

EMU defended: reply to Newman (2014)

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Abstract In his “EMU and Inference,” Mark Newman *European Journal for Philosophy of Science*, 4(1):55–74, 2014 provides several interesting challenges to my explanatory model of understanding (EMU, Khalifa *Philosophy of science*, 79(1):15–37, 2012). I offer three replies to Newman’s paper. First, Newman incorrectly attributes to EMU an overly restrictive view about the role of abilities in understanding. Second, his main argument against EMU rests on this incorrect attribution, and would still face difficulties even if this attribution were correct. Third, contrary to his stated ambitions, his own, inferential model of understanding (IMU) does not have any distinctive advantages over EMU. These three points defend EMU against Newman’s objections.

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In my “Inaugurating Understanding or Repackaging Explanation?” (Khalifa 2012),¹ I challenged recent philosophical theorists of scientific understanding to show that their work was not redundant given more venerable ideas about explanation. In particular, I offered the following explanatory model of understanding as a foil to these theorists:

(EMU) Any philosophically relevant ideas about scientific understanding can be captured by philosophical ideas about the epistemology of scientific explanation without loss.

In his “EMU and Inference,” Mark Newman (2014) provides several interesting challenges to EMU. I shall comment on three aspects of Newman’s paper. First, Newman incorrectly attributes to EMU an overly restrictive view about the role of abilities in understanding. Second, his main argument against EMU rests on this incorrect attribution, and would still face difficulties even if this attribution were

¹Hereafter, I refer to this piece as “Inaugurating Understanding.”

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correct. Third, contrary to his stated ambitions, his own, inferential model of understanding (IMU) does not have any distinctive advantages over EMU. These three points defend EMU against Newman's objections.

1 Propositionalism and logical chauvinism

First, Newman (2014, 55) claims that EMU has two untoward consequences:

Propositionalism: “all understanding-relevant explanatory knowledge is propositional in nature,” and

Logical Chauvinism: “the abilities we use to generate understanding are merely our logical reasoning skills.”

Given how EMU is defined, I am only committed to propositionalism and logical chauvinism if these are consequences of the epistemology of scientific explanation. As a first pass, we might think that EMU's prescribed epistemology amounts to the following:

S understands why *p* if and only if there is some *q* such that *S* knows that *q* explains *p*.

This certainly suggests that EMU entails propositionalism. In particular, it appears that the only understanding-relevant knowledge is propositional knowledge that *q* explains *p*. In “Inaugurating Understanding,” I further unpacked this:

Understanding amounts to (a) knowing that the explanans is true, (b) knowing that the explanandum is true, and (c) for some *l*, knowing that *l* is the correct explanatory link between the explanans and the explanandum (Khalifa 2012, 26).

In line with propositionalism, each of these items (a–c) involves propositional knowledge. I will defend this view in the next section.

What then of logical chauvinism? Admittedly, it would be easy to read “Inaugurating Understanding” as denying any prominent role for abilities in understanding. If this were my view, then even logical chauvinism would overstate the role that I accord to understanding-relevant abilities. However, this is *not* my view, for I *only* argued that *de Regt* (2009) provides no reason to countenance skills or abilities over and above the account of understanding I presented above:

...I am agnostic about whether the alternative sketched by a–c provides an accurate account of understanding. Rather, it suffices for my purposes that *de Regt* provides no reason to think that we would lose anything by adopting it (Khalifa 2012, 27).

Thus, I take a–c to be nothing more than a foil to *de Regt*'s view, but not the final word on understanding.

Furthermore, the only textual evidence I can find that remotely suggests that I endorsed logical chauvinism is in my discussion of de Regt's discussion of Hempel. There I wrote:

...even if we granted every bit of de Regt's ... argument ... the big upshot is that understanding a DN explanation requires deductive-reasoning skills. But do we really need a theory of understanding to tell us *that?* (Khalifa 2012, 27).

