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UNDERSTANDING AND THE FACTS?[1]

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Abstract:

If understanding is factive, the propositions that express an understanding are true. I argue that a factive conception of understanding is unduly restrictive. It neither reflects our practices in ascribing understanding nor does justice to contemporary science. For science uses idealizations and models that do not to mirror the facts. Strictly speaking, they are false. By appeal to exemplification, I devise a more generous, flexible conception of understanding that accommodates science, reflects our practices, and shows a sufficient but not slavish sensitivity to the facts.

That 'knowledge' is a factive term is uncontroversial. Regardless of the evidence or reasons that support a person's belief that *p*, she does not know that *p* unless '*p*' is true. Pat does not know that Phaedippas ran from Marathon to Athens unless 'Phaedippas ran from Marathon to Athens ' is true. Each separate bit of knowledge answers to the facts. Understanding, like knowledge, is a type of cognitive success. Perhaps it is a type of success that we enjoy only when our views about a topic are true. In that case 'understanding' is also factive. Pretty plainly, understanding somehow answers to facts. The question is how it does so. If 'understanding' is factive, all or most of the propositional commitments that comprise a genuine understanding of a topic are true. Many epistemologists believe this. But, I will argue, such a factive conception is too restrictive. It does not reflect our practices in ascribing understanding and it forces us to deny that contemporary science embodies an understanding of the phenomena it bears on.

This is too high a price to pay. I will propose a more generous, flexible conception of understanding that accommodates the deliverances of science, is reflective of our practices, and shows a sufficient, but not slavish, sensitivity to the facts it concerns.

We cannot ascertain whether 'understanding' is factive merely by inspecting ordinary usage, for the term 'understanding' is used in a variety of ways. Some are irrelevant to epistemology; others pull epistemology in different directions. 'I understand' can hedge an assertion or attenuate its force. 'I understand that you are angry with me' may be a mild overture that gives you space to politely demur. This is a moderating use. Or I might say 'I understand that you are angry with me' when I am not sure that you are angry, but have some reason to think so. Then, 'I understand' indicates a backing away from a full-fledged claim to epistemic entitlement. This is hedging. These are not the sorts of usages that interest me. I am concerned with cases in which understanding is a sort of cognitive success. So for the remainder of the paper, I shall use the term 'understanding' as cognitive success term. In such cases the understander has a claim to epistemic entitlement. The questions that concern me here are what is the bearer of that entitlement and what is the claim to it? I contend that a non-factive explication of 'understanding' yields a concept that better suits epistemology's purposes than a factive one does.

I do not dispute the existence of factive uses of the term 'understanding' any more than I dispute the existence of hedging or moderating uses. Nor do I deny that epistemology could incorporate a factive conception of understanding. My argument is that a factive conception cannot do justice to the cognitive contributions of science and that a more flexible conception can. Since science is one of humanity's greatest

cognitive achievements, epistemology ought to accommodate it. That is, epistemology ought to explain what makes good science cognitively good. The conception of understanding that I propose figures in an epistemology with the capacity to explain how good science embodies and conveys an understanding of the phenomena it concerns. Explication involves pruning and molding ordinary usage to craft a conception that suits our purposes. My argument is that for an epistemology that seeks to accommodate science, an explication that construes 'understanding' as nonfactive is more serviceable than one that construes it as factive.

The first order of business is to identify the unit of understanding – the primary bearer of understanding's epistemic entitlement. There are two obvious candidates: individual propositions and more comprehensive bodies of information. I can say, "I understand that Athens defeated Persia in the battle of Marathon". Or I can say, "I understand the Athenian victory over Persia in the battle of Marathon". If the unit of understanding is the proposition, then the difference between knowledge and understanding seems slight. If the proposition 'I understand that Athens defeated Persia in the battle of Marathon' is supposed to be a stand-alone proposition (and is not supposed to be a hedge), it is hard to see how it differs from 'I know that Athens defeated Persia in the battle of Marathon'. In that case, 'understanding' should be construed as factive, because 'knowledge' is factive. But if my understanding that Athens defeated Persia in the battle of Marathon depends in a suitable way on my overall understanding of such matters as the course of the battle, the strategies and tactics of the two armies, and the history of relations between Athens and Persia, the situation is different. The epistemological standing of 'Athens defeated Persia in the battle of Marathon' then

derives from its place in a more comprehensive understanding of the history of Greece. That is, the proposition derives its epistemological status from a suitably unified, integrated, coherent body of information. This is the core conception of understanding. It affords a basis for distinguishing between understanding and knowing particular truths. And it is the conception of understanding that is closely connected to explanation.[2] Whether it is factive is the question I want to address.

