Genericity and Inductive Inference*

Henry Ian Schiller
The University of Sheffield

DRAFT forthcoming in *Philosophy of Science*
PLEASE CITE FINAL VERSION

Abstract We are often justified in acting on the basis of evidential confirmation. I argue that such evidence supports belief in non-quantificational – or *generic* – generalizations, rather than universally quantified generalizations. I show how this account supports, rather than undermines, a Bayesian account of confirmation. Induction from confirming instances of a generalization to belief in the corresponding generic is part of a reasoning instinct that is typically (but not always) correct, and allows us to approximate the predictions that formal epistemology would make.

1 Introduction

If members of a kind F are observed to have some property G, this may confirm a general pattern among the Fs. If sufficiently many confirming instances are observed, this will be reflected in changes to the actions and attitudes taken towards F. Observing that m-many penguins waddle, that n-many slices of rhubarb pie have made me ill, or that o-many dogs act viciously towards me, may (given certain thresholds are met for the values of m, n, and o) influence the way an observer acts towards penguins, rhubarb pies, and dogs *in general*.

In short: evidence we get about specific members of a group can shape the sorts of decisions we make with respect to that group as a whole. I may start taking a longer way home because my usual route brings me past a dog park; I may decide to eat a snack before going to your house, because I know

* For stimulating discussion that improved this paper, thanks to Andrew del Rio, Sinan Dogramaci, Stew Cohen, Stella Fillmore-Patrick, Amelia Kahn, Matt McGrath, Jon Morgan, and Ravi Thakral, members of the ERGO epistemology reading group at UT Austin, and an audience at the *Generic Generalizations and Social Practices* workshop at the University of Sherbrooke. Sinan Dogramaci must be given special thanks for in depth feedback on multiple drafts of the paper, without which I am not sure it would be a piece of publishable philosophy. Thanks to two anonymous referees and an editor for *Philosophy of Science* for detailed feedback that has greatly expanded the scope and depth of the paper.

you will be serving rhubarb pie. Such changes in my actions and expectations – to the extent that they are directed at *F*s in general – are underwritten by beliefs that *generalize* with respect to members of *F*.

Further, the decisions that we make on the basis of such observations often appear to be *rationally justified*. Let us consider these claims in connection with the following plausible principle about the relationship between an agent's (or group of agents') evidence and the actions they are justified in performing:

> Justification-Action Link: If a belief-forming method provides rational justification for some action, then that method of belief-formation provides doxastic justification for some belief, which is what underwrites that action.[1]

This principle represents this paper's central methodological commitment: that we may reason *backwards* from claims about rational action to claims about the beliefs that underwrite it.[2] If you are justified in *acting* on the basis of some observation you have made – if that observation figures essentially in an explanation of your rational behavior – then it does so by providing justification for a belief formed on the basis of that observation (see Williams 2020 for some discussion of this principle). The goal of this paper is to determine the output of a certain kind of inference by considering the actions such inference rationalizes.

Let us combine this principle with the earlier observation that observing *n*-many *F*s that are *G* can be justification for acting on a *general belief* about *F*s. Specifically, a general belief linking *F*s to *G*.[3] Let us call the belief forming pattern whereby specific instances are used to support general propositions a *generalizing inductive inference*.[4]

When we make a generalizing inductive inference involving an evidence base that includes some set of *F*s, we form a belief about *F*s in general on the basis of an observation of a limited number of *F*s. The standard question about such inferences – often called *the problem of induction* – is how they can

1 This is a weakened version of a principle linking *knowledge* and action, which is widely endorsed by accounts on which knowledge "figures essentially in explanations of behavior" (Kipper 2018: 2221). See Hawthorne & Stanley 2008, Fantl & McGrath 2002, 2009, Weisberg 2013, Williamson 2000 for discussion.

2 Thanks to an editor of *Philosophy of Science* for suggesting that I make this explicit.

3 I assume, following Davidson (1967), that we can quantify over events as though they are members of kinds, such that it makes sense to say that *a* is a buttering, and that *a* takes place in the kitchen, and thus that butterings take place in the kitchen. In general, however, I will restrict discussion to quantification over ordinary objects.

4 I use 'generalizing inductive inference' and 'inductive generalization' interchangeably.

possibly be justified, given that there is no necessary connection between experienced and unexperienced instances of a kind or phenomenon. How is it rational to suppose that the next observed *F* will be *G*, given that previous instances have been? And further, how can such a rational transitions reflect a *prima facie* epistemic connection between a generalization and its confirming instances?[5]

This paper addresses a different question: the question I am interested in is about the doxastic states that underwrite such inference patterns. This question might, at first glance, seem confused: to describe a particular inference pattern just is to describe a maneuver from a certain set of beliefs or body of evidence, *E*, to another set of beliefs *H* (or less committally, from one proposition to another). But there is another – I think productive – way of thinking about (and individuating) inference patterns, and this is as maneuvers from a certain evidential position to a certain *rational* position. If nothing else, I hope that this paper vindicates this methodology.

The thesis of this paper, plainly stated, is that generalizing inductive inferences provide justification for the sort of belief that is given expression by a *generic generalization*. More thoroughly: when inductive inferences justify (a change in our) actions and attitudes with respect to some kind *F* this is by way of providing doxastic justification for a belief in a generic.[6] Inductive inference is a kind of reasoning tool that allows us to produce non-quantificational thoughts about kinds – to characterize and organize our thoughts about those kinds. Call this the *Generic View*.

5 See Hume 1748/1993; see Lange 2008 for a comprehensive summary. Let us take a very simple view of what it would be for an inference from A to B to be justified: an inference from A to B is justified if and only if someone who is justified in believing A would also be justified in believing B, believes B on the basis of A, and is not presented with any defeaters for their belief (cf van Cleve 1984). The question, then, is one of "showing that inductive inferences are justified" (ibid: 555).

6 We could also state this in terms of the results of a generalization: inductive inferences are moves from evidence about confirming instances to a general belief about Fs, and the thesis of this paper is that the confirming instances provide support for a general belief of a generic form. Or: inductive inferences are moves from confirming instances of Fs that are Gs to a justified expectation of regularity among Fs, where this expectation is underwritten by a belief in a generic. I find these ways of putting it confusing, because they seem to obscure the distinction between a cognitive and an epistemic question about induction. The main thesis of this paper might also be stated as the thesis that inductive generalizations are generic in character, but this needs to be taken to be an epistemic, rather than cognitive claim, and it might be difficult to see how to do this (see Nelson 1962 for a defense of the cognitive version of this thesis).