For this to saddle me with logical chauvinism, I would need to endorse both de Regt's account of understanding and the view that all explanations are deductive-nomological. However, as Newman readily acknowledges elsewhere in his essay, it is clear that I endorse neither.

Having clarified exegetical issues surrounding "Inaugurating Understanding," let me now turn to larger conceptual questions. First, does EMU allow *any* skills/abilities (deductive or otherwise) to figure prominently in understanding? Yes. Indeed, while it did not figure in my original article, I am congenial to what Pritchard (2012, 248) calls the "ability intuition," i.e., the idea that "knowledge requires cognitive ability, in the sense that when one knows one's cognitive success should be the product of one's cognitive ability." For instance, perceptual knowledge is the product of perceptual abilities; inferential knowledge, the product of inferential abilities; memorial knowledge, the product of memory; etc. Additionally, it seems that these abilities should be reliable in some sense.

What does this mean for understanding? As I see it, EMU suggests the following thesis about abilities:

(EMU_A) The abilities involved in understanding why *p* are nothing over and above the reliable cognitive abilities involved in knowing a correct explanation of *p*.

Note that EMU_A allows for a healthy ecumenicalism about "explanatory abilities." For example, our "explanatory abilities" are reliable only if they allow us to discriminate between correct and incorrect explanations, but different abilities might realize these discriminations in different contexts, depending on the phenomenon to be explained, relevant methods, etc.

For instance, in some situations, the design and execution of controlled experiments—as well as the interpretation of the results thereof—allow us to discriminate between good and bad explanations. In other situations, we might take our cue from theorists of Inference to the Best Explanation (Harman 1965, 1986; Lipton 2004; Lycan 1988, 2002; Thagard 1978, 1992), i.e., we discriminate between explanations based on the degree to which they optimize various theoretical virtues (simplicity, scope, accuracy, etc.) that are predicated of our larger system of beliefs.²

In principle, if not in practice, these two ways of evaluating explanations need not involve the same cognitive abilities. Furthermore, EMU_A need not entail that understanding-relevant abilities are always of the first, "experiment-mongering" variety or always of the second, "virtue-mongering" variety. Indeed, even if this were a false

² Note that in either case, many of the relevant abilities seem to be non-deductive in nature, *pace* logical chauvinism.

dilemma, EMU_A would be unthreatened. Suppose that in different contexts, different clusters of these and other abilities are involved in explanatory knowledge. Then the result is a pluralistic epistemology of explanation. EMU and EMU_A provide clear advice in this case: we should adopt a correspondingly pluralistic account of understanding.³

More to the point, whether the epistemology of explanation involves experiment- or virtue-mongering abilities, is monistic or pluralistic, etc. need not be settled by appeal to an antecedent account of understanding. Extensive triangulation between epistemological theories and a comprehensive inventory of scientific explanations would suffice. Echoing the themes of “Inaugurating Understanding,” I suggest that the burden of proof is on friends of understanding to show why we need to add understanding into our stable of heavy-lifting philosophical concepts.

Thus, all told, I have argued that EMU can be decoupled from logical chauvinism. However, the challenge of logical chauvinism suggests a broader question about whether EMU can accord *any* cognitive abilities a role in understanding. In response to this broader challenge, I have appealed to Pritchard’s “ability intuition,” and, from this, sketched an EMU-friendly approach to abilities (EMU_A).

2 Propositionalism defended

While I have offered my defense against charges of logical chauvinism, propositionalism’s defensibility is still an open question. Newman contrasts two cases to show that differences in understanding do not supervene on differences in propositional knowledge. After presenting these cases, I shall argue that EMU can correctly adjudicate between them.