Understanding is primarily a cognitive relation to a fairly comprehensive, coherent body of information. The understanding encapsulated in individual propositions derives from an understanding of larger bodies of information that include those propositions. I understand that Athens defeated Persia in the battle of Marathon, because I grasp how the proposition stating that fact fits into, contributes to, and is justified by reference to a more comprehensive understanding that embeds it.

Obviously, not just any comprehensive, coherent set of cognitive commitments will do. A coherent body of predominantly false and unfounded beliefs does not constitute an understanding of the phenomena they purportedly bear on. So despite its coherence, astrology affords no understanding of the cosmic order. The issue that divides factivists and non-factivists is not whether understanding must answer to the facts, but how it must do so. Following Plato, let us call the required connection, whatever it may be, between a comprehensive, coherent body of information and the facts it bears on an understanding's tether. Even if astrology offers a comprehensive, internally coherent account of the cosmos, it yields no understanding because it lacks a suitable tether.

Sometimes we say things like "Joe understands astrology," or "Paul understands mythology" or "Bill understands rationalism", meaning only that the epistemic agent

knows his way around the field. He knows how its contentions hang together, and is adept at reasoning within the framework that they constitute. This sort of understanding neither has nor needs a tether to the facts. One can understand a theory in this sense regardless of the theory's fidelity or lack of fidelity to the facts. This sort of understanding is a genuine cognitive achievement, but not the one that concerns us here. I set it aside.

To understand the Athenian victory involves more than knowing the various truths that belong to a suitably tethered comprehensive, coherent account of the matter. The understander must also grasp how the various truths relate to each other and to other elements of the account. She should also be able (and perhaps be aware that she is able) to use that information – to reason with it, to apply it, perhaps to use it as a source of working hypotheses about related matters. Someone who knows geometry, for example, knows all the axioms, all the major theorems, and how to derive the major theorems from the axioms. You can acquire this knowledge simply by memorizing. But someone who understands geometry can reason geometrically about new problems, apply geometrical insights in different areas, assess the limits of geometrical reasoning for the task at hand, and so forth. Understanding something like the Athenian victory is not exactly like understanding geometry, since the applications and extensions are more tentative, the range to which insights can reasonably be applied is more restricted, the evidence for a successful application is empirical (and may be hard to come by), and so on. But in both cases understanding involves an adeptness in using the information one has, not merely an appreciation that things are so. Evidently, in addition to grasping connections, an understander needs an ability to use the information at his disposal.

Knowledge is factive in that one does not know that *p* unless '*p*' is true. Jonathan Kvanvig (2003) maintains that understanding is factive as well. But understanding concerns subject matters rather than individual propositions. So what it means to claim that understanding is factive is a bit harder to make out. Perhaps understanding is factive if it is impossible to understand a subject – say, the history of Athenian warfare – unless some identifiable, suitably inclusive proposition is true. That proposition might be the long conjunction of all the atomic propositions belonging to the coherent body of information that constitutes the understanding. (This parallels the interpretation of coherence theories of knowledge as requiring the truth of the conjunction of the atomic propositions in a coherent system of beliefs.) On such an account, understanding would be a sort of knowledge, namely the knowledge of long, subject-matter-connected, conjunctive propositions.

This proposal faces several problems. First, it does not accommodate the requirement that the understander grasp the relations among the atomic propositions – that the understander appreciate how they bear on one another. Although the body of information understood must be coherent, if the understander need only know the conjunction, there is no requirement that she grasp the coherence. Second, it does not accommodate the insight that the student who understands geometry can do more with it than the student who just knows all the axioms, the main theorems and their derivations. Third, it does not accommodate the fact that not all the propositions that comprise a genuine understanding of a subject need be true. We would be inclined to say that an historian understood the Athenian victory even if he harbored a few relatively minor false beliefs about the matter.