Traditionally, we take such inferences to justify beliefs in universal generalizations.[7] The problem of induction is often just treated as the problem of figuring out "how the discovery that a great number of Fs are Gs can make it rational to be confident that *all* Fs are Gs" (Bacon 2020: 354, emphasis mine). After setting up the Generic View in Section 2, I argue in Section 3 against such standard views, on which justification for action comes via a justified belief in a universal quantification.[8] In Section 4 I attempt to incorporate the insights of the Generic View into Bayesian approaches to inductive inference. On a Bayesian approach, decisions we make on the basis of generalizing inductive inferences are justified by probabalistic beliefs or *credences*. I argue that the Generic View supports, rather than undermines, probabalistic approaches to inductive confirmation.[9]

2 The Generic View

This section presents the view that generalizing inductive inferences have a generic character: observing confirming instances of a generalization about *F*s supports belief in a generic generalization. First, I will briefly say some things about what generic generalizations are. In the rest of this section I will elaborate on the connection between inductive inferences and beliefs with generic content.

2.1 What are generic generalizations?

Generics are statements that express non-quantificational generalizations. Generics "express general claims about kinds", but cannot "be used to answer the question how much or how many" (Leslie 2012: 355).[10] In a generic a property *G* is attributed directly to a (bare plural designator of a) *kind F*,

7 There have, however, been some notable holdouts; for instance, Popper (1959) has argued that the sciences, at least, need to do away with induction to universal generalizations (see also Claveau & Girard 2019).

8 This is not the first time this has been discussed; see Llewelyn 1962, Nelson 1962, for an earlier discussion of the claim that direct kind predication is what inductive inferences justify beliefs in. Nelson, specifically, argues that inductive generalizations are not quantifiable.

9 Some important points about terminology: the term 'generalization' is used ambiguously, both to refer to belief-forming methods ('inductive generalization') and also to refer to propositions that are general in character ('generic generalization'). I try, in this paper, to reserve the term 'generalization' for the latter. Instead of 'inductive generalization' I will use the term 'inductive inference' or 'generalizing inductive inference'.

10 As Sterken (2017) notes, generics do not "convey any stable or easily specifiable information about how many members of the given kind or group have the given property" (1).

without apparent quantification over individual members.[11] Sentences that express generic generalizations in English include 'Dogs have four legs', 'Ravens are black', 'Ducks lay eggs', and 'Mosquitoes carry West Nile'. *"Does Derek want to join us for breakfast?", you ask; "Of course," I respond, "New Yorkers love bagels".*

Generic generalizations are interesting to philosophers, linguists, and developmental psychologists, because of their abstruse formal properties and also because of the fundamental role they apparently play in cognitive development.[12] Generic sentences appear to be a human universal (in that they are present in every known language) but in no language are such sentences known to be 'marked' with an explicit generic operator.

This paper is about justification for beliefs with contents that generic sentences are used to express, so I start with some (general) comments about the contents of generic sentences. First, as Sorensen (2012) notes, "generics cannot be elliptical for universal generalizations or statistical generalizations" (445). Though this is a substantive assumption, it is not difficult to motivate. As Leslie (2007a, 2017) notes, when we consider generic statements to which we would assent, we do not think of these *as* having obvious quantificational paraphrases. Very young children are able to adopt and use generic generalizations years before they are competent with explicit quantification, weakening the prospects for holding generic generalizations to be quantificational.

A comprehensive survey of theories of generics would be too much to attempt in this paper, but I will briefly survey some of the most promising views.[13] The main *semantic* controversy is about whether generics have a tripartite structure involving a binary quantifier, 'Gen'. But as we will see, the main import of this controversy for the present paper may be metasemantic in nature.

11 The term 'kind' here should be taken in as general a sense as possible, to mean anything (or any group of things) that we can think of under a concept. For the sake of consistency, I will use the term 'kind' in many places where a term like 'group' or 'type' might appear more natural.

12 On this second point, see Johnston & Leslie 2012, Leslie 2007a, 2008, Leslie & Gelman 2012, Rhodes et al. 2018, among others.

13 See Sterken 2017 for a survey of the state of the art concerning the semantics of generics.

Simple Theories

Liebesman (2011) defends the view that generic sentences express direct predications of properties to kinds.[14] Liebesman's 'simple' theory of generics punts questions about the truth conditions of generics to their metaphysics (see Carlson 1982 on this point); the logical form of a generic like

(1) Tables have legs.

is just $L(t)$, where L denotes the property of leggedness, and t names the kind *table*.[15] The truth conditions of (1) are thus fixed in much the same way as that of a simple subject predication like

(2) Josh runs.[16]

Both (1) and (2) are true just in case the subject of the statement instantiates the predicated property. To say that Josh runs is, semantically, just to say that Josh is among the running things in our semantic model.[17] And what settles the question of whether it is appropriate to include Josh among the running things in our model is a matter for metaphysics to decide.

Aren't we owed a story about what it is for tables to have legs, for dogs to have teeth, for cats to meow? A semantic theory tells us how things have to be to make a sentence S true, but only in the set theoretic terms given by a formal model – it does not owe us an explanation regarding what it is for things to be the way the model represents. Likewise, a theory of epistemic justification tells us the conditions under which the sorts of thoughts that

14 The fact that no known language includes an explicit generic operator has been taken to be some evidence that there is no such operator in the syntax. However, this might also be taken as evidence that the binary generic operator is a cognitive default (cf Leslie 2007a). Some other evidence for the simple view comes from the fact that we can quantify over kinds in such a way that the truth of the quantificational statement depends on the truth of a generic. The sentence 'Most mammals give birth to live young' is (on one reading) made true by the fact that the majority of mammal *species* are such that they give birth to live young.

15 Carlson (1982) defends the view that generic sentences contain an operator, but that this functions only as a monadic predicate operator, taking individuals to kinds. On Carlson's (1982) view, (1) is represented in the semantics by $G(\lambda x(Lx))(t)$.

16 As Sterken (2015a) notes, "the intuitive truth-conditions of generics seem to vary quite radically from generic to generic" (1). Intuitively, this is because what it is for one generic to be true is quantifiably different than for another. It seems natural to think that there is a connection between the intuitive truth of 'Tigers have stripes' and the fact that many tigers have stripes, but – to use a standard contrast case – most books are paperbacks, and yet 'Books are paperbacks' is intuitively false.

17 We can give a Carlson-inspired view here: perhaps Josh runs if sufficiently many instances of Josh instantiate the property of running.

are expressed by S are appropriate to have, but it can also avoid difficult questions about what makes it the case that the world is the way it is.

A theory of justification might provide us with an explanation for how observing a red apple is *prima facie* justification for believing that the apple is red, but the epistemologist does not thereby owe us a story about what it is for an apple to be red. Likewise, we might claim that observing n-many black ravens justifies us in believing that ravens are black, without offering a story about what it is for ravens to be black. Simple theories provide us with an attractive way of packaging the thesis of this paper: that observing – for instance – sufficiently many black ravens just is an observation of the blackness of ravens.

