SCIENTIFIC EXPLANATION

Topic 2

What questions can science answer?

- The supposition—common before the rise of modern science—that the universe is a cozy little place, created for our benefit, with humans at its center, is an anthropomorphic conception.

A new approach in the philosophy of science

- Karl R. Popper (1935), Carl G. Hempel (1948), R. B. Braithwaite (1953), and Ernest Nagel (1961) published important works in which they maintained that there are such things as legitimate scientific explanations, and that such explanations can be provided without going beyond the bounds of empirical science.

- It has sometimes been asserted that explanation consists in reducing the mysterious or unfamiliar to that which is familiar.
- Appealing as the notion of reduction of the unfamiliar to the familiar may be, it is not a satisfactory characterization of scientific explanation.

the deductive-nomological (D-N) model

- The deductive-nomological model (DN model), also known as Hempel's model, the Hempel–Oppenheim model, the Popper–Hempel model, or the covering law model, is a formal view of scientifically answering questions asking, "Why...?". The DN model poses scientific explanation as a deductive structure—that is, one where truth of its premises entails truth of its conclusion—hinged on accurate prediction or postdiction of the phenomenon to be explained.

four conditions of adequacy for D-N explanations

- 1. The explanandum must be a logical consequence of the explanans; that is, the explanation must be a valid deductive argument.

- 2. The explanans must contain at least one general law, and it must actually be required for the derivation of the explanandum; in other words, if the law or laws were deleted, without adding any new premises, the argument would no longer be valid.

- 3. The explanans must have empirical content; it must be capable, at least in principle, of test by experiment or observation.
- 4. The sentences constituting the explanans must be true.

A law and a law-statement

- A law is a regularity that holds throughout the universe, at all places and all times.

- A law-statement is simply a statement to the effect that such a regularity exists.

- How to prove a law-statement?

- All gases, kept in closed containers of fixed size, exert greater pressure when heated.
- In all closed systems the quantity of energy remains constant.
- No signals travel faster than light.
- Contrast these with the following:
- (iv) All of the apples in my refrigerator are yellow.
- All Apache basketry is made by women.
- (vi) No golden spheres have masses greater than 100,000 kilograms.

- (vii) No enriched uranium sphere has a mass greater than 100,000 kilograms.

- Philosophers have often claimed that we can distinguish true generalizations that are lawful from those that are accidental. Even if we grant the truth of, we must conclude that it is an accidental generalization. Moreover, they have maintained that among universal generalizations, regardless of truth, it is possible to distinguish lawlike generalizations from those that are not lawlike.