Philosophy of Science // Fall 2015

Handout 17

Laws and the regularity theory: Earman

Hume on laws. When people think of natural laws, they are likely to follow Leibniz and conceive them as reflecting necessary connections in nature. To know a law is to know what things follow what things—that is, to know causal connections between events. But this idea was challenged by Hume: The idea of necessary connection is spurious, since it is unobservable. But we cannot very abandon the idea of a law (or of causation, for that matter), since without it we will not be able to make predictions.

The ontological assumption. Earman distinguishes three strands in Hume's argument: constant conjunction, felt determination, and counterfactual dependence. The idea of counterfactual dependence is put aside. Felt determination: some theorists went as far as to say that the distinction between lawlike uniformities and accidents on a cosmic scale was due to our attitudes to them. That is, a regularity can be judged lawlike because it is more useful in *our* predictions. Earman's discussion starts from the point of rejecting this view. What distinguishes two kinds of regularities is *their* features, not our attitudes. At the same time we have to explain our success in forming rational beliefs about lawlike regularities.

The Regularity theory: formulation. Laws manifest themselves in observable regularities. The regularity theory: there is nothing in laws above and beyond just those regularities. The idea is to say that laws are nothing but uniformities on a cosmic scale.

Definition 1. S is a statement of a *law of nature* just in case the following conditions are satisfied:

(1) S is a universal statement
(2) S is true
(3) S is contingent
(4) S contains only non-local empirical predicates ('suitably kosher').

Objections. First, there is an issue of *unrealised possibilities*. It is a cosmic uniformity that every dog had no more than 10^{100} hairs on its skin. So we have a law: 'Every dog has no more than 10^{100} hairs on its skin.' But then no dog could have more than 10^{100} hairs on its skin—as a matter of a law of nature! This is absurd.

Then there are *uninstantiated generalisations*. Laws can be put in the form: $\forall x(Fx \rightarrow Gx)$ (All Fs are Gs). But this is too liberal, since it allows in a law such as: 'All centaurs are vegetarian.'

Let us look at this in a little more detail. 'All centaurs are vegetarian' should be paraphrased as a conditional: for all x, if x is a centaur, then x is vegetarian. So we formalise this as: $\forall x(Cx \rightarrow Vx)$ (All Cs are Vs). We also recall the following truth-table for conditional statements:

P	Q	$P \rightarrow Q$
T	**T**	**T**
T	**F**	**F**
F	**T**	**T**
F	**F**	**T**

Finally, as a matter of fact, centaurs don't exist. Therefore, our generalisation is true. Yet, clearly, it cannot be a law of nature.

The remedy may be to amend the laws and make them refer to actual objects and their actual behaviour. So we would put them in the form: $Fa \,\&\, \forall x(Fx \rightarrow Gx)$.

However, it seems that some laws may well be formalised as: $\forall x{\sim}Fx \,\&\, \forall x(Fx \rightarrow Gx)$. For example, Newton's First Law: if no external force acts on a body, it will be at rest or in uniform motion. But in reality every object is acted upon by an external force. An altogether different case is a functional law of the form $y = f(x)$, such as Boyle's law. It determines the values of y regardless of whether particular values of x were instantiated.

Empiricist constraints. In order to formulate a more cogent view of laws, Earman begins by outlining a number of constraints imposed on any empiricist account:

E_0 Laws are contingent.
E_1 For any w_1, w_2, if w_1 and w_2 agree on all occurrent facts, then w_1 and w_2 agree on laws.
E_2 For any w_1, w_2, if w_1 and w_2 agree on laws, then w_1 and w_2 agree on regularities entailed by the laws.
E_3 Qualitative and quantitative differences in occurrent facts and empirical regularities create differences in laws.
E_4 Every fact and regularity is admissible as evidence in favour or against any law. That is, we treat regularities as candidates for entering into an integrated system.

Question 2. Why cannot we replace E_2 with: For any w_1, w_2, if w_1 and w_2 agree on laws, then w_1 and w_2 agree on all occurrent facts?

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