Operator Theories

The most common class of semantic stories takes generic sentences to involve a two-place operator, 'Gen'. On such views, the logical form of a generic sentence $\ulcorner F$s are Gs$\urcorner$ is

Gen: Gen x $[F(x)][G(x)]$

According to Sarah-Jane Leslie's influential view, 'Gen' is a cognitive default generalization (Leslie 2007a, 2008) – meaning that by default we trigger this operator when considering how properties adhere in kinds.

Such defaults reflect a cognitive capacity for typing groups, often by linking them to essential features (Leslie 2017).[18] The metaphysical truth-conditions for generics – now relativized to cognitive defaults – track dimensions along which we sort the world that most benefit us in navigating it.[19] Notably, by typing groups not only by their characteristic properties, but their striking ones as well. These theories blur the line between epistemic and practical rationality, as generic beliefs will reflect our capacity to organize the world in a way that benefits us, rather than merely represent.

18 See Sterken 2015b for some criticism.

19 Other operator views are defended by Nickel (2016), who holds that the generic operator functions to pick out the most normal worlds, and Sterken (2015a), who holds that the generic operator is an indexical that picks out different thresholds for quantification depending on the context. Both normality views and Leslie's cognitive default view treat the generic operator as picking out something that allows us to organize the world by categories that are most salient to us – they both track what we might think of as default expectations concerning how the world is or should be. I will discuss Sterken's view towards the end of the paper.

2.2 Pragmatic Features of Generics

How can any claim about justification for a (kind of) belief be made if what it takes for that belief to be true is not known?[20] The central methodological assumption of this paper is that we can reason *backwards* from how rational agents behave to the information that explains their behavior. Rather than the truth-conditions of generic sentences, we might consider their inferential and action-guiding properties. What are the properties that generics have, such that they play the role that they do in our reasoning and practical inference?

2.2.1 Generality

Both a universal generalization of the form ⌜All *F*s are *G*s⌝ and a generic generalization of the form ⌜*F*s are *G*s⌝ can be said to express something about *F*s in general. But these constructions put expression to entirely different sorts of thought.

Unlike universal generalizations, generic sentences are used to express thoughts which appear to be directly about a kind, rather than (sets of) individual members of a kind (though this may not be reflected in the underlying semantic structure). So this generality is achieved in different ways. The thoughts expressed by generics are, perhaps, helpfully thought of as singular thoughts about general *objects*. Thus the generality of the claim is shifted from its semantics to its ontology.[21]

What is it to ascribe 'generality' to a thought or claim? This can be explained in terms of the inferences and actions they dispose us to make. Namely, to have a belief that is general about a class is to be able to reason, in a certain way, about arbitrary members of that class.[22] When you believe a universal generalization, like 'All ravens are black', this disposes you to act in a certain way towards any potential future raven. If you believe that all ravens are black but you fail to act as though the next raven you encounter will be black, then you are not being rational (and on some views you may not even count as having that belief). Thus, the belief that all ravens are black disposes you to treat any *arbitrary* raven you might encounter as black.

As Sorensen (2012) notes, "[belief] in a generic disposes one to believe that an arbitrary member of a kind will have the relevant [property]" (444) – in

20 Thanks to an anonymous reviewer for raising this issue.

21 Though this observation has been used to argue for a particular semantics for generics (cf Liebesman 2011), though see Leslie 2015. See Liebesman & Sterken 2021 for additional discussion about the relationship between generics and the metaphysics of kinds.

22 Thanks to an anonymous reviewer for pushing me to say a bit more about this.

other words, generic propositions dispose us in at least one of the same ways that universals do.[23] To think about *F*s in general is to think about properties instantiated by arbitrary members of *F*. The way in which generics are general may vary depending on – among other things – the semantic theory we accept. For instance, we might insist on a normative understanding, such that a generic is about *F*s in general because it tells us something about what any *F* ought to be like (Nickel 2016).[24]

2.2.2 Flexibility

Generic sentences express "general propositions without being committed to full generality" (Liebesman 2011: 409). A generic of the form ⌜*F*s are *G*s⌝ expresses something about *F*s in general without making a commitment to the presence of *G* in every instance of *F*. Generic sentences like 'Ravens are black' and 'Dogs have four legs' can be felicitously uttered even though there are albino ravens and three-legged dogs. In other words, the existence of non-*G* members of *F* does not undermine an assertion of the generic ⌜*F*s are *G*s⌝.

Imagine you would like to get a pet, and your only criteria is that it be an animal that flies. I can felicitously utter, as a reminder, 'Birds fly' and not have said something misleading (even though we may both be able to think of many flightless birds). Birds fly, but cats don't – cats are clean, but dogs aren't. Such statements are understandable, and play an action guiding role. What I have done is I have prompted you to consider, in your search for the ideal pet, the kind *bird*. Some mammals fly but 'Mammals fly' does not – to us – seem as appropriate a thing to utter.[25] Some mammals fly, but many more do not; it is not appropriate to think of the kind mammals (in this context, at least) as among the flying things in our ontology.[26]

23 Note that this is not the familiar notion of generality that is typically contrasted with singular ascriptions.

24 This may help us understand the relationship between induction and knowledge of what the next in an arbitrary sequence of members of some kind might be like. That ravens are black tells me that the next raven *ought* to be black, at least in some sense; that mosquitoes carry West Nile tells me that the next mosquito is something I should avoid.

25 Insofar as it is appropriate, it is natural to read such claims as elliptical for 'Some mammals fly' or even 'Mammals may fly'.

26 It is sometimes claimed that some generic generalizations forbid exceptions (Sorensen 2012). For instance, a generic like 'Whales are mammals'. But there is not much *semantically* interesting about this. It is a feature of the property of being a mammal that if one member of a kind (where that kind is individuated in a particular way) has it, they all must.

2.2.3 Non-Quantifiability

To reiterate a point made above: generics express something general about a kind, but the fact that G is true of *many* or *most* members of a kind F is neither a necessary nor sufficient condition for a generic $\ulcorner F$s are $G\urcorner$ to be felicitous to state. Against necessity: we can note the apparent felicity of statements like 'Ducks lay eggs' (perhaps true of many, but certainly not most ducks) and 'Mosquitoes carry West Nile' (not true of many mosquitoes).[27] Against sufficiency: we can note the apparent *infelicity* of statements like 'Books are paperbacks' (true of most books) and 'Humans are right handed' (true of most humans).[28]

Sally Haslanger notes that generics let us sort kinds by their 'striking features'; perhaps by the features that strike us as most important (Haslanger 2011: 185). The fact that many individual dogs are four-legged might strike us as an important feature for distinguishing dogs from other sorts of things (like: humans, birds, insects).[29]

2.2.4 Role in Inference

It has been observed that generics often license the following sorts of (non-monotonic) inferences:[30] (P1) Birds fly, (P2) Tweety is a bird, therefore (C) Tweety should fly. That Tweety *should* fly does not entail that Tweety *does* fly. And though learning that Tweety is a bird may license actions taken on the basis of the belief that Tweety flies, this is a defeasible belief. That tweety flies is a proposition we can accept for the purpose of deliberation and action, but it remains to be seen whether it is true.