- Case (i): *Semantic Ability*. Through rote memorization, a person knows that *the difference in air pressure on the top and bottom of an airplane’s wing explains why it can fly*. However, if asked “how a related object, like a hang-glider or a helicopter, stays aloft, she just stares back... with a blank expression.” Newman claims, “She does not understand the explanation in any explanatorily-relevant way, she merely knows it” (Newman 2014, 61).
- Case (ii): *Comprehension Ability*. The person has semantic ability, plus “an idea of how it can be that q entails p,” which includes the ability to “distinguish the properties of objects in the explanation which are responsible for the explanatory connections, or links in the story” (Newman 2014, 61). Unlike a person with mere semantic ability, this allows the person to “see” how hang-gliders and helicopters fly. Newman (2014, 63) draws the following lesson from these cases:

These cases reflect ... distinct, though overlapping levels of cognitive skills. Since EMU permits only propositional knowledge for understanding p (knowledge-that) it must fail to capture case (ii), which requires knowledge-

³ Indeed, in “Inaugurating Understanding,” I favored a pluralistic approach to explanation, so I lean towards a corresponding pluralism about its attendant epistemology. However, for the argument at hand, all that is needed is EMU_A .

how. Khalifa claims EMU does capture case (ii) by appeal to S's inferential ability but that cannot be correct because making inferences is not just having more propositional knowledge; it requires our doing something. It requires we infer how-p. This is knowledge-how, not knowledge that.

First an important clarification: I do not claim that EMU captures case (ii) “by appeal to S's inferential ability.” I claim that EMU captures case (ii) by appealing to S's larger stock of explanatory knowledge. Specifically, unlike the semantically-able person in case (i), the comprehension-able person in case (ii) knows not only that *the difference in air pressure on the top and bottom of an airplane's wing explains why it can fly*, but also that *the difference in air pressure on the top and bottom of a hang-glider's wing explains why it can fly*. As I wrote in “Inaugurating Understanding”:

[S]o long as these new applications just amount to new explanations, proponents of EMU can claim that this is a difference in degree, not kind: the more that one can explain, the more one understands (Khalifa 2012, 26–27).

Now, admittedly, there would still seem to be a difference in kind between a semantically able person who can explain as much as a comprehension-able person. However, EMU has two ways to capture this difference.

First, I am skeptical that their propositional knowledge is identical. Specifically, recall that I characterized EMU as entailing that *S* understands only if, for some *l*, the understander knows that *l* is the correct explanatory link between the explanans and the explanandum. Semantically- and comprehension-able people may well have different propositional knowledge of this explanatory link. In particular, Newman characterizes this as differences in their ability to “distinguish the properties of objects in the explanation which are responsible for the explanatory connections, or links in the story.” However, I see no reason to differentiate between the ability to distinguish “the properties of objects” that are “responsible” for the links and a deeper, more detailed description of those links that includes information about these properties and their relationships to these links.⁴ Since deeper, more detailed explanations are (*ceteris paribus*) better, I take this to be a natural way of accounting for the greater understanding of comprehension-able persons entirely in terms of propositional knowledge.

Second, even if one chafes at this suggestion, recall that propositionalism is compatible with a robust role for cognitive abilities. Specifically, the ability intuition suggests that differences in propositional knowledge can track with differences in ability. Is this a large concession to Newman? Only if it required something beyond the “explanatory abilities” permitted by EMU_A. However, as Newman has presented the two cases, the differences in semantic and comprehension abilities seem to amount to the ability to identify the invariant causes of winged flight, and invariance has been widely heralded as a feature of good explanations (e.g., Woodward 2003), and can also

⁴ More precisely, let l_1 be a schematic description of an explanatory link and let l_2 be l_1 plus a description of how certain properties F_1, \dots, F_n produce (“are responsible for”) l_1 . Then we simply plug in l_2 into my condition *c* above: *S*'s understanding is a result of knowing that l_2 is the correct explanatory link between the explanans and the explanandum.

be gleaned from certain accounts of simplicity and scope. So, just as EMU prescribes, we would lose nothing by simply appealing to that literature.

So, to take stock, Newman alleged that EMU could furnish only semantic ability but not comprehension ability; I demur. Specifically, I have argued that these two abilities can track with differences in propositional knowledge, and that propositional knowledge, in turn, is compatible with the possession of cognitive abilities that could account for the difference between semantic and comprehension ability.

