Confirmation 4
Reasoning by Analogy; Nicod's Condition

(pp. 11–14)

Patrick Maher
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Reasoning by analogy

If two individuals are known to be alike in certain respects, and one is found to have a particular property, we often infer that, since the individuals are similar, the other individual probably also has that property. This is a simple example of reasoning by analogy and it is a kind of reasoning that we use every day. (p. 11)

Example

My neighbor had her carpets cleaned by Klean Rite, and the company did a good job on them. That is reason to think Klean Rite would do a good job on my carpets.

Notation

- "a" and "b": Individual things.
- "F" and "G": Logically independent properties.
- "Fa": Individual a has property F.

Example

- $a =$ the cleaning job done on my neighbor's carpets
- $b =$ the cleaning job that will be done on my carpets
- $F =$ done by Klean Rite
- $G =$ good
- $Fa =$ The cleaning job done on my neighbor's carpets was done by Klean Rite.
- $Fa.Ga =$ The cleaning job done on my neighbor's carpets was done by Klean Rite and was a good job.

Conditions C should satisfy to be a good explicatum

(6) $C(Gb, Fa.Fb, Ga)$

(7) $C(Gb, Fa.Fb, Ga.F'a.{\sim}F'b)$

(8) $C(Gb, Ga, F'a.{\sim}F'b)$

Here F' is a property that is logically independent of both F and G.

- Carnap (1945, 1950, 1952) proposed explicata for inductive probability that satisfy (6) but not (7) or (8).
- For the case where there are only two properties, Maher (2000) showed that certain foundational assumptions pick out a class of probability functions, called P_I, that satisfy (6) and (8) and are otherwise satisfactory.
- Finding a fully satisfactory explicatum for the case where there are three properties remains an unsolved problem (Maher 2001).

Nicod's condition

From now on, "confirms" means "incrementally confirms."

Nicod's condition

"All F are G" is confirmed by finding that something is both F and G.

Examples

- "All metals conduct electricity" is confirmed by finding that some metal conducts electricity.
- "All ravens are black" is confirmed by finding a black raven.

Background evidence

- Nicod did not mention background evidence.
- His condition is false for some backgrounds.

  A black raven *refutes* “All ravens are black” when the background evidence is “If there are any ravens, then some of them aren’t black.”

- Hempel (1945) claimed Nicod’s condition is true when there is no background evidence.
- I.J. Good (1968) argued that Hempel is wrong:
  - Given no evidence, it is improbable that ravens exist, in which case “All ravens are black” is (trivially) true.
  - Given only that ravens exist, they are probably not all the same color.
  - So given no background evidence, finding a black raven increases the probability there is a non-black raven and hence *disconfirms* “All ravens are black.”

Hempel relied on intuition and Good's argument isn't rigorous.

Analysis using precise explicata

- "No background evidence" is explicated by taking the background evidence to be a logically true sentence; call it T.
- Let $A =$ All F are G.
- Hempel's claim expressed in explicatum terms is:

  (9) $C(A, Fa.Ga, T)$.
- Maher (2004) showed (9) is false for some $p \in P_I$ and the intuitive reason is the one identified in Good's argument.
- This confirms that Nicod's condition is false even when there is no background evidence.

Why does Nicod's condition seem plausible?

- People might not distinguish between Nicod's condition and: "Given that an object is F, finding that it is G confirms that all F are G."
- In explicatum terms that is:

  (10) $C(A, Ga, Fa)$

  whereas Nicod's condition is:

  (9) $C(A, Fa.Ga, T)$.
- (10) is true provided only that p satisfies the laws of probability, $0 < p(A|Fa) < 1$, and $p(Ga|Fa) < 1$.
- Failing to distinguish these could make it seem that Nicod's condition is true.

Questions

1. State two conditions that C should satisfy if it is to adequately reflect reasoning by analogy. Give an intuitive justification for each condition.
2. State Nicod's condition and show that it is false for some background evidence.
3. How did Good argue that Nicod's condition is false when there is no background evidence?
4. Express in explicatum terms the claim that Nicod's condition holds when there is no background evidence; say what the symbols you use mean. What did Maher show about this?
5. Under what conditions is $C(A, Ga, Fa)$ true? Explain why.