EXPLANATION, SCIENTIFIC UNDERSTANDING, AND THE ABILITY TO MAKE USE OF INFORMATION

In this paper I explore the relations between some influential theories of explanation and its relation to scientific understanding. As we will see, while these theories differ in their claims about what the essence of explanation is, they otherwise contain few conflicting claims as regards the relation between explanation and understanding. I shall suggest that we should add to the picture these theories together paint the idea of having a good understanding of something as having an ability to make certain kinds of use of known facts or reliable theories about what we are trying to explain. The other ideas of the relation between explanation and understanding I will discuss are all subsumed, I shall argue, under this theory of understanding. Its truth or correctness would, thus, explain the intuitive appeal of the other ideas to be discussed.

We can start with Hempel's

> *Deductive-Nomological Model of Explanation* (*the D/N Model*): to be able explain some phenomenon's occurrence is to be able to infer the statement that it would occur from premises about antecedent circumstances and laws of nature.

Thus if it follows logically from certain premises about the laws governing some kind of phenomenon and certain statements about what the antecedent conditions are that some event or phenomenon will or would occur, then we have an explanation of this event or phenomenon. Discussing the relation between his notion of explanation, on the one hand, and the idea of *scientific understanding*, on the other, Hempel writes that

> such expressions as 'realm of understanding' and 'comprehensible' do not belong to the vocabulary of logic, for they refer to the psychological or pragmatic aspects of explanation.[1] (413)

[1] "Studies in the Logic of Explanation", *Aspects of Explanation*, (NY: Free Press, 1965), p. 413. Quoted by Friedman in his "Explanation and Scientific Understanding", in *The Journal of Philosophy*, (1974), pp. 5-19, p. 7.

Commenting on this remark, Friedman writes

> In the sense in which such concepts as 'understanding' and 'comprehensible' are clearly pragmatic, 'pragmatic' means roughly the same as 'psychological', i.e. having to do with the thoughts, beliefs, attitudes, etc. of persons. However, 'pragmatic' can also mean subjective as opposed to objective. In this sense, a pragmatic notion… is a relative notion. But, a concept can be pragmatic in the first sense without being pragmatic in the second…
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> I don't see why there can't be an objective or rational sense of 'scientific understanding', a sense on which what is scientifically comprehensible is constant for a relatively large class of people. …I don't see how the philosopher of science can afford to ignore such concepts as 'understanding' and 'intelligibility' when giving a theory of the explanation relation.[2]

There is a sense of 'pragmatic' that I believe to be highly relevant in this context, but which Friedman seems to overlook. This is the idea of being able to make practical or further theoretical use of information. More on this below. Another quick comment about these quotes: one reason why the philosopher of science can ignore concepts such as *understanding* and *intelligibility* could, it might be suggested, have to do with just how tight the relation between them and that of *explanation* is. It may be that, given the close relation between these concepts, it is more informative to explain explanation in terms of other concepts. (This seems to be Lewis's view of this matter.[3]) Again, more on this below. Back now to Friedman.

Friedman thinks it unfortunate that Hempel is not keener to connect his theory of explanation with the notion of understanding. As Friedman notes, Hempel does, nevertheless, say the following

> the [D-N) argument shows that, given the particular circumstances and the laws in question, the occurrence of the phenomenon *was to be expected*; and it is in this sense that the explanation enables us to *understand why* the phenomenon occurred.[4]

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[2] "Explanation and Scientific Understanding", pp. 7-8
[3] "Causal Explanation", in *Philosophical Papers*, (OUP, 1986) pp. 214-240, p. 228
[4] Quoted by Friedman in "Explanation and Scientific Understanding" on p. 8

Friedman comments

> Here, showing that that a phenomenon was to be expected comes to this: if one had known "the particular circumstances and laws in question" before the explained phenomenon occurred, one would have had rational grounds for expecting the explained phenomenon to occur. The phenomenon would not have taken one by surprise.[5]

Thus Friedman takes it that, on Hempel's view, *understanding certain kinds of phenomena* is equivalent to *being able to predict their occurrences*. This, Friedman thinks, will not do. For, "[t]o have grounds for rationally expecting some phenomenon is not the same as to understand it". For example, after consulting a barometer I may have rational grounds for expecting, and may correctly predict, the occurrence of a storm. But, I may not understand why the storm occurs----even if I could infer its occurrence from "indicator laws" and certain observations.[6]

