Unification Handout

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What makes an explanation explanatory? Where, that is, does the force of an explanation derive. The most commonly accepted thought is that the force of an explanation comes from *tracking dependence*. This is most commonly understood to be causal dependence, but also maybe metaphysical dependence.[1] But perhaps explanation derives not from tracking dependence but from unifying disparate phenomena.

[1] Maybe there are other types of dependence too?

Friedman

Friedman starts by stressing the connection between explanation and *understanding*. There seems epistemic value in more than just knowing a fact or a phenomenon, but also understanding it. What relation could give understanding?

> Water is made of tiny molecules in a state of constant motion. Between these molecules are intermolecular forces, which, at normal temperatures, are sufficient to hold them together. If the water is heated, however, the energy, and consequently the motion, of the molecules increases. If the water is heated sufficiently the molecules acquire enough energy to overcome the intermolecular forces — they fly apart and escape into the atmosphere. Thus, the water gives off steam.

Here, one regularity is explained by appealing to a more general one. This suggests a kind of unificationist/pattern subsumptionist approach.[2]

[2] He focuses more on explanations of regularities or patterns than on explanations of specific facts.

Other accounts

D-N Account

Hempel thinks that it is not really the job of philosophy of science to give an account of understanding, since it is such a subjective and person-relative notion. But Friedman denies that understanding need be subjective — it can be an objective matter what gives us understanding of a phenomenon.[3]
But Hempel does say something about understanding. He says that the D-N account shows that the phenomenon is *to be expected* and this yields understanding. Friedman argues that understanding and rational expectation are different notions. The barometer can give us reason to expect the storm, but it does not explain it.

[3] We need to be careful to distinguish understanding from the feeling of understanding.

Familiarity

Perhaps explanations give understanding by reducing unfamiliar phenomena to familiar ones. E.g, the kinetic theory of gases explain unfamiliar relations

between the heat and pressure, for example, by reducing the phenomenon to the movement of billiard balls.

This account does tell a plausible story about understanding but it is radically in conflict with actual scientific explanation. Science often explains familiar things in terms of less familiar things. 'We are all familiar with the behavior of household appliances like radios, televisions, and refrigerators; but how many of us understand why they behave the way they do?'

Intellectual Fashion

> Like the "familiarity" theorists, holders of this view believe that the phenomenon doing the explaining must have a special epistemological status, but, unlike the "familiarity" theorists, they think that this status varies from scientist to scientist and from historical period to historical period.

This is very Kuhnian.

> Therefore, although the "intellectual fashion" account may ultimately be the best that we can do, I don't see how it can give us what we are after: an objective and rational sense of 'understanding' according to which scientific explanations give us understanding of the world. We should try every means possible of devising an objective concept of explanation before giving in to something like the "intellectual fashion" account.

Friedman's Unificatory Account

Given these criticisms we can extract three conditions on theories of explanation.

1. It should apply to actual scientific explanations — it shouldn't say that lots of science is misguided.
2. It should be objective.
3. It should connect explanation and understanding.

Friedman claims that the idea of unification can meet these conditions.

Notice that the kinetic theory of gases in some sense simplifies things. Previously, there were lots of different phenomena about gases that were accepted independently, but the kinetic theory of gases allows us to integrate all these phenomena and integrate the behavior of gases with the behavior of everything else.[4]

[4] Another famous example is Newton's unification of the celestial and the terrestrial.

> I claim that this is the crucial property of scientific theories we are looking for; this is the essence of scientific explanation — science increases our understanding of the world by reducing the total number of independent phenomena that we have to accept as ultimate or given. A world with fewer independent phenomena is, other things equal, more comprehensible than one with more.

What does 'independent' mean?

> I don't have anything very illuminating to say about what it is for one sentence to be acceptable independently of another. Presumably, it means something like: there are sufficient grounds for accepting one which are not also sufficient grounds for accepting the other.

Explanation is basically derivation from the unificatory laws. Though the issues here are somewhat complicated.[5]

[5] E.g. where does the asymmetry come from?

> On the view of explanation that I am proposing, the kind of understanding provided by science is global rather than local. Scientific explanations do not confer intelligibility on individual phenomena by showing them to be somehow natural, necessary, familiar, or inevitable. However, our over-all understanding of the world is increased; our total picture of nature is simplified via a reduction in the number of independent phenomena that we have to accept as ultimate.[6]

[6] Is this Holism good or bad?

Lewis

The D-N account can be unificationist or dependence-based, depending on what the metaphysics of laws is. Lewis developed an account of laws that fits well with unificationism.
The basic idea: laws are the axioms of deductive systems that best balance simplicity and informativeness about the world.
Guiding intuition: imagine what an ideal scientist with all the information about the patterns of events in the world would say that the laws are. In effect we are just extending the principles that scientists already use — taking those epistemic principles and making them constitutive of lawhood.

> Take all deductive systems whose theorems are true. Some are simpler, better systematized than others. Some are stronger, more informative, than others. These virtues compete: an uninformative system can be very simple, an unsystematized compendium of miscellaneous information can be very informative. The best system is the one that strikes as good a balance as truth will allow between simplicity and strength. How good a balance that is will depend on how kind nature is. A regularity is a law iff it is a theorem of the best system.

This is the *Best system account*. Systemization and unification are clearly very closely related.
There are lots of nuances and complexities.

Strevens

> According to the pattern subsumption approach, a good explanation shows that the phenomenon to be explained is an instance of a more general pattern. To understand an event, then, is to see that it is an instance of a pattern of events.

There is a problem though. Isn't it easy to gerrymander unification. Something needs to be done about that. Lewis appeals to *naturalness*; Strevens to *cohesion*.