Kvanvig agrees. He does not believe that understanding a topic consists in believing a long conjunction. Nor does he insist that every proposition in the comprehensive body of information be true. Rather, he maintains, we cannot understand a topic unless most of the propositions and all of the central propositions that constitute our coherent take on that topic are true. He allows that a few peripheral falsehoods might degrade one's understanding of a topic, but not destroy it. That understanding is factive in this sense is the thesis I want to dispute.

Unlike knowledge, understanding admits of degrees. A freshman has some understanding of the Athenian victory, while her teaching fellow has a greater understanding and her professor of military history has an even greater understanding. Epistemology should explain what such differences in degree consist in. A factive account can easily recognize three dimensions along which understanding can vary: breadth, depth, and significance. The professor might have a broader understanding of the Athenian victory, being able to embed his coherent body of true beliefs into a more comprehensive understanding of Greek history. He might also have a deeper understanding. In that case, his web of belief is more tightly woven; it contains more propositions, and/or more non-trivial inferential connections between propositions. But on a factive account, both the student and the professor understand the Athenian victory insofar as they grasp coherent bodies of predominantly true propositions, and believe the propositions that belong to those bodies. The student and the professor might also weigh the facts differently. Even if each believes a given truth, and incorporates it into a coherent body of beliefs about the matter, the professor might consider it highly significant, while the student considers it just another truth about the battle. If the truth

really is significant – if, for example, it is central to explaining why the Athenian battle formation had strong flanks but a weak center – then the professor's better understanding consists in his appreciating the significance of the truth, not merely in his recognizing that it is a truth. Factive accounts then can accommodate some differences in degrees of understanding.

However, there is another dimension along which we can measure greater and lesser understanding that friends of factivity cannot take on board. For it involves conceding that some bodies of information, even though they are not true, nonetheless display a measure of understanding. The growth of understanding often involves a trajectory from beliefs that, although strictly false, are in the right general neighborhood to beliefs that are closer to the truth. The sequence may terminate in true beliefs. But even the earlier steps in the sequence should fall within the ambit of epistemology. For they are, to an extent – often to a considerable extent – cognitively valuable.

A second grader's understanding of human evolution might include as a central strand the proposition that human beings descended from apes. A more sophisticated understanding has it that human beings and the other great apes descended from a common hominid ancestor (who was not, strictly speaking, an ape). The child's opinion displays some grasp of evolution. It is clearly cognitively better than the belief that humans did not evolve. But it is not strictly true. Since it is central to her take on human evolution, factivists like Kvanvig must conclude that her take on human evolution does not qualify as understanding. In that case, epistemology need give no account of what makes the child's grasp of evolution cognitively good, or cognitively better than a view that takes humans to have evolved from butterflies. This may not seem like a major

objection since the child's opinion is fairly naïve. Perhaps it is not unreasonable to conclude that she does not understand. But the pattern exhibited in this case is endemic to scientific education. We typically begin with rough characterizations that properly orient us toward the phenomena, and then refine the characterizations as our understanding of the science advances. Think of the trajectory from naïve folk physics through Newtonian mechanics to relativity and quantum mechanics.

Kvanvig (2003, p. 201) believes that when we construe such a take on a subject as understanding, we use the term 'understanding' in an honorific sense, just as we use the term 'knowledge' in an honorific sense when we speak of 'the current state of scientific knowledge', while conceding that some of what belongs to the current state of scientific knowledge is false. Such honorific usages of epistemic terms are, he maintains, extended usages that fall outside the scope of epistemology. Only in an extended sense then does the child have any understanding of evolution.

Perhaps it would be feasible to dismiss such uses of 'understanding' as merely honorific if they applied only to young children or novice students of a subject. I tend to think otherwise, for I think epistemology should have something to say about what makes the views of the second grader who thinks humans evolved from apes better than the views of a second grader who thinks humans did not evolve or one who thinks that we evolved from butterflies. But the main problem with the contention that understanding is factive is that the pattern displayed by the student as she moves from the naïve view of human evolution up to the view held by the professor of evolutionary biology is the same pattern science displays in the sequence of theories it develops.