Instead of this picture, Friedman thinks that we should accept

> *The Unification Theory of Explanation and Understanding*: we *explain* some phenomenon by providing a theory of it that connects it with other phenomena about which we already have theories. *An explanation* is, in other words, a theory that reduces the number of independent phenomena. We *understand* some phenomenon when and if we see how, or have theories about how, it is related to other phenomena.[7]

This sort of theory implies, I believe, the relation between explanation and understanding that Friedman attributes to Hempel. If we know well how different phenomena are related, then it would seem that, at least in most cases, we would be able to rationally expect the occurrence of certain kinds of phenomena given the prior occurrence of certain other phenomena.

Consider next Lewis's theory of the explanation of events and phenomena and its relation to understanding, which we can call

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[5] p. 8
[6] Ibid.
[7] "Explanation and Scientific Understanding"

> *The Causal History Theory*: we *explain events* by giving causal information about the causal history of this event. We *explain kinds of events, or phenomena*, by giving information of what the causal histories of such events in general look like. We *understand* the occurrence of events and phenomena if we have such explanatory information about the causal histories of these events or phenomena.[8]

How is this theory related to the other theories? If we know how different phenomena are related, because we have some unifying theory of the kind Friedman has in mind, then it would seem that we know what the causal relations among different kinds of phenomena are. And, if we have such unifying knowledge, as was noted above, then we'd be in position were we'd have rational grounds for predicting that certain events will occur.

Lewis's theory is intended to cover only explanations of events or kinds of events. Kim proposes that we should give a broader account of explanation, which includes Lewis's view, namely what we can call

> *The Dependency Theory*: to *explain* something in terms of something else is to give some account about how the first thing depends somehow on the second thing. To *understand* something is to understand the dependency relations in which this thing stands to other things.[9]

If we are *Moral Realists*, for example, we may think that certain actions are ones we ought to perform because of what we could achieve by acting in these ways. For any such act, its having the property of *being something we ought to do* will depend on its having certain natural properties, but this dependence will not be causal but instead of some normative sort. So, we explain why such acts ought to be performed by giving the natural properties upon which its status of something we ought to do depends.

Return now to Lewis's view. Discussing the idea of understanding as having explanatory information in the sense of knowing facts about the causal history of

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[8] "Causal Explanation"

[9] "Explanatory Knowledge and Metaphysical Dependence", in *Philosophical Issues*, (1994), pp. 51-69

something, Lewis writes that, "the more of that you possess, the better you understand"[10] (228). This seems right when it comes to what Lewis is discussing, namely the explanation of and our understanding of particular events. But, we can now ask, does this claim of Lewis's generalize to understanding of kinds of events, regularities, and scientific theories?

In trying to answer this we can first suppose that we have broadened Lewis's claim so as to make it include Kim's claim that some explanations appeal to other kinds of dependencies than causal dependence, like, for example, the supervenience of the normative on the non-normative. On this broader idea,

(1) the more knowledge of the dependency relations you have, the better your understanding is, and this is all there is to understanding things.

Is (1) true? One reason for doubting this we might have could be that we are tempted by the Unification Theory of the relation between explanation and understanding and that we think that the second conjunct of (1) makes (1) incompatible with the Unification Theory. I doubt, however, that there really is a deep disagreement between those who accept (1) and defenders of the Unification Theory. If we have extensive knowledge of the ways in which different things *depend* on each other, then we seem, in effect, to have knowledge that reduces the number of *independent* phenomenon.

Now since, as I argued above, the Unification Theory seems to imply or contain the theory Friedman attributes to Hempel---the idea that to understand some phenomenon is to have rational grounds for expecting it to occur---it seems that the dependency theory expressed by (1) also includes this theory.

Have we now said everything there is to say about ideal understanding? So far what we have is this. The more knowledge we have of how something depends on other things and/or of how other things depend on this phenomenon, the better we understand this thing. I would now like to suggest that there is one dimension of understanding that is lacking in the picture painted so far. And, we now return to the sense in which I take understanding to be in one sense an at least partly pragmatic notion. The idea I have in mind is what we might call

[10] "Causal Explanation", p. 228

> *The Practical Theory*: if two people know an equal amount of dependency facts, but one person is able to make use of this knowledge more efficiently in further reasoning or in acting than the other, then the former person has a *greater understanding* of the thing in question than the latter. To *explain* something is to state facts about this thing's relations to other things. To *understand* this thing is in part to know such facts. But, to have an *ideal understanding* of something does often also include being able to make use of one's knowledge of this thing.