The connection between such epistemic 'ought'-claims and rational deliberation and action is not well understood. But what ought to happen – epistemically – should have some impact on what one ought to do. For

27 The latter of these might be disputed as actually being some kind of capacity claim – like, 'Mosquitoes *have the capacity to* carry West Nile' or 'Mosquities *are (the) carries of* West Nile', or even 'Any mosquito *could be* a West Nile carrier'. To me, however, the most natural paraphrase is one that classes the kind *mosquito* as among the West Nile carriers.

28 Perhaps this is due to the properties in question being ones we use to sort and discriminate between members of these kinds.

29 Relatedly, generics appear to require little evidence in order for us to accept them as true (Cimpian et al. 2010). Why our cognitive systems are set up this way is, perhaps, something that could be explained by some of the conjectures made at the end of this paper. This paper is focused on the claim that inductive belief forming methods generate epistemic support for generics, and not the any claims about what it takes to believe a generic to begin with. So we can set this issue aside, for now.

30 See Thakral 2018.

instance, it seems natural to think that if you believe it ought to rain, then you are justified in acting as though this will be the case.

2.3 Generics and generalizing inferences

In the course of making a generalizing inductive inference, an observation or series of observations occur – connecting members of a group F to a property G – and a conclusion is thereby drawn about Fs in general. The evidence collected leaves open the possibility that there are unobserved Fs, and in fact the conclusion drawn is, in part, *about* those unobserved members of the group. A standard way of understanding inductive inferences is as a reasoning mechanism that allows us to draw conclusions about the unobserved in virtue of what we have in fact observed.

Based on this, we can identify two characteristic properties of generalizing inferences:

a. The evidence used in a generalizing inference is *compatible* with the feature observed in a group of Fs not holding for every F. Observing n-many Fs as having the property G is always compatible with some individual $n+x$th F not having the property G (and the action taken with respect to the inference is taken in full view of this compatibility).

b. The belief justified by a generalizing inference is *general*: the belief that an agent comes to hold on the basis of her observation of a group of n-many Fs is a belief about Fs in general (i.e., arbitrary members of F), not just a belief about n-many Fs.

Generic generalizations express something general about arbitrary members of a kind. Thus, I take it for granted that the generality consideration in (a) is met by the Generic View, and does not need to be elaborated.[31] Below I elaborate on the claim that inductive generalizations are compatible with disconfirming evidence, and how we might treat this as an explanatory desiderata for a theory of inductive inference. I also explain how it is that such disconfirming evidence, despite potentially overwhelming the confirming evidence, is not itself to be taken as evidence for a different generic claim.

31 It has been pointed out to me by [name removed] that none of this is decisive against treating inductive generalizations as justifying beliefs in other kinds of quantified statements (for example: an existential generalization or some other generalized quantifier). I think there are a few responses that can be given to this, but the most obvious issue is that this does not preserve the intuition of generality.

2.3.1 Compatibility with 'defeaters'

In a standard example of a generalizing inductive inference, things go as follows. An observation is made that many *F*s are *G*s.[32] We then infer from this evidence to an expectation of regularity – for instance, that the next thing observed which is *F* will be *G* as well. We can identify the following feature of generalizing inductive inferences:

> Compatibility: The evidence base (that *n*-many *F*s are *G*s) in an inductive inference to a general belief about *F*s, is compatible with evidence that disconfirms the general belief. Specifically: it is compatible with there being non-*G* members of *F*.

One way of putting the problem of induction made famous by Hume (1748/1993) is as a problem of reconciling (i) the compatibility of an inductive base with some proposition *p* with (ii) the fact that *p* is *not* compatible with the conclusion of the inductive inference. But the problem of induction is a problem of uncertainty. It is the problem of explaining how evidence can justify an expectation of regularity without the possibility of deductive certainty. Hume pointed out that we cannot be certain of the regularity that we expect, and those who have since defended the rationality of induction have sought to defend the claim that our confidence in this regularity is nevertheless warranted.

Induction is fallible because the expectations it produces are fallible. But this fallibility has nothing to do with the possibility of coming to have contradictory beliefs. On the Generic View, the object of your full belief is a generic. Generics are compatible with there being disconfirming instances of the generic (i.e., a generic Fs are G is compatible with an F that is not G). Consider generics like 'dogs have four legs', or 'ravens are black'; these can be asserted and believed despite known counterexamples (three-legged dogs, albino ravens). The generic generalization is not one of which you are going to be deductively certain (it is possible to be deductively certain of a generic, but the source of the inference should not change how you are licensed to deploy it).[33]

32 I will speak very generally and (hopefully) non-committally about the nature of evidence: it is whatever serves the role of *E* in an induction from *E* to a general belief about some kind *F* (where *E* is a confirming instance of that belief). We might treat evidence as just what an agent already knows, or as the information that an agent has available to them (via observation, or merely among their set of beliefs).

33 We can see that this is so without even establishing the role that generic statements play in deduction. There is some reason to think that generics cannot be deductively established as anything other than atomic propositions (Liebesman 2011).

2.4 Justified generic beliefs

The view that induction has a generic character is supported by plausible claims about when generics are justifiably believed. When do we say that a belief in a generic is justified? Do generalizing inferences provide this justification? (If so, under what circumstances?) To answer this first question, we might consider what it takes for an assertion of a generic to be warranted, and to warrant action.[34]

Mel and Vic are searching for a piece of jewelry, which has been lost somewhere on the street. They both know that the object is bronze, but nothing else. Mel has no idea what bronze looks like, and so she asks Vic what to look out for. Vic has never seen the ring, but knows what bronze looks like. Vic tries to think about what kind of thing they could tell Mel that would help; Vic reflects on bronze objects she's seen, and says to Mel 'Bronze jewelry is shiny'.

Mel's assertion is justified; it even seems as though it is plausibly confirmed by what she knows about instances of bronze jewelry. Even if she knows that tarnished or oxidized bronze is not shiny, it seems as though she is plausibly justified in making this assertion. Vic is then justified in acting on Mel's assertion, by way of looking out for a shiny object. The basis for Mel's assertion (and Vic's action) is clearly an inductive maneuver.

