The Evidential Impact of Explanatory Considerations
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A. Roche-Sober Critique

1. Screening-Off Thesis (SOT): Let H be some hypothesis, O be some observation, and E be the proposition that H would explain O if H and O were true. Then O screens-off E from H: $Pr(H|O\&E) = Pr(H|O)$.

2. SOT is true *iff* "explanatoriness is evidentially irrelevant" (IRRELEVANCE).

3. (C) So, "explanatoriness is evidentially irrelevant."

B. M&P Reply to Premise 2 – IRRELEVANCE is False

IRRELEVANCE is false because explanatory considerations can increase the resilience of a probability function (i.e. less likely to change in light of new evidence)

IRRELEVANCE is false example: X-sphere

> Two subjects, Tom and Sally. Both know that there are 1,000 "x-spheres" in an opaque urn. They observe the same random drawing with replacement of 10 x-spheres. 5 red and 5 blue x-spheres are drawn. Sally and Tom have the same updated credences after the first 10 drawings, Pr(next x-sphere is blue) = 0.5.

> Sally and *not* Tom has an explanation for why the drawings came out as they did. "Sally knows that blue and red x-spheres must be stored in exactly equal numbers because the atomic structure of x-spheres is such that if there are more (or less) blue x-spheres than red, the atoms of all of the x-spheres will spontaneously decay resulting in an enormous explosion."

> Given Sally's explanation, her credence is more resilient to future misleading information.

> For example, given an improbable run of 10 blue x-spheres, Tom's credence would change accordingly in response to this misleading information, but Sally's wouldn't.

R&S reply:

> **(a)** Here are 4 features of the x-sphere example:
> (i.) Sally and Tom have a credence of 0.5 in proposition H.
> (ii.) Sally's credence is more resilient

(iii.) Sally but not Tom knows that if blue and red x-spheres are stored in unequal numbers, then there will be an enormous explosion, and
(iv.) Sally but not Tom has an explanation of why the probability of the blue x-sphere on a random drawing from the urn is 0.5.

(ii.) is true. (iii.) makes (ii.) true, not (iv.). (iv.) is screened off by (iii.)

(b) Explanatoriness might be evidentially relevant if the explanation indicates some fact I, which specifies a probabilistic relation between H and E. (for example, I = H → E)

But in Bayesian confirmation theory agents are logically omniscient, so they already know facts like I. So these agents don't need an explanation to indicate I. "Explanatoriness has no confirmational significance, one purely logical and mathematical facts are taken into account."

Comment 1: Fine, but there aren't actually logically omniscient scientists. So, insofar, as IBE is merely a descriptive enterprise, it seems plausible to suggest that facts like I might be part of an actual explanation in real science. In which case, explanation would be evidentially relevant in real science.

M&P reply:

(a) (iii.) just is (iv.) You might think they are distinct, but it must be argued for, which R&S don't do. On a causal account of explanation they are not distinct – knowledge of the causal relations (which Sally has) is necessary and sufficient for having an explanation.

Comment 2: Drawing a distinction between (iii.) and (iv.) must be argued for as M&P suggest. But M&P only plausibly establish that (iii.) and (iv.) are the same in some cases (on the causal account and maybe within mathematics?). If we are pluralists about explanation and admit multiple forms under the IBE slogan, it would seem that R&S have succeeded at limiting at least some of the types of explanations that IBE should allow to be evidentially relevant. Namely, those where having an explanation just is knowing logical or probabilistic relations.

(b) This response simply assumes that explanatory considerations are entirely separate from probabilistic relations between hypothesis and evidence. But as the x-sphere case shows, knowing explanatory facts amounts to knowing some probabilistic relations between hypothesis and evidence In some cases, knowing I is equivalent to knowledge of explanatory considerations. So the logically omniscient agent is already taking into account explanatory considerations, at least in some cases.

What counts as "logical and mathematical" facts? Depending on how you conceive of this, they may just encompass the explanatory facts. So, explanatoriness seems evidentially irrelevant, but that's just because they have already been taken into account

C. M&P Reply to Premise 1 – SOT is false in some cases.

There are some cases where Pr(H|O&E) > Pr(H|O). M&P mention the Newtonian explanation of planetary orbits, and the general relativistic explanation of the precession of the perihelion of Mercury.

Comment 3: I am a bit skeptical that IBE is doing much work here.

R&S reply:

Suppose you know that H → O, so you realize that Pr(O|H)=1.
You then find the value of Pr(H|O) by obtaining Pr(H) and Pr(O).
It follows then (assuming 0 < Pr(H),Pr(O) < 1) that Pr(H|O) > Pr(H).
Then you learn that O obtains, and so increase your credence in H.
Later on you learn E, you shouldn't increase your credence in H again, as M&P suggest.

In other words, all of the evidential work is being done by logical and mathematical truths.

M&P reply:

R&S are again assuming that knowing that H → O isn't explanatory knowledge. However, it is plausible that knowing H → O is the same as having an explanation of O when H is true.

For R&S, explanation must be something over and above knowing logical and probabilistic relations. Some cases may require more of an explanation, but not all. *Example*: Explanations in pure mathematics plausibly consist entirely of information concerning logical and probabilistic relations.

Comment 4: The case of mathematics seems substantially different than cases in natural science, which is taken to be the traditional domain of IBE. I am not sure this is a very strong defense then. I wouldn't want to say that IBE still works, but only in cases of mathematical explanation, since IBE isn't traditionally taken to be relevant there. Going just this route would clearly demonstrate the success of the R&S critique, I think.

M&P agree that it would be a mistake to increase credence in H after learning E. But that is just because E has already been taken into account when you include your knowledge of Pr(O|H).

" The crucial question then is whether explanatory facts are, at least at times, indicative of facts about full or partial entailment. If E is so indicative, then the screening-off test is not a good test for confirmation relevance."

"On our view R&S's screening-off test amounts to a prohibition against counting the same facts twice. While good methodological advice, it does nothing to show that explanatoriness is evidentially irrelevant."

Comment: My Takeaway: Supposing M&P are correct that there are some explanations which simply indicate logical or probabilistic relations (which my intuition tells me is plausible) – those explanations do play an evidential role (in conflict with the R&S critique). So M&P are correct in their general response. However, they have weakened IBE insofar as it now admits only a subset of explanations which were allowable before the R&S critique (if you're a pluralist). One problem is that IBE is nebulous, and the R&S critique has succeeded in that it has forced more clarity, where there was very little before. The most important thing to be established now if one wants to pursue IBE, I think, is what exactly are the types of explanation that simply indicate these logical/probabilistic relations. Until we do that, we merely trade intuitions about explanation, which is hardly completed philosophy, and we have no clear limits on where IBE applies. Of course, having done this, we reduce IBE to a husk of what it could have maybe been.