Compare two persons, Al and Ally, and their abilities with respect to geometry[11]. Al knows the axioms and major theorems of geometry and how to derive these theorems from the axioms. Ally knows these things as well, but also knows how to apply geometrical reasoning to new problems, apply insights from geometry to different areas of thought, and make good assessment of the limits of what we can do with geometrical reasoning. It seems to me that we should say Ally has a *better understanding* of geometry than Al and that we should say this because, in comparison with Al, Ally is more able to *make use* of her knowledge of the axioms and major theorems of geometry.

Likewise, understanding Ethics, some moral realist might claim, consists in part of being able to draw the right normative conclusions about novel cases. So, this sort of ability-to-make-use-of-knowledge theory of ideal understanding goes well together with the idea of explaining by acquiring knowledge about dependency relations.

Turn next to understanding natural phenomena. On this sort of theory, an ideal understanding of natural phenomena involves an ability to predict what's going to happen and being able to some degree to control one's environment. Our understanding of fire, for example, was hugely improved when we learned how to make fire.

Suppose next that some cult leader has an intuitive sense of how to manipulate people and that he believes that certain kinds of observable reactions in people are signs from God that he should act in certain ways in their presence. These beliefs allow this cult leader to control others in the sense of being able to make these others the subjects of his will. There is, it seems to me, a sense in which this cult leader understands human

[11] Catherine Elgin discusses these people, without using these names I give them, in her "Understanding and the Facts", in *Philosophical Studies*, 2007, 132: 33-42

psychology better than psychologists who don't have his false religious beliefs about people's behavior but who wouldn't be able control others in the way in which the cult leader is able to. On the whole it might be that the psychologist has a greater number of approximately true beliefs about the human mind, but since the cult leader can use his false religious beliefs in controlling others, he does, in one way, understand the human mind better than the psychologist.

Perhaps it will be objected here that, intertwined with his crazy religious beliefs about signs from God, this cult leader most likely has true beliefs that the psychologist lacks, and this is what accounts for his greater ability to control others, which in turn means that his greater understanding really is just a matter of knowing more facts. (Though these facts are somehow disguised inside the crazy non-facts this cult leader would cite in trying to explain his beliefs and viewpoint.) This may be true, but I still think that examples of this kind do help to tease out the intuition that understanding something is not just a matter of knowing facts: it also involves, at least when it comes to having a great understanding of something, being able to make use of this knowledge, either practically or in further theoretical thinking. And, there does seem to be something intuitive about the idea that there can be cases in which people who know fewer facts than others nevertheless understands certain things better than these other people.

Suppose that the following is true of two school children, Jack and Jill. Jack is better at memorizing facts that he learns in school than Jill is. But, whenever Jill manages to memorize some new set of facts, she will usually be able to come up with new ideas based on these newly learned facts and will sometimes be able to anticipate what the teacher is going to say next time in a way that Jack seldom is. Even though Jack knows more facts than Jill does, it seems to me that Jill understands the facts she does know better than Jack understands those that he knows.

All these examples are meant to make an intuitive case for the idea of ideal understanding as having a pragmatic aspect in the sense of involving an ability to make use of knowledge about something. The example with the cult leader is supposed to show or suggest that we could understand something well in one respect----namely, that of being able to use our theories about things---while understanding it less well in another respect---namely, that of having as true beliefs as possible about the ways in which things depend on each other.

The idea is in part that understanding is a concept that is represented by many different related things, namely the things needed to be able to make use of information in further theoretical reasoning or in successful practical deliberation and in action. If this is correct, then the intuitiveness of all the different theories considered above is explained. They all concern things that help us to make use of our knowledge of things.

At this point it might be objected that the theory of understanding I am putting forward is too imprecise and all-inclusive. That, I believe, is not an objection, but how it should be. The concept of *understanding* is, it seems to me, not a very fine-grained one.