheless, for the time being, I propose that we treat both natural and artificial substantial forms in the same way, both as kinds of homeostatic property clusters with some significant degree of *per se* unity among its constituent members. Now is a good time to mention also that Aristotle additionally distinguished substantial forms and accidental forms. For present purposes, we can understand this as just the distinction between a natural/artificial kind and the properties clustered in homeostasis, which constitute it. Perhaps we might also induce on artificial forms.

[13] Not all Aristotelian and Neo-Aristotelian scholars agree that artifacts are substances, and so my proposal is at least somewhat controversial in that respect. Some interpreters and followers of Aristotle suppose that artifacts never form enough per se, substantial unity to achieve genuine substantiality. Artifact terms, on this view, ought instead probably be understood as accidents of some sort held by natural substances. See Koons and Pickavance (2015: 145-153).

concept of schmelican, we might then observe schmelicans in our environment, even though this would not support our inductive practices.

The second part of the alternative Aristotelian account I would like to sketch here attempts to meet this challenge by adding to Lange's account. Instead of affirming direct realism alone, I recommend that we resurrect a different, richer theory from the Aristotelian corpus: *the doctrine of noetic epagoge*. The doctrine of epagoge is a complex thesis comprised of four sub-theses. I'll detail those theses now, and then I will show how the doctrine can help with the problem at hand.

First, to commit oneself to the doctrine is to commit oneself to a kind of *direct realism*, of the sort Lange suggests. The sub-thesis here is that we perceive objects in the world qua category of objects that correspond to our generic concepts. So, in opening my eyes, I do not simply see blotches of color, or a mere *representation* of a coffee table, but I actually see *the coffee table*, an object, and I see it precisely *as* a coffee table—or *qua* coffee table.

Second, it is to commit oneself to a kind of *revelationism* about concept formation. This is in contrast to *constructivism* about concept formation (cf. Locke 1689; and Piaget e.g. 1927, 1930, 1932, 1947, Piaget & Inhelder 1948; cf. also Koffka 1935 & Kohler 1947) and *nativism* about it (cf. e.g., Plato c. 390 BC, Leibniz 1703). Constructivists hold that our concepts of the world are the result of our own invention. Nativists hold that they are known independently of any particular experience, even if they must be occasioned in the individual before they have access to them. But revelationists hold that we discover our concepts, and that in a real sense, concepts are *revealed* to us in experience. (More on this in a moment.)

Third, it is to commit oneself to the existence of a certain cognitive-perceptual faculty and its distinctive ability.[14] *Nous* is the faculty for engaging in *epagoge*. And *epagoge* is an intellectual ability to grasp, not only the instances of various forms in the world, but the actual forms themselves. Aristotle (seems to have) held that via an act of noetic epagoge (*intuitive induction*), human beings possess the ability to literally perceive the forms themselves. He says that our nous's ability to engage in epagoge is dependent on our ability for long-term memory, and its success is at least partly dependent on how many encounters we have had with instances of the form. The more instances of the form we encounter, the clearer our perception of the inherent underlying form of the objects becomes. During this process, Aristotle thought that the mind literally takes on the form of a thing while leaving behind its matter, so that

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[14] This is not to imply that any such faculty will be obviously represented in human physiology or neurology. We are speaking here of a purely quasi-cognitive-perceptual faculty, which falls only within the realm of psychology proper (cf. Bittle 1945: Chapter 14, "Aristotelian Ideogeny"). Per *multiple realizability*, we ought suppose that *agent intellect* might be realizable in multiple ways (cf. Bickle 2020).

the very selfsame thing unifying the matter of the object is what comes to be present in the mind (or soul). The mind possesses this unique ability to intake new forms while at the same time maintaining its own (cf. *De Anima* 429ᵃ13–18; cf. also Shields 2020: esp. §7). The mind, in effect, is like what Richard Rorty (1979) called a "mirror of nature." However, Aristotle also held that not only can our minds receive forms from the objects around them, they can also generate forms from matter to produce new objects. This is what we see in the case of a sculptor, who first conceives of a statue, then with hammer and chisel causally interacts with the marble, and the result is that a statue comes into existence which exemplifies just that form which originally existed in the artisan's mind—at least, it does if she carves it well. In this way, our minds are not only mirrors of nature, but nature sometimes acts like a mirror of our minds.[15]

And the final sub-thesis to which committing to the doctrine of noetic epagoge commits one is a thesis linking up concepts with the forms we intake during epagoge. This is just the thesis that *our concepts are identical to those forms* we discover in the natural world. My concept of a dog just is the form of a dog, as it exists identically in every dog in the world, who differ from one another accidentally, insofar as they possess different matter.