This is not just practical justification, either. If Mel and Vic were looking for their friend's ancient bronze armlet, which neither has seen, but which Mel knows for a fact is oxidized, then it could be helpful for her to say 'Bronze is green'. Yet she does not seem justified in doing so: in fact Mel seems to retain justification for uttering 'Bronze is shiny' (perhaps with an addendum like '...but this ring is probably not' or 'This ring is probably green'). 'Bronze is shiny' is assertable because Mel has seen a lot of shiny bronze; 'Bronze is green' is not assertable, because it does not match her inductive base.

At least in some scenarios, then, we say that a belief in a generic is justified if the generic matches our inductive base. It will be reasonable in such scenarios to say that generalizing inductive inferences can provide us with justification in asserting a generic.

34 To claim that someone is justified in asserting something is not to claim that their assertion is 'correct' in the sense of being norm-compliant. For instance, if you hold that there is a knowledge norm for assertion, then warrant for assertion comes from knowledge of the content of the assertion. Nevertheless, you might respect the importance of an internalistic criteria of justification for asserting something, such that my assertion seems to be justified given my evidence (or given what I take my evidence to be). It is this sort of case that I am interested in discussing here.

But this raises some questions about the scope of the view. For starters, if an inductive base of *n*-many *F*s that are *G* allow for counter-instances (*F*s that are not *G*) then why shouldn't those counter-instances form an inductive base of their own, especially given that they may outnumber the *F*s that are *G* (as is the case for generics like 'Ducks lay eggs')? And are we really meant to believe that *any* inductive base serves to justify us in forming a generic generalization? If the inductive base included only instances of oxidized bronze, would we be justified in asserting 'Bronze is green'? What if the inductive base included only paperback books?

A lot will depend on what information is already part of our evidence. In the case of green bronze, we're in a position to know that this is an unusual feature with what Leslie calls a positive counterinstance (i.e., a counterinstance which is a "concrete alternative property" adequate for characterizing the kind (Leslie 2007b: 66)). But if we weren't aware of this, and if all the bronze in our inductive base was oxidized, then I do think we would have *prima facie* warrant in thinking that bronze is green. Likewise, if your inductive base included only paperback books and you did not have a great grasp of what a book *is*, you would – I take it – be justified in beliefs that books are soft, bendable, made entirely from paper: all the properties of paperbacks.

We might make similar claims in instances where the confirming instances of a generalization are outnumbered by its defeaters. The majority of ducks do not lay eggs, or have egg laying capacities (even if it's a slim majority). And yet we are confident in stating that ducks lay eggs. But the property of being an egg-laying creature – and what gives such a generalization its explanatory value – is one that requires little adherence among its members. The majority of instances of Josh are such that he is not running, but we cannot infer – on these grounds alone – that Josh does not run, and this is because such instances are compatible with the most plausible ways of making it the case that Josh runs, and we are aware of this. Likewise, the observation that many ducks do not lay eggs does not serve *for us* as the inductive base for a generic, since we are in a position to know that the observations we are making adhere with the same regularity in worlds where ducks do and do not lay eggs.

Observing an egg-laying duck and observing a non-egg-laying duck do both give us confirmation of (contradictory) generics. However, what it takes for these generics to be true is quite different. This is because what it is for a kind to have a property *F* or *G* is different from what it is for a kind to have the negation of that property. So the conditions under which it is true that ducks lay eggs and the conditions under which it is true that they do not are not parallel. But this means that we should not expect the conditions under which we are justified in believing each of these things to be parallel either. Claims about absences of properties may be hard to justify, but things that entail those absences for particular individuals are not: 'Ducks have penises', 'Josh naps', 'Ravens are affected by albinism'.

3 The standard picture, revisited

The standard view of inductive confirmation is that observing that n-many Fs are Gs under the right circumstances (you have observed no non-G Fs, you have some prior expectation of regularity due to F being a certain sort of kind) justifies belief in a universal generalization. In this section I will argue that the standard account fares much worse than the generic account, as far as explaining our actions. First, consider the following case from Bacon 2020:

> "It is a law that emeralds are either blue or green, but the distribution of colors is otherwise determined randomly. By chance it happens that all the emeralds in the actual world are green."

Someone who observes 100 emeralds in a row, under these conditions, is "not in a position to infer that the next emerald will be green".[35] In other words, they are not in a position to make a traditional inductive leap.

But I think they *are* justified – at least plausibly – in treating emeralds as green objects. They are justified in *acting as though* the next emerald will be green: i.e., looking out for green things if their goal is to find more emeralds; avoiding emeralds if they have some deep aversion to green objects. This justification does not come from a belief that those emeralds with which they may be confronted that they *are* green, but because they ought to be, and are thus rationally treated as green.

Of course, in some cases a very inductive-looking leap from evidence to universal generalization is available. If I observe 35 South China tigers and I see that they are all striped, I may be justified in believing that all South

35 "[E]pistemic possibilities are identified with assignments of colours to emeralds, and an epistemic possibility w is consistent with my knowledge if at most n different emeralds in that possibility have colours that differ from their actual colours... After observing the first 100 emeralds to be green, and ruling out sequences that don't begin with 100 green emeralds, there are still worlds that are open where some of the remaining emeralds – up to n of them – are blue. This sort of model correctly predicts that I am not in a position to know that all emeralds are green after learning that the first 100 are green" (Bacon 2020).

China tigers are striped if I also have justified belief that there are *roughly* 35-40 South China tigers living in the wild.

This kind of likelihood is generated by the antecedent knowledge that there are roughly n many tigers in the wild. This provides an expected regularity for my observation which gives it a statistical advantage. The same thing can be found in a case where I observe 100 ravens and have a strong justified belief that ravens do not vary in color (I would be wrong to hold this conditionalizing belief, as there are albino ravens). I have an expectation that future instances of gravity I observe will behave in roughly the same way as all the instances of it I have observed. I have only observed a small fraction of all the instances of gravity there will ever be, but I have a strong and justified expectation of regularity.