A central tenet of Copernicus's theory is the contention that the Earth travels

around the sun in a circular orbit. Kepler improved on Copernicus by contending that the Earth's orbit is not circular, but elliptical. Having abandoned the commitment to absolute space, current astronomers can no longer say that the Earth travels around the sun simpliciter, but must talk about how the Earth and the sun move relative to each other. Despite the fact that Copernicus's central claim was strictly false, the theory it belongs to constitutes a major advance in understanding over the Ptolemaic theory it replaced. Kepler's theory is a further advance in understanding, and the current theory is yet a further advance. The advances are clearly cognitive advances. With each step in the sequence, we understand the motion of the planets better than we did before. But no one claims that science has as yet arrived at the truth about the motion of the planets. Should we say that the use of the term 'understanding' that applies to such cases should be of no interest to epistemology?

One might follow Kvanvig and contend that the use of 'understanding' here is honorific. We apply the term in these cases only because we think that the advances that the scientists have made are on the way to the truth – the comprehensive, general account of celestial motion that gets it right. In effect, current science borrows its epistemic status from its descendants. Sellars (1963) argues that in a mature science, later theories should show why their predecessors were right to the extent that they were. So the later theories are supposed to at least partially vindicate their predecessors. Where this does not happen, we are apt to conclude that the earlier scientists didn't understand the phenomena that their theories purported to explain. We do not, for example, consider phlogiston theorists to have had any understanding of combustion.

Suppose we concede this point. Let us admit that in saying that the various

astronomical theories embody an understanding, we take out a lien on the future of science. Still, I would urge, the cognitive achievements embodied in such theories should be a central concern for epistemology. Even if we do not yet have (and may never get) the truth, we have made real cognitive progress. We understand the motions of celestial bodies better than our predecessors did. Epistemology should explain what makes current understanding better. If we say that the uses in question are honorific, epistemology should explain why certain attitudes toward certain topics are worthy of honor.

Another aspect of science is even more troublesome for the factive view – namely, science's penchant for idealization. Science streamlines and simplifies. It devises and deploys comparatively austere models that diverge from the phenomena it seeks to explain. The ideal gas law accounts for the behavior of gases by describing the behavior of a gas composed of dimensionless, spherical molecules that are not subject to friction and exhibit no intermolecular attraction. There is no such gas. Indeed, there could be no such gas. Nonetheless, scientists purport to understand the behavior of actual gases by reference to the ideal gas law.

Idealization is taken by scientists not to be an unfortunate expedient, but rather a powerful tool. There is no expectation that in the fullness of time idealizations will be eliminated from scientific theories. So the 'promissory note-ishness' that we saw in talk about the progress in our understanding of celestial motion is not in place here. Elimination of idealizations is not a desideratum. Nor is consigning them to the periphery of a theory. It is simply not the case that the bodies of information that constitute scientific understanding are, or that their ultimate successors can be expected

to be, composed of truths, with any residual falsehoods only occurring at the periphery. The ideal gas law lies at the core of statistical mechanics, and some such law is likely to lie at the core of any successor to current theories.

I concede that many of the propositions that fall within the scope of 'the current state of scientific knowledge' are not strictly *knowledge* because they are not true. In ordinary usage we withdraw a claim to know a proposition if we discover that the proposition is false. So it is reasonable to construe 'knowledge' as factive. If we are being scrupulous, we should probably not speak of the current state of scientific *knowledge* unless we are convinced that the propositions we are speaking of are true. But the contention that 'understanding' is factive does not have the same strong support from ordinary language. Since 'understanding' applies to large, often somewhat inchoate bodies of information, it takes a direct object that is not a proposition. Pat understands the Athenian victory, Joe understands the motions of the planets, Ralph understands the Federal Reserve System. And we typically acknowledge that people can have a measure of understanding even if the contentions making up the bodies of information they endorse diverge somewhat from the truth. So our ordinary use of 'understanding' as applied to bodies of information does not supply a strong argument for a factive analysis. There is, however, a recognition that 'understanding' is a cognitive success term. If I am going to reject the factive analysis, I need some way to identify or characterize that cognitive success.