In summary, the doctrine of noetic epagoge is the thesis that, via *nous*, we engage in acts of *epagoge*, whereby we not only intake *objects in the world qua informed*, but we also come to perceive the *forms* of those things themselves, which then become *present in our minds when we think of and perceive instances* of the form. Aristotle developed this doctrine in his *Posterior Analytics*, in the context of trying to account for our knowledge of forms. In this context, he rejects both nativism and the alternative, early-modern sort of concept constructivism held by Locke et al. I'll quote him at some length on this point. Aristotle writes:

> We have already said that scientific knowledge through demonstration is impossible unless a man knows the primary immediate premises... Now it is strange if we possess them from birth; for it means that we possess apprehensions more accurate than demonstration and fail to notice them. If on the other hand we acquire them and do not previously possess them, how could we apprehend and learn without a basis of pre-existent knowledge? For that is impossible... So it emerges that neither can we possess them from birth, nor can they come to be in us if we are without

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[15] Michelangelo is said to have famously described his process of sculpting, not as one of *imposing* form on matter, but rather as one of *liberating* form already in the matter. If so, Michelangelo would have likely accepted an *eduction theory* of artificial forms—a very surprising position (cf. Bittle 1950: 298-305). Some of his sculptures suggest that he consciously avowed this commitment too, as it made its way into his aesthetics on several memorable occasions. His *Atlas Slave* (c. 1530) shows this well. We are presented with a form struggling for liberation in at least two different senses: one, political, and one, metaphysical. (cf. Stone 1961.)

knowledge of them to the extent of having no such developed state at all...

Therefore, we must possess a capacity of some sort, but not such as to rank higher in accuracy than these developed states. And this at least is an obvious characteristic of all animals, for they possess a congenital discriminative capacity which is called sense-perception. But though sense-perception is innate in all animals, in some the sense-impression comes to persist, in others it does not. So animals in which this persistence does not come to be have either no knowledge at all outside the act of perceiving, or no knowledge of objects of which no impression persists; animals in which it does come into being have perception and can continue to retain the sense-impression in the soul: and when such persistence is frequently repeated a further distinction at once arises between those which of the persistence of such sense-impressions develop a power of systematizing them and those which do not. So out of sense-impression comes to be what we call memory, and out of frequently repeated memories of the same thing develops experience; for a number of memories constitute a single experience...

From experience again—i.e. from the universal now stabilized in its entirety in the soul, the one beside the many which is a single identity within them all—originate the skill of the craftsman and the knowledge of the man of science, skill in the sphere of coming to be and science in the sphere of being.

We conclude that these states of knowledge are neither innate in a determinate form, nor developed from higher states of knowledge, but from sense-perception. It is like a rout in battle stopped by first one man making a stand and then another, until the original formation has been restored. The soul is so constituted as to be capable of this process... When one of a number of logically indiscriminable particulars has made a stand, the earliest universal is present in the soul: for though the act of sense-perception is of the particular, its content is universal—is man, for example, not the man Callias. A fresh stand is made among these rudimentary universals, and the process does not cease until the indivisible concepts, the true universals, are established: e.g. such and such a species of animal is a step towards the genus animal, which by the same process is a step towards a further generalization.

