

## 1. Background: Induction's Failures

### 1.1. Why accept IBE as a rule of inference?

An *ideal* account of induction would have the following features:

- (a) It could be specified as a set of precise *rules* of reasoning;
- (b) It would be *rationally compelling*, i.e. violating these rules would *entail* that someone is irrational;
- (c) It would be *objective*, in the sense of being independent of historical/psychological context in which the data appear; and
- (d) It would be *ampliative*, in the sense of having conclusions that introduce information not contained in the premises.

We should distinguish between two kinds of inductive inferences:

- *Horizontal* inferences invoke only observable properties in both their premises and conclusions. This is what van Fraassen (BvF) means by 'extrapolation' or the 'narrow sense' of induction.
  - Ex. All observed Fs are Gs. So (probably) all Fs are Gs.
  - Ex. Slightly fancier version:  $m/n$  of observed Fs are Gs. So  $\Pr(G | F) \approx m/n$ .
- *Vertical* inferences invoke some observable properties in their premises, but can also refer to unobservable properties in both their premises and conclusions.
  - Ex. IBE:  $e, h$  best explains  $e$ . So (probably)  $h$ .

The empiricists of the Scientific Revolution (Bacon, Newton) aspired to reason in accordance with horizontal rules of induction; no vertical rules were allowed.

If only horizontal inferences satisfied (a)-(d), then we would only need observations, and would not need more "speculative" or "theoretical" concepts, such as the "laws, necessities, [and heavy-duty notions of] universals" that characterize vertical inferences. If vertical inferences also satisfy (a)-(d), then these theoretical concepts are respectable.

IBE becomes plausible precisely because the Ideal form of Horizontal induction (IH) appears unattainable.

### 1.2. Why is IH unattainable?

#### 1.2.1. The initial problem: the alien die

Suppose that there is a six-sided alien die that has been tossed one time and comes up "ace." It will be tossed 999 more times.

AD1. If any (simple) version of IH is true, then the fact that all observed tosses (=1 toss) of the alien die have been aces makes it reasonable to believe that all tosses of the alien die will be aces.

AD2. That one toss of the alien die came up aces does not make it reasonable to believe that all tosses of the alien die will be aces.

AD3.  $\therefore$  No simple version of IH is true. (AD1, AD2)

#### 1.2.2. Complexity doesn't help

AD1 is the source of the problem: we must have more complex versions of IH. The added complications are twofold:

(i) *A principled starting point*: An exact prescription of what beliefs or degrees of belief a person should have at the outset, and

(ii) *An auxiliary rule* about how beliefs should be revised with each new observation.

This raises a *second problem*: There are many potential auxiliary rules that provide very different ways of extrapolating from the data. So choosing any *one* of these auxiliary rules will be *arbitrary*.

*Possible solution*: Be as neutral as possible, e.g. by finding the common core of all of these auxiliary rules. This raises a *third problem*: then your rule will be relatively *uninformative*.

*Another possible solution*: Try to strike the right balance between non-arbitrariness and informativeness.

This raises a *fourth problem*: there are many different ways to think of the 'right balance' here. So choosing any *one* of them will be *arbitrary*...

## 2. Van Fraassen's Objections to IBE

While IH cannot satisfy criteria (a)-(d) above, some hold that IBE—a kind of vertical inference—can.

### 2.1. *The Bad Lot Argument*

- BL1. If IBE is rationally compelling, then it is always rational to assume that we have considered at least one true explanation.
- BL2. It is not always rational to assume that we have considered at least one true explanation.
- BL3. ∴ IBE is not rationally compelling. (BL1, BL2)
- BL4. If IBE satisfies the ideal of induction, then it is rationally compelling, i.e. not inferring the best explanation entails that someone is irrational. (From criterion (b) in §1.1 above.)
- BL4. ∴ IBE does not satisfy the ideal of induction. (BL3, BL4)<sup>1</sup>
- BvF then considers three possible reactions to the Bad Lot Argument.

