Isaac Newton: *Principia* (1687)

**Rules of Reasoning in Philosophy**

**Rule 1** *We are to admit no more causes of natural things than such as are both true and sufficient to explain their appearances.* To this purpose the philosophers say that Nature does nothing in vain, and more is in vain when less will serve; for Nature is pleased with simplicity and affects not the pomp of superfluous causes.

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

As to respiration in a man and in a beast; the descent of stones in Europe and in America; the light of our [cooking] fire and of the sun; the reflection of light in the earth, and in the planets.

**Rule 3** *The qualities of bodies … [that] are found to belong to all bodies within the reach of our experiments, are to be esteemed the universal qualities of all bodies whatsoever.* For since the qualities of bodies are only known to us by experiments, we are to hold for universal such as universally agree with experiments. …

If it universally appears, by experiments and astronomical observations, that all bodies about the earth gravitate towards the earth … in proportion to the quantity of matter which they [each] contain; that the moon likewise gravitates toward the earth; that, on the other hand, our sea gravitates towards the moon; and all the plants towards the moon; and all the planets one towards another; and the comets in like manner towards the sun; we must, in consequence of this rule universally [conclude] that all bodies whatsoever are endowed with a principle of mutual gravitation.

**Rule 4** *In experimental philosophy we are to look upon propositions inferred by … induction from phenomena as accurately or very nearly true … till such time as other phenomena occur, by which they may either be made more accurate, or liable to exceptions.* This rule we must follow, that the argument of induction may not be evaded by hypotheses.

**General Scholium (i.e. the Basic Lesson)**

Hitherto we have explained the phenomena of the heavens and of our sea by the power of gravity, but we have not assigned the cause of this power. This is certain, that it must proceed from a cause that penetrates to the very centers of the sun and the planets … that [it] operates not according to the quantity of the surfaces of the particles upon which it acts (as mechanical causes used to do), but according to the quantity of the solid matter which they contain, and propagates its virtue on all sides to immense distances, decreasing always as the inverse square of the distances. … But hitherto I have not been able to discover the cause of those properties of gravity from phenomena, and I frame no hypotheses; for whatever is not deduced from the phenomena is to be called a hypothesis; and hypotheses, whether metaphysical or physical, whether of occult qualities or mechanical, have no place in experimental philosophy. In this philosophy particular propositions are inferred from the phenomena, and afterwards rendered general by induction. … To us it is enough that gravity does really exist, and act according to the laws which we have explained, and abundantly serves to account for all the motions of the celestial bodies, and of our sea.
The six primary planets are revolved about the sun in circles concentric with the sun, and with motions directed towards the same parts. Ten moons are revolved about the earth, Jupiter, and Saturn, in circles concentric with them. It is not to be conceived that mere mechanical causes could give birth to so many regular motions. This most beautiful system of the sun, planets, and comets, could only proceed from the counsel and dominion of an intelligent and powerful Being. And if the fixed stars are the centers of other like systems, these, being formed by the wise counsel, must be all subject to the dominion of One.

This Being governs all things, not as the soul of the world, but as Lord over all; and on account of his dominion he is wont to be called Lord God, or Universal Ruler; for God is a relative word, and has a respect to servants and Deity in the dominion of God not over his own body, as those who fancy God to be the soul of the world, but over servants. The Supreme God is a Being eternal, infinite, absolutely perfect; but a being however perfect, without dominion, cannot be said to be Lord God; for we say, my God, your God, the God of Israel, the God of Gods, and Lord of Lords; but we do not say, my Infinite, or my Perfect: these are titles which have no respect to servants. The word God usually signifies Lord; but every lord is not a God. It is the dominion of a spiritual being which constitutes a God: a true, supreme, or imaginary dominion makes a true, supreme, or imaginary God. And from his true dominion it follows that the true God is a living, intelligent, and powerful Being; and from his other perfections, that he is supreme or most perfect. He is eternal and infinite, omnipotent and omniscient; that is his duration reaches from eternity to eternity, his presence from infinity to infinity; he governs all things, and knows all things that are or can be done. He is not eternity and infinity, but eternal and infinite; he is not duration or space but he endures and is present. He endures forever, and is everywhere present; and, by existing always and everywhere, he constitutes duration and space. Since every particle of space is always, and every indivisible moment of duration is everywhere, certainly the Maker and Lord of all things cannot be never and nowhere. Every man, so far as he is a thing that has perception, is one and the same man during his whole life, in all and each of his organs of sense. God is the same God, always and everywhere. He is omnipresent not virtually only, but also substantially; for virtue cannot subsist without substance. In him all things are contained and moved; yet neither affects the other: God suffers nothing from the motion of bodies; bodies find no resistance from the omnipresence of God. It is allowed by all that the Supreme God exists necessarily; and by the same necessity he exists always and everywhere. Whence he is all similar, all eye, all ear, all brain, all arm, all power to perceive, to understand, and to act; but in a manner not at all human, in a manner not at all corporeal, in a manner utterly unknown to us. …