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 conditions S hold & 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. 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 the probability of S is p, the probability of A is q, and the probability of B is r, then the probability of B is q|p&r.*
Initial Conditions:	*The probability of S is q.*
Causal Condition:	*The event A occurs, which has the p.*
Event Explained:	*The evet B occurs, which has the 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.*

We can now understand what is going on when you ask for a causal explaination. You ask, for xample, " *Why does Mars travel in an ellipse?*" You then receive an explanation is, "*It is a planet*." Hidden behind the answer, an assumed by the explainer, is that you both understand an unexpressed law of nature: all planets travel in ellipses. Likewise if you ask, "*Why is this rock hexagonal?"* You receive the explaination, "*Because it is an emerald."* Again, a background natural law is being assumed: all emeralds are hexagonal. In almost all cases, the relation between the cause and effect is probabalistic, but in ordinary life we do not say so explicitly.