### 2.2. *Reaction 1: Privilege*

- P1. We are naturally disposed to consider at least one true explanation.
- P2. If we are naturally disposed to consider at least one true explanation, then it is always rational to assume that we have considered at least one true explanation.
- ~BL2. ∴ It is always rational to assume that we have considered at least one true explanation. (P1, P2)

#### 2.2.1. *The Evolutionary Argument for P1*

- E1. Had we not been naturally disposed to consider at least one true explanation, our species would be extinct.
- E2. Our species is not extinct.
- P1. ∴ We are naturally disposed to consider at least one true explanation. (E1, E2)
- BvF: *E1* is false. Our theories/explanations are not likely to be true just because we thought of them and we have survived. Lots of species without *any* capacity to consider explanations have survived.

#### 2.2.2. *The Theistic/Rationalist for P1*

- TR1. If we are made in God's image, then we cannot be dreadfully awful in our epistemic tasks.
- TR2. If we are not dreadfully awful in our epistemic tasks, then we are naturally disposed to consider at least one true explanation.
- TR3. We are made in God's image.
- P1. ∴ We are naturally disposed to consider at least one true explanation. (TR1-TR3)
- BvF: We don't know which of our epistemic tasks are important ones for God. Perhaps they are restricted to things needed to lead a virtuous life, but don't pertain to science, skepticism, etc.

### 2.3. *Force Majeure<sup>2</sup>*

- FM1. Scientists must choose from among the available explanations, even if none of them are true.
- FM2. If scientists must choose from among the available explanations, even if none of them are true, then IBE is rationally compelling, even if it is not always rational to assume that we have considered at least one true explanation.
- ~BL1. ∴ IBE is rationally compelling, even if it is not always rational to assume that we have considered at least one true explanation. (FM1, FM2)
- BvF: The argument works only if we equivocate on the meaning of "rational compulsion." In particular, rules of inference are supposed to tell us what it is rational to *believe*. However, the argument only concerns what it is rational to *choose*. Rational choices ≠ rational beliefs (James' example of the crevasse jumper.)

### 2.4. *Retrenchment*

IBE is a misnomer: we do not infer that our best available explanations are true; only that explanatory considerations make them more probable than any other *empirically unrefuted* alternatives (*including ones we have not considered*).

Here are some alternative ways of expressing the same idea:

<sup>1</sup> We're concerned primarily with the argument for BL3. However, BvF is out for BL5.

<sup>2</sup> This literally means "greater force." In other contexts, such as this one, it means "irresistible force."

- All else being equal, if  $b+$  is the best explanation of  $e$ ,  $b-$  is an inferior explanation of  $e$ , and  $e$  is the total evidence available, then  $e$  makes  $b+$  more probable than  $b-$ .
- If both  $b+$  and  $b-$  fit all the empirical evidence, then the further "super-empirical" features that make for the best explanation (simplicity, power, etc.) can make  $b+$  more probable.

BvF: The set of explanations of  $e$  is very large, and  $b+$  is a random member sampled from it. So it's very unlikely to be true.

#### 2.4.1. Critique of Simplicity

Suppose that  $b+$  is a simpler (and hence better) explanation of  $e$  than  $b-$ .

S1. Either:

- $b+$  is *objectively* simpler than  $b-$  because it represents an objective structure in the world that is simpler than the corresponding structure in  $b-$ ; or
- $b+$  is *subjectively* simpler for us (to understand, use, etc.) than  $b-$ .

S2. If  $b+$  is objectively simpler than  $b-$ , then there will be empirical evidence about the differences between the respective structures they (purport to) represent.

S3. If there is empirical evidence about the differences between the respective structures that  $b+$  and  $b-$  (purport to) represent, then empirical considerations (rather than simplicity) are doing the inferential work.

S4. If  $b+$  is *subjectively* simpler than  $b-$ , then simplicity has nothing to do with  $b+$ 's probability.

S5.  $\therefore$  Either empirical considerations (rather than simplicity) are doing the inferential work, or simplicity has nothing to do with probability (S1-S4)

S6. If empirical considerations (rather than simplicity) are doing the inferential work, or if simplicity has nothing to do with probability, then simplicity is inferentially idle.

S7.  $\therefore$  Simplicity is inferentially idle. (S5, S6)

BvF suggests that similar arguments can be run for other explanatory considerations.