3 EMU versus IMU

With this, Newman's objections to EMU have been addressed. However, Newman offers his own inferential model of understanding (IMU) as an alternative to EMU, and a natural question is whether IMU offers any philosophical insights that can't be captured by the epistemology of explanation. Skipping over many interesting details of Newman's account, the crux of IMU is this:

(K): Knowledge of an explanation is the activation of ordinary rules in a cognitive hierarchy that correctly represent the explanation's propositional content.

(U): Understanding an explanation is achieved when those activated ordinary rules are coupled by the correct inference rules.⁵

Newman claims that IMU has four advantages over EMU. I shall argue that EMU is no worse than IMU on any of these fronts. First, Newman (2014, 72) claims that IMU provides a better account of the phenomenology of understanding:

Like EMU, the inferential model also asserts that if you have a correct explanation of *p* then you understand *p* regardless of how you feel about it, yet the inferential model goes further by explaining how you can come to obtain that feeling in the first place. EMU has no explanation for how that feeling arose, whereas the inferential model isolates its origination in the activation of an incorrect inference rule.

I'm skeptical that recovering the phenomenology of understanding ought to be a desideratum in the first place. In many other philosophical contexts, we are content to let the phenomenology fall where it may. This seems especially true in philosophy of science. For instance, phenomenological considerations appear to play no role in philosophical discussions of confirmation, causation, reduction, etc.

However, even if phenomenology were a desideratum on understanding, EMU can be extended to account for "aha" moments—namely, as cases in which a person believes that he has explanatory knowledge.⁶ Where there is no second-order belief of this kind, one has no "aha" feeling. Where this second-order belief is true, the "aha" feeling tracks with genuine understanding. Where this "aha" feeling misleads, a person *falsely*

⁵ Since many of the details of this view will not bear on what follows, I refer readers to Newman's work for further details.

⁶ Note that the person must have two beliefs: (1) the belief that *q* explains *p*; and (2) the belief that *I know that q explains p*. The second is the source of the "aha" feeling.

believes that he has explanatory knowledge. Note that this might mean either that he falsely believes an incorrect explanation to be correct, or that he is unwarranted in believing in a particular explanation. The latter, I assume, will sometimes track with misused inference rules, so it can replicate IMU's explanation of this same phenomenon.

Second, Newman (2014, 72) claims that IMU provides a constitutive account of understanding:

Where EMU claimed to have answered de Regt's call for a 'constitutive' account of understanding, we now see it clearly just rejects the request. The inferential model on the other hand embraces the problem and locates the constitutive components as being the generation of and relations between ordinary and inferential rules in our cognitive architecture.

I happily grant that I reject certain requests for a 'constitutive' account of understanding. As I wrote:

EMU unpacks many of the slogans that might prompt one to think understanding requires further explication, albeit in a deflationary manner (Khalifa 2012, 20).

By definition, deflationists about X reject requests for substantive accounts of X. So, if Newman takes 'substantive' and 'constitutive' to be synonyms, then it should be clear that to cite this as a benefit clearly begs certain questions. Indeed, since Newman has not shown that the request for a constitutive account of understanding is worth honoring, I do not see how this can count as a benefit for IMU. On the other hand, Newman may mean something slightly different by a 'constitutive' account of understanding; namely an answer to the question, "In virtue of what does one understand?" On this construal, EMU does provide a constitutive account, namely by claiming that we understand in virtue of having broad and detailed knowledge about an explanation.

Third, Newman (2014, 72) argues that IMU provides a better account of the role of abilities in understanding:

...the third nagging problem for understanding theorists which EMU apparently took care of was the temptation toward the 'ability thesis'. Khalifa claims EMU swallows this thesis whole... But as we have seen there is more to be said about inference than Khalifa recognizes. Specifically it is the difference between cases (i) and (ii).

