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A Kuhnian defence of inference to the best explanation

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ABSTRACT

According to inference to the best explanation (IBE), scientists infer the loveliest of competing hypotheses, 'loveliness' being explanatory virtue. This generates two key objections: that loveliness is too subjective to guide inference, and that it is no guide to truth. I defend IBE using Thomas Kuhn's notion of *exemplars*: the scientific theories, or applications thereof, that define Kuhnian normal science and facilitate puzzle-solving. I claim that scientists infer the explanatory puzzle-solution that best meets the standard set by the relevant *exemplar of loveliness*. Exemplars are the subject of consensus, eliminating subjectivity; divorced from Kuhnian relativism, they give loveliness the context-sensitivity required to be truth-tropic. The resulting account, 'Kuhnian IBE', is independently plausible and offers a partial rapprochement between IBE and Kuhn's account of science.

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1. Introduction

It is generally agreed that inference to the best explanation (IBE) is widely used in science. According to IBE, we infer what would, if true, be the best explanation of the evidence.[1] Scientists formulate a pool of competing potential explanations, identify the best, and infer on those grounds that it is the actual explanation of the evidence (or *an* actual explanation—some evidence may be explained in several compatible ways).

But which is the *best* potential explanation in any pool? Peter Lipton, whose account of IBE (Lipton, 2004) is definitive, argues that the best explanation is the *loveliest* explanation, 'loveliness' being explanatory virtue: "the explanation that would, if correct, be the most explanatory or provide the most understanding [is] the 'loveliest' explanation" (Lipton, 2004, p. 59). As Lipton (2004, p. 60) notes, a good account of inductive inference must tell us on what basis we judge one proposed conclusion likelier than another, and IBE claims to do this in terms of *explanatory* considerations. Loveliness is thus essential to IBE; failure to take loveliness seriously is failure to acknowledge IBE's identity as an account of induction. Consequently, IBE is correctly defined as inference to the loveliest potential explanation (hereafter, I take 'IBE' to be synonymous with this definition).[2]

It should be emphasised at once that 'loveliness' is *not* a byword for aesthetic value. If one endorses IBE one does not thereby endorse the controversial thesis that the most beautiful hypotheses are likeliest to be true (whatever that amounts to). As just noted, loveliness is a matter of *explanatory virtue*; what makes for loveliness is just what makes for understanding (of course, lovely-making factors may also be aesthetically appealing). Consider the 'dormitive virtue' explanation of opium's causing drowsiness. This explanation provides almost no understanding: 'opium has a dormitive virtue' says little more than 'opium causes (has the power to cause) drowsiness', and it is precisely this power we seek to explain. Hence the explanation has few explanatory virtues, and none to any great extent—it is only minimally lovely. We may infer it, since *some* understanding is given (it does more than paraphrase the evidence, avoids ad hoc clauses, and so on), but it is clear we can do better. Empirical investigation of opium's 'dormitive virtue' yields more informative hypotheses, enabling us to move away from this banal explanation towards a thorough understanding of the phenomenon. If true, these later hypotheses

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[1] In common with most discussions of IBE, I construe explanation factively: for something to be an explanation, it must be true.

[2] More strictly, IBE is the inference that the loveliest of a pool of competing potential explanations is an actual explanation, *where the loveliest is lovely enough to be inferred and sufficiently lovelier than its competitors*. If the italicised condition is not met, inference may be postponed.

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will display greater explanatory virtue—they will be lovelier. In this context then, 'loveliness' is merely shorthand for 'degree of explanatory virtue'.

In this paper, I offer neither an analysis of explanatory virtue nor an account of any candidate virtue, let alone an exhaustive list. Rather, my aim is to defend IBE against two crucial objections, viz. that loveliness is too subjective to guide inference, and that it is not a guide to truth (an account of loveliness does emerge, but it is broadly functional in character).

Perhaps surprisingly, my main tool in answering these objections is Thomas Kuhn's notion of *exemplars*, the scientific theories, or applications thereof, that define periods of Kuhnian normal science. In Section 2 I outline Kuhn's account of science, focussing on the role of exemplars. In Section 3 I present the two objections to IBE—the subjectivity objection (SO) and the truth objection (TO)—in more detail and bring out their significance. In Section 4 I answer SO by claiming that exemplars instruct scientists in how to solve problems by providing standards of loveliness against which to assess potential puzzle-solutions. These standards are shared by all relevant scientists; hence loveliness is not subjective as SO claims. On my account, loveliness *is* relative to puzzle-solving context, but this context-sensitivity is to be expected, given the ways the various sciences approach their problems. It is also beneficial, since it promotes problem-solving.

In Section 5 I answer TO. Kuhn states that paradigms are tailored for effective puzzle-solving and that, across paradigms, science makes puzzle-solving progress. I argue that epistemological reliabilism explains these phenomena: science progresses because its puzzle-solving method gets better at tracking the truth. Since exemplars are crucial to that method, the standards of loveliness they generate are truth-tropic.