Thus it is clear that we must get to know the primary premises by induction (epagoge); for the method by which even sense-perception implants the universal is inductive... From these

considerations it follows that there will be no scientific knowledge of the primary premises, and since except intuition nothing can be truer than scientific knowledge, it will be intuition that apprehends the primary premises. (*Posterior Analytics*: 99ᵇ20-100ᵇ13; trans. Mure 1941: 184-186)[16]

What I am about to suggest now is that we take on board Aristotle's doctrine of epagoge. However, I suspect this is likely to be met with some resistance. To this reaction, I would recommend that one suspend judgment until one has seen in what way noetic epagoge can serve as a solution to the puzzle at hand. Note also that commonsense intuition is the heir of the early moderns, who, as we have discussed, rejected the Aristotelian picture of inductive formal perception, and not always for great reasons (cf. Malebranche 1674: III.ii.2; Bassford 2020b).

Now that the doctrine of epagoge has been explicated, I'll next show how it is able to overcome the third objection to the natural kinds account, the one which specifically targeted Lange's modification to it. The objection was that, even if we can grant that the young medical student is able to simply *see* an instance of lung cancer, and see it precisely as lung cancer, unless she has good reason for having adopted the concept of *lung cancer* over, say, the concept of *flamingo-lung cancer*, we still have no good grounds for believing in the reasonability of our inductive practices. Her adoption would seem to be arbitrary. But if one accepts *noetic epagoge*, this is not so. This is because the Aristotelian can respond that her adoption of lung cancer was not the result of *inventing* some new concept with which to carve up the world. If it were, then she just as well might have adopted a different concept. The concept of lung cancer, rather, was *discovered* by the medical student, as a result of encountering the form in various instances of lung cancer; and, moreover, her concept *just is* the selfsame form which she perceived in a continued act of noetic epagoge. To learn to objectively see some *x* as an *x* is to undergo a process, as Aristotle would put it, wherein the actual form of *x*-ness itself has become stabilized in one's soul; just as an army comes to be upon a battlefield, upon repeated instances coming to be there, one at a time.

The reason this response works as a reply to the objection is because the Aristotelian can say that epagoge is a kind of perception and, thus, a kind of non-inferential, direct justification. If one sees a dog, then they obtain immediate justification in the existence of dogs. In like fashion, if one sees *dogginess*, then they should also be understood to have obtained immediate justification in the existence of the dog-form. In this way, it was no decision on the part of the medical student to

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[16] There are numerous conflicting interpretations of Aristotle on this point. I cannot hope to enter into that exegetical dispute here. The sort of interpretation which I am employing in this essay is the one which is, more or less, held similarly by T. Engberg-Pederson (1979), Thomas Upton (1981), Louis Groarke (2009: esp. Chapter 4; 2014), and R. J. Hankinson (2011; also in personal collaboration, c. 2020), among others. (Cf. also Aquinas c. 1270.)

adopt the concept. The concept, rather, came to her from outside, and she had no more option to adopt the concept than she did to adopt the particular experiences of specific instances of lung cancer. During perception, we are a patient in a causal process which results in our obtaining *information* about the world. Similarly, Aristotle could say, during intuitive induction, we are also a patient in a causal process, and just as we have no option about what we intake when we activate our perceptual faculties, we in turn have no real option about what we intake when we activate our noetic faculties.[17]

So what this shows, I think, is that the third objection to the natural kinds solution only goes through if one is assuming that the concepts we have adopted can only be justified on the basis of some inference or indirect evidence. But this presumes a kind of concept constructivism. Therefore, if we add concept revelationism to the account, the objection can be circumvented.

One final point before concluding: Lange's direct realist account was proposed only in order to complement the natural kinds solution. So, strictly speaking, Lange would only have us commit to direct realism about natural kinds. We have recommended substituting the concept of natural kind with substantial form. What I would recommend, then, is that we suppose that we are capable of engaging in noetic epagoge and thereby not only taking on the various natural forms in our environment, but also certain artificial ones too, like cars. This secures the soundness of our inductive practices with respect to both nature and human artifice, which is the desired result.[18]

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[17] Earlier we noted that our concepts have changed quite radically throughout human history and throughout each individual's personal cognitive development. So, what shall I say about this, holding as I do that concept formation is a kind of perception? Have all previous generations (and perhaps even our own) simply been *noetically hallucinating* in believing in witches and *aether* and so on? This is a very difficult question to answer and demands its own dialectical occasion.

