**Modern Causal Explanation**

In modern science standard cases causal explanation takes a set form.

**Laplacian Explanation**. Newtonian scientist and philosophers believed that causal laws were necessary, i.e. that if the cause occurs, the effect must necessarily, without exception, follow. Pierre Simon Laplace (1749 –1827) believed that the universe was like a clock, a Newtonian machine, like clock, in which the parts were so ordered that if you know the state of the universe at one time, and the laws of physics, you could deduce by the necessary laws what the state of the universe would be at any given future time. This view is known as *Laplacian determinism*. On this deterministic model a particular event is explained by citing both a law of nature that governs that even and the evidence that the causal conditions necessary for the application of that law are satisfied.

Law: *Every A is B Planets travel in ellipses. Emeralds are hexagonal.*

Causal Condition: *This is an A Mars is a planet. This rock is an emerald.*

Event Explained: *This is a B Mars travels in an ellipses. This rock is hexagonal.*

This kind of explanation has a set “logical form:”

**Logical Form of Laplacian “Hypothetical Explanation”**

Law: *Necessarily, in standard conditions S, every A is B.* or

*Necessarily, for any x, if S* & *x is A, then x is B.*

Causal Condition: *This is A.*

Event Explained: *This is B.*

Here *A* is often said to be ***the cause of*** *B.*

**Probabilistic Explanation.** Modern physics and statistical thermodynamic in particular has taught us that the causal relations in the world are not necessary but probabilistic, i.e. that a cause follows an effect not 100% of the time but only with a certain probability. On this model causal laws are probabilistic and take this form:

**Logical Form of Probabilistic “Hypothetical Explanation”**

Law: *If S has a probability of p and A and A a probability of q, and B a probability of r,*

*then B has a probability of q|p*&*r.*

Initial Conditions: *S holds with a probability of q.*

Causal Condition: *This is A with a probability of p.*

Event Explained: *This is B with a probability of q|p*&*r.*

The calculation of *q|p*&*r (read “the conditional probability of q give p and r)* is calculated by the probability calculus. Here *A* is again said to be ***the cause of*** *B.*

You ask, *Why does Mars travel in an ellipse?* The explanation is, *It is a planet*. *Why is this rock hexagonal? Because it is an emerald.* Implicit but unexpressed in each explanation is an appeal to a law of nature.