This response to TO makes clear that my approach to Kuhn is piecemeal. I claim that we may divorce Kuhn's historically-informed insights about the structure of science from his philosophically-motivated relativism. Rejecting the latter and keeping the former, we may illuminate both IBE and Kuhnian science. The project is begun with exemplars, but in Sections 6 and 7 I explore the extent to which IBE is compatible with other key aspects of Kuhnian science. Having shown 'Kuhnian IBE' to be plausible, I conclude by noting the modest rapprochement between IBE and Kuhnian science thereby achieved.

2. Kuhn's account of science

Kuhn (1996) identifies a pattern in the histories of mature sciences: extended periods of normal science governed by a paradigm or tradition of scientific work, punctuated by occasional scientific revolutions in which old paradigms are replaced by new ones. Crucial to this pattern is the theoretical *exemplar* (Kuhn, 1996, pp. 187–198). According to Kuhn, in any period of normal science, exemplars are "the concrete problem-solutions that students encounter from the start of their scientific education [and] at least some of the technical problem-solutions found in the periodical literature that scientists encounter during their post-educational research careers and that also show them by example how their job is to be done" (Kuhn, 1996, p. 187). For Kuhn, that job is puzzle-solving, an enterprise he distinguishes from problem-solving in a way that does not concern us here (reasons for ignoring the distinction are given in Section 5; Kuhn confuses his position by using the terms 'problem' and 'puzzle' interchangeably, as the above quotation attests). Exemplars earn their name because "scientists solve puzzles by modelling them on previous puzzle-solutions" (Kuhn, 1996, p. 189).

Exemplars are crucial to productive normal scientific work, but this is not their only function. Exemplars are at the root of paradigms' ability to define—both conceptually and in the sense of demarcation—the subject matter of a particular science during a period of normal science; further, they tell the relevant scientific community how to investigate it. This is because they are the focus of the consensus that constitutes normal science. Exemplars reveal the all-important similarities between hitherto recalcitrant phenomena and those already understood within the paradigm. Exposure to exemplars (typically received as a student) thus habituates scientists to see certain extant and emerging puzzles as relevant, certain ways of solving them as appropriate, and certain solutions as better than others (Kuhn, 1996, pp. 37–40, 45–47). During normal science, scientific communities accept exemplars unreflectively. On Kuhn's account, it is this widespread dogmatism that allows productive puzzle-solving to take place; normal scientists do not constantly question the basis of the science in which they work (Kuhn, 1996, p. 164).

As these brief remarks indicate, Kuhn is unclear on whether exemplars are correctly seen as applications of theories, i.e. specific puzzle-solutions, or theories themselves, i.e., puzzle-solving tools. puzzle-solving tools. The quotations above, for instance, suggest the former, but some functions Kuhn ascribes to exemplars—the definition of scientific terms and education with respect to symbolism, for example (Kuhn, 1996, pp. 188–191)—are better served by theories. Further, if exemplars are to help explain the appearance and disappearance of the consensus they generate in accordance with Kuhn's historical claims, then they are better seen as theories, since theory-change is the key feature of scientific revolutions. I return to this ambiguity and its relevance to the present project in Section 4.1.

Kuhn's account of science is much more complex than this, but more detail here is unnecessary. In Sections 4 and 5 I use exemplars to defend IBE against SO and TO. I now take a closer look at these objections.

3. The objections

3.1. The subjectivity objection

The subjectivity objection (SO) is this:

> **SO**: loveliness is too subjective to be a guide to inference. Conceivably, different groups of scientists may fail to converge on a single explanation when asked to select the loveliest from a given range of competitors; thus inference will be impossible.[3]

The charge is plausible, for at least two reasons. Firstly, despite what was said above, 'loveliness' has connotations of aesthetic preference, and good inductive inference is not a matter of taste. Secondly, it is notoriously difficult to determine what the explanatory virtues are and how they are weighted in cases of conflict. Thus SO identifies a deep-seated worry about IBE: I find one explanation loveliest, you favour another, and we may never reach agreement.

Defending IBE, one might appeal to its descriptive merits. For example, inductive inference can be audience-relative: parties who evaluate evidence differently or have different background beliefs may legitimately make different inferences about the same evidence. Loveliness' flexibility allows IBE to accommodate this (Lipton, 2004, p. 143). That is right, but SO worries about subjectivity, which audience-relativity does not exhaust. The allegation is

[3] Lipton (2004, p. 70) calls SO 'Hungerford's objection', after Margaret Wolfe Hungerford, whose novel *Molly Bawn* (1878) contains the line 'beauty is in the eye of the beholder'. I reject his terminology since the reference to beauty is misleading.

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