[18] The critical reader may recall that Sankey also posited as a sound objection to natural kind accounts that they can't make sense of reasonably inducing on a single individual's behavior, say, to predict her future behavior, since no individual is a natural kind of her own. I have not yet offered any solution to this worry, which affects my own account, as it stands. My preferred Aristotelian response to this issue is to appeal to the scholastic concept of *individual substantial forms* (in contrast to *generic* substantial forms), whereby it is assumed that each individual has their own unique form, perhaps giving rise to individual propria too, in addition to the form they share with other members of their *infima species*. One might complain that this overly complicates our hylomorphic theory, since a thing's matter is already playing the role of individuating it from other members of its species. But the issue's complicated. See Ainsworth (2020: §3) for more on the individuating principle in Aristotle's philosophical cosmology. This dispute probably reached its peak in the late medieval era (cf. Suarez 1597: DM5; Garcia 1982).See also Losonsky (1987), Roce-Royes (2011), and Ujvari (2013) on *individual essentialism*, a subject of immediate relevance to individual substantial forms. So long as there are also individual forms in addition to generic forms, and so long as we may intuit them too, then my intuitive solution could well make provision for the soundness of inducing on a single

10. Concluding Remarks

Let's now conclude with a summary of where we've been. The principle challenge of this paper is how best to respond to the problem of induction. The problem of induction is a skeptical challenge of how to justify our inductive practices: Why should we think induction is any more reasonable of a way of acquiring knowledge than any other arbitrary way of moving from premises about what we have experienced to conclusions about what we have not, such as tealeaf readings? Sankey and Lange have responded that we can justify our inductive practices by appealing to natural kinds. Given what it is to be a natural kind, to observe one of them is to acquire information also about others, which then supports inductive inference. And so, at least here, our inductive practices are obviously reasonable. Lange then went a step further and said that even our belief in individual natural kinds in our environment is in need of no justification. We perceive individual instances of natural kinds directly, and we perceive them as natural kinds, and so the skeptical worry does not start anew at some new level of the dialectic. In this way, Lange addressed the first major objection which I posed to the account, which was a challenge to justify classifying objects in the world into putative natural kinds.

But we found two additional problems with the Sankey-Lange account. The second major objection to it was that the concept of natural kind is too narrow to account for the entirety of our apparently reasonable inductive practices—namely, those instances of cogent inductive inference involving subjects which are artificial kinds. And the third major objection was that Lange's direct realist modification to the account still faces a potential problem, so long as one presupposes a constructivist ideogeny about concept formation. If one is a constructivist, then the skeptic might still raise a new challenge: What justifies our adoption of natural kind concepts rather than some other arbitrary ones which would not support inductive inference? I took both of these objections to be decisive against the account.

And so, I have proposed a new, but very similar solution—one which appeals to Aristotelian substantial forms and intuitive induction (i.e., generic inductive perception). The thought is, first, that instead of appealing to natural kinds, we appeal to Aristotelian substantial forms (on the assumption that this includes artificial kinds too); and second, that instead of affirming direct realism only, we go a step further and accept the entirety of what I have called the Aristotelian "doctrine of noetic epagoge": the thesis that, via *nous*, we engage in perceptual acts of *epagoge*, whereby we not only intake *objects in the world qua informed*, but we also come to perceive the *forms* of those things themselves, which then become *present in our minds when we*

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individual's behavior. We might intuit not only the humanity of Callias but the peculiar Callias-ness of him too.

think of and perceive instances of the form. Substantial form is a broader category than natural kinds in the right way. And if one accepts noetic epagoge, the problems endemic to Lange's account are circumvented too, since then we can justify our selection of concepts via perception, just as we directly and non-inferentially verify that there exists particular instantiations of them.

In this essay, I set out with a destructive task and a constructive one. The destructive task was to show why the natural kinds solution to the problem of induction is insufficient; and the constructive one was to propose some alternative Neo-Aristotelian account which might avoid the former account's vices while at the same time inheriting its virtues. I believe I have done this. The task still remains to consider potential responses to the modified Neo-Aristotelian account on behalf of the skeptic. Completing that task must await some new occasion.[19]

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