

Lecture XI

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Laws and explanation

- ① Laws: L_1, \dots, L_n
 - ② Conditions: C_1, \dots, C_m
 - ③ Explanandum: E
- Explanations are arguments.
 - The laws and the initial conditions, both understood as statements, logically entails the explanandum.
 - Informally, conditions are causes, but the causal talk is intelligible only in the presence of general laws (compare Hanson).

Hempel's verdict

- Historical science currently offers nothing more than explanatory sketches.
- An example of error: singling out initial conditions as determiners of historical events.
- The talk of determination is justified once we possess general laws (this follows from linking causation to laws).
- History is one of the fields of empirical science.

Difficulties

Pre-emption

Suppose that Jones drinks a poison such that there is a law saying that anyone who drinks it will die within 24 hours. However, shortly afterwards Jones is hit by a bus. According to Hempel, his death is explained by drinking the poison, and this seems wrong.

Symmetry

Suppose we increase the volume of the gas in a syringe. Then, given that the temperature is constant, Boyle's law [$PV = T$] should explain why the pressure subsequently drops. But equally, that later drop in pressure also explains why the volume increases, which is clearly wrong.

What is a law?

Laws are *true lawlike sentences*. So, what is **lawlike**?

Syntactic form?

- 1 Universal form: must have the form 'Every x is F .' But: 'Every student in this class likes Obama' is not a law.
- 2 Universal form and infinite scope: must not refer to a limited number of objects. But: Kepler's laws refer only to the planets in the Solar system.
- 3 OK, we now distinguish between fundamental laws and derivative laws.

Fundamental laws

- Universal form, infinite scope, and no reference to specific objects: simple generality.
- But: 'Everything that is either the 43th US President, or the best tennis player in 2010 is male' is not a law.
- Now, define '*x* is *preten*' as '*x* is either the 43th US President, or the best tennis player in 2010'.
- Then you have 'Everything that is *preten* is male.' But this does not seem to be a law, though has simple generality.

Breaking with positivism

- Laws are characterised by supporting counterfactual statements.
- 'If x were a planet of the Solar system, it would have had an elliptic orbit'—true.
- But 'If x were a preten, then x would have been male'—false.
- That is, laws express some form of necessity.
- So, laws cannot be characterised by a purely syntactic procedure.
- This is a double affront to positivism. Necessity is a suspect notion, plus there is no linguistic decision procedure to define lawhood.

Confirmation

- Confirmation is a notion weaker than verification.
- A general law cannot be verified by a finite body of evidence, yet may well be confirmed by it.
- There are problems with the theory of confirmation:
- Relevance: any evidence is relevant relative to the hypothesis under consideration.
- The relation between general hypotheses and their instances.
- Rules of induction: how exactly to determine that the given body of evidence confirms or disconfirms a hypothesis.

Nicod's criterion of confirmation

$\forall x(Px \rightarrow Qx)$.

That is: an object a confirms our hypothesis iff Pa and Qa ; disconfirms it iff Pa and $\neg Qa$; is neutral iff $\neg Pa$.

Shortcomings:

- 1 It applies only to conditional statements.
- 2 It fails for the transposition of conditional statements.

The second shortcoming indicates the inadequacy of the Equivalence Condition: whatever confirms (disconfirms) one of two equivalent sentences, also (confirms) disconfirms the other.

Paradoxes of confirmation

- Nicod's criterion cannot, therefore, be seen as a necessary condition of confirmation: the existence of black ravens confirms $\forall x(Rx \rightarrow Bx)$, but it does not confirm—as it should—the equivalent sentence $\forall x(\neg Bx \rightarrow \neg Rx)$.
- Yet Nicod's criterion may be considered a sufficient condition of confirmation. That is, the existence of an object which confirms a hypothesis according to Nicod's criterion will be seen as 'genuinely' confirming it.
- We are led here to the paradoxes of confirmation. Since non-black non-ravens confirm $\forall x(\neg Bx \rightarrow \neg Rx)$, they would also confirm $\forall x(Rx \rightarrow Bx)$.
- But clearly the existence of green frogs is irrelevant to the status of the hypothesis about ravens, hence a paradox.
- Hempel appears to suggest that non-black non-ravens confirm $\forall x(Rx \rightarrow Bx)$ to a small degree.