

their interactions in the sense that we can observe their movement across the night sky. But suppose we do not yet know the laws of gravity, the pattern of relationships that governs these movements. ... Can we use our observations of the movement of these planets to formulate such a law? We can't logically deduce such a law from observations. But we can observe the movement of the planets, and create meticulous descriptions. Those descriptions can inspire us to think deeply about the underlying patterns that could cause this behavior. The formulation of laws that explain this behavior is fundamentally a creative act, where the pattern of relationships is dreamt up and proposed.

Induction is crucial in the progress of science: astronomers propose different working mechanisms ("hypotheses") that could wholly or partially explain the observed phenomena, and test them by using the hypothesis to predict future outcomes, and check whether the hypothesis is true by matching it with observations. In the formulation of these predictions, we can again use the solid reasoning pattern of deduction: knowing the elements in a situation, and proposing a pattern of relationships between these elements, we can do our deductive calculations and predict where a planet will be in the future. Then we can wait until that moment arises, observe the planets again, and check whether the prediction was correct or not. If the planet is indeed where the hypothesis said it would be, we can cautiously say that the proposed pattern of relationships could be true. If the planets are not where the hypothesis projected them, the astronomer will have to come up with another possible theory of how these planets interact, and again use the power of deduction to test the new proposal. The progress of science comes from endless discussions between scientists who challenge and prove false each other's hypotheses until there is agreement that a certain proposed pattern of relationships is probably "true," because it matches current observations.

Detectives work in much the same way, or at least they do in novels: there is a group of "elements" (the suspects), and there is the undeniable fact of the dead body (the outcome of an unknown process). To find out what happened, the detective needs to create scenarios about how the murder might have happened, and scrutinize them through deduction (would this scenario of interactions have led to the murder, and the position of the body in the exact circumstances in which it was found?). This is pure induction, a creative act—even though Sherlock Holmes adamantly denies this creativity, claiming that it is all "deduction, my dear Watson." But by deduction alone, Sherlock Holmes would never have arrived at the scenario which exposes the murderer. Like detectives, scientists seem embarrassed being caught creatively guessing how something might work,