As a very crude first approximation, I suggest that understanding is a grasp of a comprehensive body of information that is grounded in fact, is duly responsive to evidence, and enables non-trivial inference, argument, and perhaps action regarding that

subject the information pertains to. Obviously this is hideously rough. Some of the roughness is inevitable, if understanding must comprehend everything from the second grader's very shallow take on evolution to the mature scientist's broad, deep, textured grasp of the subject. But some of the roughness can be smoothed out with a bit more work.

Let us start by looking at scientific idealizations. These are both central and ineliminable. We understand the behavior of actual gases by reference to the alleged behavior of a so-called ideal gas. There is no such gas. So how can it figure in our understanding of the world? I suggest that effective idealizations are felicitous falsehoods (Elgin 2004). Nothing in the world exactly answers to them, so as descriptions, they are false. But they are felicitous in that they afford epistemic access to matters of fact that are otherwise difficult or impossible to discern. Idealizations are fictions expressly designed to highlight subtle or obscure matters of fact. They do so by exemplifying features they share with the facts.

To make this out requires saying a bit about exemplification. Consider a pedestrian example. Commercial paint companies supply sample cards that exemplify the colors of paints they sell. The cards contain instances of those colors, and refer to the colors they instantiate. Such cards have a motley array of other properties as well. They consist of sequences of colored rectangles, usually with a name or number associated with each color. They are a few inches long, and perhaps an inch and a half wide. They make good bookmarks and poor doorstops. They were manufactured somewhere, on some particular date, and were shipped via some means. They are a certain distance from the Eiffel Tower. Most of the properties of the cards are utterly irrelevant to their

function. Some nonfunctional elements facilitate but do not figure in the cards' function. None of these properties is exemplified. To exemplify a property, an exemplar must both instantiate and refer to it. (Goodman, 1968, Elgin, 1996). The function of the cards, in their standard use, is to display and hence afford epistemic access to paint colors. By at once instantiating and making reference to the colors, the cards perform their function. They exemplify their colors.

Other samples and examples function in the same way. A water sample drawn by the EPA exemplifies its impurities. A sample problem worked out in a textbook exemplifies a reasoning strategy that students are supposed to learn. Each sample or example highlights some of its own properties, makes them manifest, draws attention to them.

Exemplification is selective. An exemplar exemplifies only some of its properties. It brings those properties to the fore by marginalizing, downplaying, or overshadowing others. What a given exemplar exemplifies depends on how it functions. If the paint sample cards were used to teach children what a rectangle is, they would exemplify the shape rather than the colors of the patches.

Although it cannot simultaneously exemplify all its properties, an item can in principle exemplify any property it literally or metaphorically instantiates. Still, doing so is not always easy. Shortly before a tornado, the sky often turns a distinctive shade of green. But a paint company would be ill advised to recommend that potential customers look at the sky during a violent storm in order to see that color. Tornadoes so rare and dangerous that any glimpse we get of the tornado-impending sky is unlikely to make the color manifest. We could not see it long enough or well enough, and would be unlikely

to attend to it carefully enough to decide whether it was the color we wanted to paint the porch. It is far better to create a lasting, readily available, easily interpretable sample of the color – one whose function is precisely to make the color manifest. Such a sample should be stable, accessible, and should have no properties that distract attention from the color. Effective samples and examples are carefully contrived to exemplify particular features. Factors that might otherwise predominate are omitted, bracketed, or muted. If the property is subtle, rarely instantiated, or difficult to discern, a good deal of stage setting may be required to bring it to the fore. This holds in scientific as well as commercial cases. The conductivity of water is hard to determine in nature, because the liquid in lakes, puddles, rivers and streams contains impurities. By eliminating the impurities in the lab, the scientist can contrive a sample of pure water, thus gaining epistemic access to the property she is interested in studying.

But if the cognitive contribution of an exemplar consists in the exemplification only of select features, then anything that exemplifies exactly those features can, in a suitable context, make the same contribution. Return to the sample cards mentioned above. Like just about everyone else, I spoke of the cards as though they were comprised of paint samples, telling instances of the very stuff you might use to paint the porch. This is not true. The sample on the card does not consist of paint, but of an ink or a dye of the same color as the paint whose color it exemplifies. If the sample were supposed to exemplify other properties of the paint, such as its durability or resistance to acid rain, this divergence would be objectionable. But since it purports only to exemplify the paint's color, and it is in fact the same color as the paint, the divergence is unproblematic. The card affords epistemic access to the property we want epistemic access to.

