Four Rules of Scientific Reasoning from Principia Mathematica

Newton included at the beginning of Book 3 (in the second (1713) and third (1726) editions) a section entitled "Rules of Reasoning in Philosophy." In the four rules, as they came finally to stand in the 1726 edition, Newton effectively offers a methodology for handling unknown phenomena in nature and reaching towards explanations for them. The four Rules of the 1726 edition run as follows (omitting some explanatory comments that follow each):

Sir Isaac Newton was a significant contributor to the Scientific Revolution. Newton believed that scientific theory should be coupled with rigorous experimentation, and he published four rules of scientific reasoning in Principia Mathematica that form part of modern approaches to science:

Rule 1 *We are to admit no more causes of natural things than such as are both true and sufficient to explain their appearances.*

Rule 2 *Therefore to the same natural effects we must, as far as possible, assign the same causes.*

Rule 3 *The qualities of bodies, which admit neither intensification nor remission of degrees, and which are found to belong to all bodies within the reach of our experiments, are to be esteemed the universal qualities of all bodies whatsoever.*

Rule 4 *In experimental philosophy we are to look upon propositions inferred by general induction from phenomena as accurately or very nearly true, not withstanding any contrary hypothesis that may be imagined, till such time as other phenomena occur, by which they may either be made more accurate, or liable to exceptions.*

Newton's rules of scientific reasoning have proved remarkably enduring. His first rule is now commonly called the principle of parsimony, and states that the simplest explanation is generally the most likely. The second rule essentially means that special interpretations of data should not be used if a reasonable explanation already exists. The third rule suggests that explanations of phenomena determined through scientific investigation should apply to all instances of that phenomenon. Finally, the fourth rule lays the philosophical foundation of modern scientific theories, which are held to be true unless demonstrated otherwise. This is not to say that theories are accepted without evidence, nor that they can't change – theories are built upon long lines of evidence, often from multiple pieces of research, and they are subject to change as that evidence grows.

Newton was not really dealing with philosophy as we think of it today. He was laying down some basic principles for physics that seemed reasonable and necessary in order to understand his laws. The first rule was to eliminate any unnecessary aspect of a theory that is not required as necessary. Thus God and angels and demons play no part in Newton's physics. Neither do the bodies at rest or motion have a desire to rest or be in motion, an idea that was popular in his day. The second rule was to further simplify that if we observe effect B it would have been caused by cause A, simply because we have determined in the past that A causes B. The third rule is a declaration that location is not important in physics in the sense that laws that operate on earth will be the same that operate with the heavenly bodies, stars and planets. This is a declaration of the universality of the laws of physics. The fourth rule simply means that any law of physics is open to future correction or improvement and Newton's laws are not to be inferred as being absolute or unconditional. All in all, Newton did reasonably well, considering the superstitiousness of his fellow "philosophers."