
Accounts of Scientific Explanation

- Accounts of Scientific Explanation are intended to be both descriptive and normative

Descriptive => Provides a description of what scientists see as explanatory - A purely descriptive account is mere “science reporting” that is argued from authority. Such accounts struggle as they cannot capture disagreement or falsity.

Normative => States what scientists should view as explanatory - A purely normative account is mere “armchair philosophy” where the account becomes entirely detached from actual science.

- Such accounts should strive to balance both a normative and descriptive account

Nagel's *The Structure of Science* (1961)

Nagel claims that, while not the sole task of scientists, it is an important goal to provide systematic and responsibly supported explanations.

He offers a list of explanatory-why questions spanning many different areas:

1. Why is the sum of any number of consecutive odd integers beginning with 1 always a perfect square?
2. Why did moisture form on the outside of the glass when it was filled with ice water yesterday?
3. Why did a smaller percentage of Catholics commit suicide than did Protestants in European countries during the last quarter of the 19th century?
4. Why does ice float on water?
5. Why does the addition of salt to water lower its freezing point?
6. Why is it that in the progeny of inbred hybrid peas, obtained by crossing round and wrinkled parents, approx. 3/4 of the peas are always round whereas the remaining 1/4th are wrinkled?
7. Why did Cassius plot the death of Caesar?
8. Why did Henry VIII of England seek to annul his marriage to Catherine of Aragon?
9. Why do human beings have lungs?
10. Why does the English language in its current form have so many words of Latin origin?

Nagel provides 4 different models of explanation and shows their differing application to such questions. In each model, the explanandum will be static under different models of explanation, but the explanans and connective “tissue” between them will change.

Deductive-Nomological Model

In this model, the explanandum is a logically necessary consequence of the explanans. This relies on there being:

1. Initial conditions
2. Law(s) of nature

from which a deductive argument is constructed. Nagel allows “law” like assumptions and argues that questions 1-6 are examples of explanatory-why questions that are captured best by this model.

According to Nagel, this model represents a “paradigm” of (“ideal”) genuine explanation. That is this model is the goal for other models of explanation. The model suffers from the issue of determining what counts as “laws”.

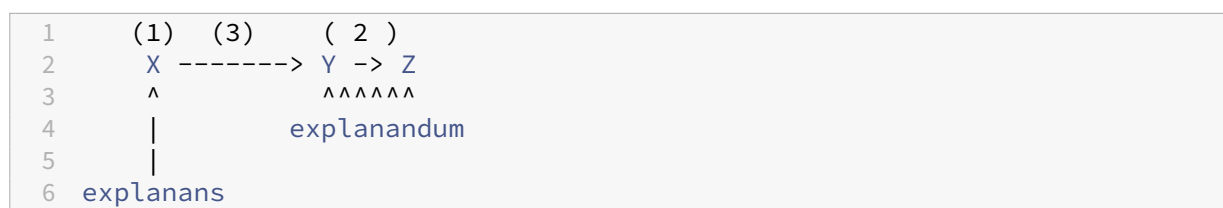
Probabilistic Explanation

This model is similar to the DN model, however in replacement of laws of nature, it substitutes statistical regularities / statistical assumptions. The connective tissue is then a probabilistic connection. That is, the explanans implies that explanandum is probable.

This is a weakening of the laws of nature and means that the connection is not a true logical deduction, but rather a deduction of a probable connection.

Functional (Existence) Explanation

This model differs significantly from the other two. It diagrammatically is



Genetic (Causal) Explanation

In this model, the explanans are causes and the deductive connection is the causes explaining their effects. This suffers from the issue of determining when to stop walking backwards in causes. In practice, it necessitates a systematic way of reducing the causes.

Hempel's *Aspects of Scientific Explanation* (1965)

Hempel claims explanations are attractive for at least two reasons:

1. Intellectual curiosity
2. Practicality

He specifically is interested in the nature of explanations that empirical science is able to provide.

- A scientific explanation is an answer to a “why question”. Specifically, it is an answer to an *explanatory seeking why question*.
- Requests for explanation require the aspects of the phenomena in question need to be clearly specified to have a clear meaning.
- Explanation (explanans) shows that the outcome “was to be expected” and reduces surprise
 - A why question asks something surprising and yearns for an explanation

Hempel's Description of the DN Model

Hempel deconstructs what he sees as examples of the DN model to characterize it. He claims that the DN model involves

- Antecedent conditions
- General laws
- A logical deduction

An explanation is therefore an argument that shows the explanandum was to be expected on the basis of particular explanatory facts and that the explanandum is a logical (deductive) consequence of them.

Hempel argues that the DN model encapsulates the Causal model

The following is an example of social science phenomena being explained by the DN model:

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1 (i) The price of oranges in O.C. doubles <-\___ Explanans
2 (ii) The law of demand <-/
3 -----
4 Quantity of oranges demanded decreases
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Like Nagel, Hempel claims this model is the best paradigm of explanation. However, similarly they have to answer the non-trivial question of what constitutes a “law”.