We might apply this insight to any case of a generalized inference. Surely there is always *some* expectation of regularity which constrains our observation. Even if the 'moderate skepticism' I advocate for is correct, there will always be a universal generalization which is justifiably believable on the basis of our evidence. If I make an observation of some Fs, and those Fs are G, there will always be a universal generalization of the following form which we can justifiably believe:

(3) $\forall x((Fx \wedge \Delta x) \rightarrow Gx)$

where Δ is the set of properties provided by the regularity. For example, if I observe several koalas in a zoo, and they all have sharp teeth, I would plausibly be justified in believing that all koalas I have seen *in the zoo* have sharp teeth. The restricting property of having been seen by me in the zoo is provided by the expected regularity of my perception.[36]

These Δ*-restricted generalizations*, as I will call them, satisfy the compatibility feature discussed in section 2.2.1.[37] If we take F to be the group that the belief is about, then a generalization of the form in (3) is compatible with there being members of the group F not having property G. The existence of koala without sharp teeth is compatible with the fact that every koala in the

36 It is worth noting that one view of generics takes them to be restricted quantifiers of exactly this sort. Such views are, for reasons outlined in Leslie 2007a, not particularly plausible, but this connection is worth noting. Thanks to an anonymous reviewer for pointing this out to me.

37 There is no deep difference between what I am calling unrestricted universal generalizations and their Δ-restricted counterparts. Both $\forall x(Fx \rightarrow Gx)$ and $\forall x((Fx \wedge \Delta x) \rightarrow Gx)$ are restricted versions of $\forall x(Gx)$. But with respect to beliefs *about members of the group F*, the first of these is unrestricted and the second is not.

zoo has sharp teeth. But this comes at the cost of giving up generality with respect to all members of the group F.

There are also certain cases in which the generic offers an explanation of your action and an action-governing universal generalization does not.

Let's say you are camping somewhere with a friend, and you learn that West Nile has been detected among animals in the park. You are certain that West Nile is incredibly rare: in fact, you are reasonably sure that the mosquito bite which transmitted West Nile in the past month were probably just two of millions in the park, and the percentage of the park's mosquitos which carry the West Nile virus is likely to be fewer than one percent, given only this statistical info.

The only universal generalization you are justified in inductively believing on the basis of the information given by the CDC warning takes scope over a small subset of mosquitos (whatever it is that two mosquitos having West Nile makes likely). The domain over which you generalize does not plausibly include the next mosquito to bite you. Thus, while you are capable of making some sort of restricted generalization, you are not justified in any fear about the next mosquito to bite you on the basis of that restricted generalization.

But you are intuitively justified in acting so as to avoid mosquitos on the basis of the information you got from the CDC warning, and thus you are justified in acting on the basis of something you learned when you learned that two mosquitos had transmitted West Nile in the park. (Consider that if you had been in a park without any instances of West Nile, your concerns would have been different.) Further, this action takes the form of avoiding the next mosquito to bite you.

When you act on the basis of an inductive generalization, and you are justified in acting, what best explains your taking the action you do is a belief with a certain set of properties. If we take this to be a matter of full belief then the only beliefs which have these properties are beliefs in generics. Whatever motivates you in this case has the following features:

i. It is a general belief about mosquitos in the park,

   - You believe something about mosquitos in this park as a kind (that they carry West Nile). It is a belief about the whole group of mosquitos, but it is not a belief about the sum of individual mosquitos which make up that whole.

ii. It seems immmune to 'counterexample',

   - The fact that some X are known not to G mosquitos do not carry West Nile is not a defeater for your belief. Finding a mosquito that does not carry West Nile does not change your opinion of mosquitos in the park generally.

iii. It seems sensitive to 'interesting features',

- Learning that some small number of mosquitoes have infected park-goers with West Nile motivates you in acting, but learning that two of the park's coyotes have white paws should not lead you take action to prepare for white-pawed coyotes.

iv. It has no associated quantity.

- Though you may have antecedent motivation for believing that X many mosquitos carry West Nile, that is not what motivates your acting. What motivates your acting is a belief about mosquitos / West Nile that you have in spite of this quantity.

4 Bayesian decision theory

The discussion so far has been couched in the language of traditional theories of confirmation; accounts of how our outright doxastic commitments to hypotheses are affected by evidence. Where it is traditionally thought that observing a sufficient number of *F*s who are *G* justifies us in committing to the claim that all *F*s are *G*s, I have argued that such observations are more appropriately taken to rationalize a commitment to the proposition expressed by a generic sentence ⌜*F*s are *G*⌝.

An alternative approach – massively popular Bayesian accounts of confirmation – eschews talk of justification in favor of probabilities for hypotheses given our evidence and prior probabilities. Bayesian accounts treat induction in terms of incremental increases in the probability we are rational to assign some proposition (a hypothesis H) on the basis of learning things (evidence, E) that lend probabilistic support to that proposition, where that support is measured in terms of an agent's prior probabilities connecting E and H.

Consider the proposition that all ravens are black (H): observing a black raven (E) raises your degree of confidence in the overall proposition, based on the following rule:

$$cr(H|\mathbf{E}) = P(H)\frac{P(\mathbf{E}|H)}{P(\mathbf{E})}$$

Given that the proposition that all ravens are black entails that any given raven will be black, $cr(\mathbf{E}|H)$ will necessarily be 1 (by the axioms of probability theory). Thus, as long as an agent has fixed prior probabilities in H and E, we can determine their probability assignment for H given E, and thus what their change in credence ought to be given that they have observed a black raven (namely, that their new credence in H should be their prior conditional credence in H given E).

According to the Bayesian, we start with a background probability assignment linking any given member of some kind to a property. Let's say your prior probability in any given F being G is 0.4. Observing any F that is G raises this probability by a predictable amount – exactly what amount will depend on an agent's priors.

How can the Bayesian strategy be reconciled with my proposal in this paper? I will suggest two such strategies of reconciliation: one strategy ties the justification conditions for generic beliefs more directly to practical rationality, which is explained by Bayesian methods. Another strategy implicates generics more directly in the Bayesian methodology, as either the objects of credence or the sources of our prior probabilities.

4.1 Compatability

It is possible to show that Bayesian decision theory and full belief models for action have distinct, and complimentary, explanatory aims from one another. Weisberg (2013) notes that Bayesians and full-believers are after different things when talking about rational action. The aim of Bayesian decision theory is to tell us what is rational; the aim of a knowledge-based account of action is to tell us what *assumptions we are justified in relying on* when we act. Presumably, we would like to act in accordance with what is rational. However, we may not always have the tools of Bayesian decision theory at our disposal.

This difference can be highlighted by analogy: Imagine a perfect food pyramid, which says exactly what portions of which foods one ought to eat in order to maximize their health. The food pyramid tells us, more or less definitively, what it is healthy to do. Of course, we do not have access to such a food pyramid (yet). So, we have developed (via selective pressures) our own sets of tools for determining healthiness of foods (how they make us feel, their taste, color, etc.). This is how, without having tasted poison, I am able to tell that something tastes wrong. This has allowed our continued existence as a species. The goodness of our diet can be measured against the health ideal of the food pyramid; however, the tools that we use to pick the foods we eat bear almost no resemblance to the food pyramid.[38]

38 Another example of this kind can be found in the truth tables and proof rules for logic. The truth tables determine the semantic facts of the logical constants, but what you actually

So, there is some rational condition, provided by Bayesian explanation. But that rational condition is hard for us to obtain. Our set of cognitive tools can provide us with a rough approximation, but at the cost of being much less precise. Such reasoning – involving things like epistemic 'oughts', and arbitrary generality – is what we typically put to use in achieving rational ends. Rationality is too demanding when it comes to certain kinds of reasoning, especially statistical reasoning that measures the prevalence of a property in one group against the prevalence of that property in another. But we can shortcut this with certain sorting techniques.

