
MODELS AS INFERENTIAL MACHINES

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THE MAIN IDEA:

THE QUESTION:

What role do models play in science?

THE ANSWER:

A substantial part of the scientific models contribute to (or support) inferential processes like

- explanations (A because B);
- predictions (if A then B);
- evidence claims (E, therefore H).

POSSIBLE WAYS TO DEFEND THE SUGGESTED ANSWER

- **BY EXAMPLES**, showing how exactly particular models are used for making explanations, predictions or evidence claims in different areas of science;

This is what most people working on models do.

- **BY A META-ANALYSIS OF THE ONGOING DISCUSSION ON MODELS**, which might reveal how the view of models-as-inferential machines follow from what I call here “shared view” of models.

A TERMINOLOGICAL NOTE:

- **Why “machines” but not “tools”, or “auxiliary hypotheses”?**

The word “machine” stresses the important fact that models are in most cases something more than sets of assumptions (auxiliaries); they possess internal structure that allow them to infer what follow from a given set of premises.

IN THIS TALK:

- **Some general observations concerning the ongoing discussion on models in philosophy of science;**
- **What seems to be a good background for a “shared view”;**
- **Important implications of the suggested shared view.**

SOME GENERAL OBSERVATIONS

- The discussion about models and their role in science occupies a central place in the philosophy of science literature;
- However, the participants in the discussion, as well as those who follow it, do not have the feeling that a significant break-through has been achieved in the understanding of scientific models;
- The discussion has been dominated by attempts to introduce new points of view, which have been represented in contrast to the existing ones;
- And those who have made attempts to summarize the discussion have concentrated on the main oppositions;
- Thus too much energy has been spared for discussing the seeming differences between the proposed views instead of what might be a basis for a useful consensus;
- For me it is this dissipation of energies that has prevented achieving a conceptual break-through in our understanding of models.

EVIDENCE FOR THE RECOGNIZED IMPORTANCE OF THE DISCUSSION

- **A significant number of publications;**
- **Conferences, special sessions, edited volumes;**
- **Most of the philosophers who have contributed to the present state of the art in philosophy of science have taken part in the discussion on models: B. van Fraassen, P. Suppes, R. Giere, M. Redhead, E. McMullin, N. Cartwright, St. Psillos.**

EVIDENCE FOR THE DISSATISFACTION WITH THE RESULTS

- **[Morgan & Morrison, 1999]:**

“Despite this rather rich heritage there remains a significant lacuna in the understanding of exactly how models in fact function to give us information about the world.”

- **[Frigg & Hartmann, 2006]:**

“Models play an important role in science. But despite the fact that they have generated considerable interest among philosophers, there remain significant lacunas in our understanding of what models are and of how they work.”

THE MAIN OPPOSITIONS IN THE CURRENT DISCUSSION ON MODELS

- **“Received view” – semantic view – models as mediators;**
- **Inside the semantic view - Giere vs. van Fraassen and Suppes;**
- **Inside the models-as-mediators view – Morrison, Cartwright, Suarez;**
- **Isomorphism (van Fraassen, Suppes) – partial isomorphism (da Costa and French) – similarity (Giere, Teller) – inferentialism (Suarez).**

THE PROCLAIMED RIVAL VIEWS ARE NOT AS RIVAL AS THEY HAVE BEEN SET OUT TO BE

- **Both the syntactic and the semantic view do not transcend the logical framework: both views stress the fact that model-building is constrained by some general principles;**
- **Although insisting on the autonomy of models, the models-as-mediators view does not cut the connection between theories and models;**
- **Model-based inference might be similarity-based or based on the isomorphism.**

That means that they allow reconciliation.

THE “SHARED VIEW” AND ITS IMPLICATIONS

- Models are always models of something and in this sense they are representations.
- However, the representational relation might be different;
THEREFORE, the question “How do models represent?” does not lead to a general understanding of the role of models in science.
- We normally use models to achieve one or another goal.
- For example, we use them as tools for predicting and explaining phenomena as well as for creating evidential relations between theories and empirical data;
- But all sorts of predictions, explanations and evidence claims are based on inference; the patterns of inference unlike the representational relation do not seem to be local.
THEREFORE, the question “How do models support or participate in inference?” should be given priority.

THANK YOU