We have already seen that the differences between these two cases did not endanger EMU, thus only Newman (2014, 72–73) fourth and most interesting "benefit" remains:

The inferential model can explain the relation between the many different types of explanations and scientific understanding. That is, we see a number of different models of explanation (Deductive-Nomological, causal, unifying, etc.), but EMU cannot address why it is that each is correct for some cases, if not for all. The Inferential Model explains the understanding we get for each type of case in terms of the coupling of cognitive rules.

This passage equivocates on the benefit that Newman is claiming for IMU. On the one hand, Newman seeks to “explain the relation between the many different types of explanations and scientific understanding;” on the other, why each model of explanation “is correct for some cases.” To put this more perspicuously, this passage suggests at least two explananda:

- (Q1) Despite their heterogeneity, why are deductive-nomological arguments, causes, unifying argument patterns, etc. all explanatory?
 (Q2) (a) Why are DN explanations are correct for some cases? (b) Why are causal explanations correct in other cases? (c)...

I shall argue that insofar as IMU provides an answer to Q1, so does EMU. As far as I can tell, IMU does not answer Q2 at all, so IMU should not claim it as a benefit.

Regarding Q1, IMU suggests that arguments, causes, patterns, etc. are unified in their role in coupling descriptive information with inference rules—what IMU defines as understanding. How could EMU answer Q1? While I did not seek to answer this question in “Inaugurating Understanding,” such answers are available. In particular, any generalizations about explanations that can be drawn from the epistemology of explanation fall within EMU’s roost. I take it as uncontroversial that inferences involving explanations are part of the epistemology of explanation. So, if IMU answers Q1, then so does EMU. In more conciliatory terms, friends of IMU can be friends of EMU.

Turning now to Q2, let me express my doubts. In particular, it seems as if Newman’s answers to Q2 assume the following form:

- (a) In cases where DN explanations are correct, DN explanations reflect the coupling of inference rules about deductive-nomological structure; (b) In cases where causal explanations are correct, causal explanations reflect the coupling of inference rules about causal structure; (c)...

These “explanations” strike me as scarcely better than explanations of opium’s soporific qualities in terms of its dormitive virtues. For instance, consider Newman’s (2014, 73) discussion of causal explanation:

Causal explanations explain because they reflect the coupling of diachronic rules reflecting causal entailments established by the same mechanisms.

The fact that such rules must further “reflect causal entailments” seems to trivialize the sense in which IMU “explains” Q2.b, for this says little more than that causal explanations are correct insofar as they enable us to reason correctly about causes. But, to rehearse a pointed question from “Inaugurating Understanding,” do we really need a theory of understanding to tell us *that*?

Now perhaps Newman can still claim this benefit so long as explanations couple *any* kind of correct inference rule to descriptive information. However, this doesn’t answer Q2. For instance, a deductive-nomological argument from the length of the shadow to the height of the flagpole is sound, and can be coupled with a correct inference rule (e.g., about how to predict the height of objects from the length of their shadows and

the angle of the relevant light sources), but a DN explanation is not correct in this context.

Hence, I do not see IMU as having a distinctive advantage over EMU. However, in answering Newman’s interesting objections, I have highlighted certain features of EMU that downplay the differences between it and IMU (and perhaps other “constitutive” accounts of understanding.) Importantly, I have not had to make any bold conjectures to do so. Rather, the key assumptions in the arguments that I have made here—that propositional knowledge involves cognitive abilities (the ability intuition); that the cognitive abilities involved in explanatory evaluation are not merely logical; and that inferences involving explanations fall within the epistemology of explanation—have plausibility independently of EMU. I take this to be a good advertisement for how rich the philosophical resources in the explanation literature can be in answering many of the questions that the concept of understanding may raise.

These and other remarks may leave the impression that I find work on understanding to be without merit. This is not so. For instance, Newman’s inferential model can be seen as a friendly elaboration of EMU. Indeed, much of its merit strikes me as advancing a naturalized epistemology of explanation. However, if that’s a fair characterization, then we are simply fellow travelers, and Newman should find no difficulties with EMU.

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