As Weisberg notes, there is a "massive research program in psychology dedicated to determining what methods we use, when we use them, and how effective they are at generating expected-utility-maximizing choices" (Weisberg 2013: 6).[39] One upshot of this research has been the discovery that we seem to favor 'economical' methods, like making decisions on the basis of full beliefs, rather than more 'expensive' Bayesian methods. This way of dividing things up seems to make Bayesian decision theory a theoretical tool for determining rational action, and making full belief a practical tool that we actually use. This is not quite how we should draw the line. It is obviously possible, even if it is not likely, that someone will use a decision theoretic method to make a decision. We might instead think of the division as drawing the line between what people ought to do (ideally) and what people generally do to match the ideal. What you do in reasoning is a low-powered way of matching what decision theory (a high-powered method) says is rational.

So, the generic view can be situated within the project of discovering a "psychologically plausible notion of rationality" Gigerenzer et al. (2000). This makes the claims of this paper (and of research on the links between full belief and action in general) conditional: *Given that we use economical methods to reason*, you are justified in believing a generic on the basis of a generalizing inference.

I think this reconciliation is promising. It matches our intuitions, too. You learn that several cats in your neighborhood have contracted the highly contagious coronavirus. What is your new credence that any arbitrary cat in your neighborhood has the virus? What should it be? Maybe there is an answer to the first question, but even if there is it is likely not accessible (perhaps it is reflected in your actions). The answer to the second question is itself not accessible to most people, and is controversial to say the least. And

deploy in reasoning is closer in kind to the proof rules, which are notoriously difficult to support *a priori*.

39 See work in experimental psychology like Baron 2007, Gigerenzer et al. (2000), and Kahneman & Tversky (1979).

yet you act, and your actions are rational (at least in an ordinary sense) and they reflect a kind of general thinking about cats. You avoid neighborhood cats, and if asked why, you might respond that cats in your neighborhood carry coronavirus.

There is reason to believe that generics express what Kahneman and Tversky call 'System 1' judgments (Leslie 2007a); these are the judgments produced quickly and with little deliberative effort.[40] Leslie treats generics as cognitive default generalizations – according to Leslie, generics "give voice to our most primitive, default generalizations, while explicit quantifiers, in contrast, require our conceptual system to actively diverge from this default" (Leslie 2007a: 382). Empirical evidence that this is the case comes from experiments involving young children, who are able to recall quantifiable information generically, but struggle with abstract quantificational characterizations.[41]

4.2 Humean Views

Bayesianism is not immune to Humean skepticism. The Bayesian rational kinematics are relativized to prior beliefs and credences, and while some of these are *a priori* principles, others seem to be closer to empirical claims. For instance, the agent's prior probability concerning the likelihood of H given E is dependent on the probability they assign to E (in this case, the probability that a particular raven will be black). But isn't the Humean point exactly that this probability cannot ever be *known*? That is, there is no way of working out from first principles how likely it is that any given raven will be black, unless those first principles are stipulated.[42] Substantive principles matching our prior probabilities to various features of the world have been proposed, but – reasonable as many of them sound – they still fall prey to the Humean skeptical argument.

But the generic view can be incorporated into the Bayesian solution in a different way, too: we might, for instance, hold that the contents of our probability assignments are generic sentences (see Silva 2020 for an interesting suggestion along these lines). Having a credence of 0.6 that all ravens are black means taking it to be 60% likely that any unobserved raven

40 Thanks to an anonymous reviewer for suggestions here.

41 As I have already noted, generic generalizations that lack an explicit generic operator are a human universal. Leslie points out, however, that quantification may not be. She points to Dan Everett's work with the Piraha language in making this claim. However, Everett's work has been highly controversial, and so I leave it to the reader to investigate.

42 See Builes forthcoming for a precise formulation of the problem of induction for the Bayesian.

will be black. But the problem of induction is one of showing how exactly this sort of prediction – a prediction about the likelihood of some unobserved thing happening – can be made.[43] We have no more reason to take this to be 60% likely than we do to take it to be 2% likely, or so the Humean will claim.

But taking it to be 60% likely that ravens are black need not have this implication. If we hold that such beliefs are not nestled in the probabilistic structure of the universe, then we need not posit any relationship here at all. The 'simple' theory of generics discussed earlier holds that generic sentences like 'Ravens are black' express 'bare' facts about the world: the kind *raven* instantiates the property of *being black*. And there is no reason to think that this sort of thing can't be more or less directly observed.

This is not to say that there is no connection between generic sentences and probabilities concerning their instances. As Silva (2020) notes, the observation of instances of a generic should make us more confident in that generic. This picture of reconciliation between Bayesian and generic approaches to induction can be extended to operator views as well. Here the precise relationship between the generic operator and probabilities is important. To give just one example, an operator view that ties the metaphysical truth-conditions for generics to something like normality (Nickel 2016) or contextually fixed probabilities (Sterken 2015a) will "explain quantificational variation as an epiphenomenon" (Sterken 2017: 4).

More generally, if we think of epistemic space as corresponding to a set of probability spaces, then any modal claim will supervene on probability distributions, even if there was no way of reading from the modal to a particular probability distribution (claims of the form $\ulcorner$Might $p\urcorner$ are true in virtue of some probability space(s) being salient). So generics qua 'Gen' will always correspond to probabilistic learning of one kind or another. A full story of how this is still needs to be worked out. But the point is that having any particular credence in a generic does not commit you to precise probabilities concerning unobserved instances of that generic. Thus, incorporating genericity into our Bayesian explanations allows us to sidestep one of the problems of induction.

5 Conclusion

The problem of induction is that there is no necessary connection between the observations we make and universal generalizations about the world, but we are nevertheless licensed in acting as though those universal generalizations

43 Thanks to an editor for this journal for making this suggestion.

are true. A gerrymandered solution to the problem of induction, then, would be to define a content whose introduction rules are substantially weaker than those for universal generalization, but whose role in inference mirrors that of a universal generalization. What I've argued is that such a solution is not gerrymandered at all – such contents (or something very much like them) are part of our everyday general reasoning.