I suggest that idealizations in science function similarly. The ideal gas is a fiction that exemplifies features that exist, but are hard to discern in actual gases. The idealization affords epistemic access to those features, and enables us to explore them and their consequences by prescinding from complications that overshadow the features in real cases. It is valuable because it equips us to recognize these features, appreciate their significance, and tease out subtle consequences that might be obscured in the welter of confounding factors that obtain in fact. It serves as a focus that facilitates indirect comparisons, where direct comparisons are unilluminating or intractable. We understand the phenomena in terms of their deviations from the ideal. Such idealizations are not true, do not purport to be true, and do not aspire to be replaced by truths. But it is hard to deny that they are cognitively valuable, and hard to deny that epistemology should attempt to explain what makes them and the theories they figure in cognitively valuable.

What should we say about the false factual propositions that occur in the scientific understanding of both scientists and novices? I said that we might concede with Kvanvig that there is something honorific about calling them cases of understanding. At least their claim to be genuine understanding depends on their relation to some (real or anticipated) future account that is cognitively better. I suggest that they too are felicitous falsehoods. The child who thinks that humans descended from apes embeds that contention in a general account that reflects both a commitment to evolution and an idea that humans and other apes are closely related through common ancestry. So although there is a falsehood involved, it is a falsehood that enables her to connect, synthesize, and grasp a body of information that is grounded in the biological facts, and is supported (to an extent) by the available evidence. It may not be a lot, but it is something. Similarly in the case of

Copernicus. The Earth's orbit is not circular. But the Earth can be accurately represented as travelling around the sun in an orbit that is not all that far from circular. So the falsehood is felicitous in that it figures in and enables Copernicus to unify a body of information in a way that answers to the evidence better than prior theories could.

These felicitous falsehoods are not fictions. Fictive sentences neither are nor purport to be true. They function in other ways. It is no defect in ideal gas descriptions that there are no gases that instantiate them. But it is a defect in Copernicus's view that the Earth's orbit is not circular, and it is a defect in the child's view that humans did not descend from apes. So understandings that embed propositions like these are in need of improvement. They are just way stations toward a better understanding of the subjects they concern.

Idealizations do not always need improvement. They are not mere way stations to something better. But their epistemic status is parasitic. The only reason to accept them is that they contribute to theories that make sense of the facts. If those theories are overthrown, we lose our reason to accept the idealizations they contain. The theories in question are answerable to evidence. So there is no danger that by acknowledging that genuine understanding may involve ineliminable felicitous falsehoods, epistemology loses touch with facts or abandons hope of discovering what is cognitively valuable. For duly accommodating the evidence is answering to facts and is cognitively valuable. But accommodating the evidence is a requirement on an entire theory or comprehensive body of information, not on each individual element of it. The theory must be tethered; but each individual claim need not be separately tethered, for understanding is holistic.

The sort of understanding displayed in science falls within epistemology's

purview. I have argued that that sort of understanding cannot plausibly be construed as factive. I have offered a non-factive account in which felicitous falsehoods figure in understanding by exemplifying features that they share with the facts. By affording epistemic access to the features and making their significance manifest, felicitous falsehoods contribute to theories that embody and convey an understanding of the ways things are.

References

Elgin, C. (2004). True Enough. Philosophical Issues, 14, 113-131

Elgin, C. (1996). Considered Judgment. (Princeton: Princeton University Press)

Goodman, N. (1968). Languages of Art. (Indianapolis: Hackett Publishing Company)

Kvanvig, J. (2003). Knowledge and Understanding (In The Value of Knowledge and the Pursuit of Understanding (pp. 185-203) Cambridge: Cambridge University Press)

Sellars, W. (1963). The Language of Theories. (In Science, Perception and Reality, (pp. 106-126) London: Routledge and Kegan Paul)

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[2] I am grateful to Jonathan Adler for this point.