The role of genericity in reasoning has been largely ignored. This paper has been an incredibly programmatic attempt at correcting this, by exploring some of the advantages of the generic view over standard views of induction, but the implications for adopting this framework are wide-ranging.

Understanding the relationship between generics and probabilities, for instance, is important to understanding how theory change occurs in science. It is often noted that the ceteris paribus laws of normal science are given in generic form (Nickel 2016). These laws are rarely thought to be exceptionless. Further, in their role as background beliefs that guide normal science, it may not be appropriate to think of them as the objects of credences, per se. Nevertheless, we may find that we need to get rid of or abandon them in case there is a statistically significant divergence of fact from law.

References

Bacon, Andrew. 2020. Inductive knowledge. *Noûs* 54(2). 354–388.

Baron, Jonathan. 2007. *Thinking and deciding*. Cambridge University Press.

Builes, David. forthcoming. The ineffability of induction. *Philosophy and Phenomenological Research* http://dx.doi.org/10.1111/phpr.12753.

Carlson, Greg N. 1982. Generic terms and generic sentences. *Journal of Philosophical Logic* 11(2). 145–181. http://dx.doi.org/10.1007/BF00278382.

Cimpian, A., A. Brandone & Susan A. Gelman. 2010. Generic statements require little evidence for acceptance but have powerful implications. *Cognitive Science* 34(8).

Claveau, François & Jordan Girard. 2019. Generic generalizations in science: A bridge to everyday language. *Erkenntnis* 84(4). 839–859. http://dx.doi.org/10.1007/s10670-018-9983-x.

van Cleve, James. 1984. Reliability, justification, and the problem of induction. *Midwest Studies in Philosophy* 9(1). 555–567. http://dx.doi.org/10.1111/j.1475-4975.1984.tb00077.x.

Davidson, Donald. 1967. The logical form of action sentences. In Nicholas Rescher (ed.), *The logic of decision and action*, 81–95. University of Pittsburgh Press.

Fantl, Jeremy & Matthew McGrath. 2002. Evidence, pragmatics, and justification. *Philosophical Review* 111(1). 67–94.

Fantl, Jeremy & Matthew McGrath. 2009. *Knowledge in an uncertain world*. Oxford University Press.

Gigerenzer, Gerd, Peter Todd & The ABC Research Group. 2000. *Simple heuristics that make us smart*. Oxford University Press.

Haslanger, Sally. 2011. Ideology, generics, and common ground. In Charlotte Witt (ed.), *Feminist metaphysics*, Springer.

Hawthorne, John & Jason Stanley. 2008. Knowledge and action. *The Journal of Philosophy* 105(10). 571–590.

Hume, David. 1748/1993. *An enquiry concerning human understanding*. Cambridge MA: Hackett Classics.

Johnston, Mark & Sarah-Jane Leslie. 2012. Concepts, analysis, generics, and the Canberra Plan. *Philosophical Perspectives* 26(Philosophy of Mind).

Kahneman, Daniel & Amos Tversky. 1979. Prospect theory: An Analysis of decision under risk. *Econometrica* 47(2). 263–292.

Kipper, Jens. 2018. Acting on true belief. *Philosophical Studies* 175(9). 2221–2237. http://dx.doi.org/10.1007/s11098-017-0956-8.

Lange, Marc. 2008. Hume and the problem of induction. In Stephan Hartmann Dov Gabbay & John Woods (eds.), *Handbook of the history of logic, volume 10: Inductive logic*, Elsevier.

Leslie, Sarah-Jane. 2007a. Generics and the structure of the mind. *Philosophical Perspectives* 21(1). 375–403. http://dx.doi.org/10.1111/j.1520-8583.2007.00138.x.

Leslie, Sarah-Jane. 2007b. *Generics, cognition and comprehension*: Princeton dissertation.

Leslie, Sarah-Jane. 2008. Generics: Cognition and acquisition. *Philosophical Review* 117(1). 1–47. http://dx.doi.org/10.1215/00318108-2007-023.

Leslie, Sarah-Jane. 2012. Generics. In Gillian Russell & Delia Fara (eds.), *Routledge handbook of philosophy of language*, 355–366. Routledge.

Leslie, Sarah-Jane. 2015. Generics oversimplified. *Noûs* 49(1). 28–54.

Leslie, Sarah-Jane. 2017. The original sin of cognition: Fear, prejudice, and generalization. *The Journal of Philosophy* 114(8). 393–421.

Leslie, Sarah-Jane & Susan A Gelman. 2012. Quantified statements are recalled as generics: Evidence from preschool children and adults. *Cognitive Psychology* 64(3). 186–214.

Liebesman, David. 2011. Simple generics. *Noûs* 45(3). 409–442.

Liebesman, David & Rachel Katharine Sterken. 2021. Generics and the metaphysics of kinds. *Philosophy Compass* e12754.

Llewelyn, JE. 1962. Unquantified inductive generalizations. *Analysis* 22(6). 134–137.

Nelson, John O. 1962. Are inductive generalizations quantifiable? *Analysis* 22(3). 59–65. http://dx.doi.org/10.1093/analys/22.3.59.

Nickel, Bernhard. 2016. *Between logic and the world: An integrated theory of generics*. Oxford University Press UK.

Popper, Karl R. 1959. The propensity interpretation of probability. *The British journal for the philosophy of science* 10(37). 25–42.

Rhodes, Marjorie, Sarah-Jane Leslie, Lydia Bianchi & Lisa Chalik. 2018. The role of generic language in the early development of social categorization. *Child Development* 89(1). 148–155.

Silva, Paul. 2020. A bayesian explanation of the irrationality of sexist and racist beliefs involving generic content. *Synthese* 197(6). 2465–2487. http://dx.doi.org/10.1007/s11229-018-1813-9.

Sorensen, R. 2012. The sorites and the generic overgeneralization effect. *Analysis* 72(3). 444–449. http://dx.doi.org/10.1093/analys/ans067.

Sterken, Rachel. 2015a. Generics in context. *Philosophers' Imprint* 15.

Sterken, Rachel Katharine. 2015b. Leslie on generics. *Philosophical Studies* 172(9). 2493–2512. http://dx.doi.org/10.1007/s11098-014-0429-2.

Sterken, Rachel Katharine. 2017. The meaning of generics. *Philosophy Compass* 12(8). e12431. http://dx.doi.org/10.1111/phc3.12431.

Thakral, Ravi. 2018. Generics and weak necessity. *Inquiry* 1–28.

Weisberg, Jonathan. 2013. Knowledge in action. *Philosophers' Imprint* 13(22).

Williams, J. Robert G. 2020. *The metaphysics of representation*. Oxford University Press.

Williamson, Timothy. 2000. *Knowledge and its limits*. Oxford University Press.