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A God of Math & Order

The new science rode in on the shoulders of theological ideas.

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What caused the scientific revolution? How did science advance from the relatively static medieval philosophies of nature to the dynamic technologies of modern science? Secular historians have argued that the church opposed this progress at every turn. But in fact a set of new theological ideas ushered in the scientific innovations of men like Galileo, Descartes, and Newton.

First, Christian thinkers applied God's sovereignty to the natural realm in a new way, asserting that nature was governed by God-designed mathematical laws. Then, concerned to protect that sovereignty against Aristotle's notion that natural entities possessed intrinsic drives, Christians began to strip nature of her divinity, positing instead mechanical processes.

"Laws he himself fix'd"

*Nature and Nature's laws lay hid
in night
God said: "Let Newton be!"
and all was light.*

Alexander Pope's famous couplet gives the impression that Newton's genius lay in his discovery of previously hidden laws of nature. This disguises what was both a novel feature of the science of the seventeenth century and its enduring legacy—the idea that there existed "laws of nature" to be discovered in the first place.

What are laws of nature? For the Middle Ages, natural laws had been universal moral rules established by God. The injunction against murder, recognized by all cultures, was a typical example of a natural law. The concept of a physical law of nature was completely absent. That came only as Christian thinkers extended God's legislative power to the natural world. As philosopher and scientist René Descartes (1596-1650) expressed it, "God alone is the author of all the motions in the world."

For its time, this was a radical claim. Following Aristotle, medieval scientists had imputed immanent tendencies to physical entities, saying for example that objects went into motion because they were seeking their own natural resting place. Nature had thus enjoyed a considerable degree of autonomy.

In the new science, however, natural objects had no inherent properties, and it was God who directly controlled their interactions. In much the same way that the Deity had instituted moral rules, he was now seen to have enacted laws that governed the natural world.

"Nature," observed Robert Boyle, "is nothing else but God acting according to certain laws he himself fix'd."

The fact that God was the author of these laws meant that they shared something of his nature. Descartes, for example, argued that because of their source, natural laws must be eternal and unchanging. He went on to justify his law of the conservation of motion by appealing to God's immutability. Nature was constant because God was immutable.

This provided a crucial foundation for experimental science. In the words of Newton's predecessor in the Lucasian Chair of Mathematics at Cambridge, Isaac Barrow, experimentalists "do not suspect that Nature is inconstant, and the great Author of the universe unlike himself." Only because they assume that God's decrees are unchanging do they expect the consistent results of a number of experiments to hold true ever after.

The mathematics of Nature

The idea of eternal and immutable laws of nature, vital to modern science, found a close ally in mathematics. A distinguishing feature of science, as many hapless students have discovered to their regret, is its mathematical character. But this had not always been so. This change, too, emerged from theology.

To medieval thinkers, the marriage of mathematics and natural science would have been an illicit and barren union. Following Aristotle, they held mathematics to be a product of the human mind. For this reason mathematics was not thought to provide true descriptions of reality: useful descriptions—yes—but not true descriptions.

Astronomers, regarded as practitioners of a mathematical science, were thus thought to trade in useful fictions. Their models were capable of predicting the positions of heavenly bodies but were not thought to provide a true physical account of the cosmos.

This very issue led to Galileo's fateful encounter with the Inquisition. He insisted that the sun-centered system of Copernicus was more than a useful mathematical device—it was an accurate physical description. Galileo's novelty, then, lay in his championing not of a new astronomical model, but of a new model of astronomy.

Mathematics could provide a true account of the universe only if it were more than a human construction. Galileo, Kepler, Descartes, and Newton made the bold assertion that mathematical relations were real only because they were convinced that mathematical truths were the products not of human minds, but of the divine mind. It was God who had invented mathematics and who had imposed mathematical laws on the universe. Like Scripture, the "book of nature" had also been written by God, and, as Galileo insisted, this book was "written in the language of mathematics."

Descartes cited the inter-testamental book, Wisdom of Solomon, to support his contention that God was a mathematician, "Thou hast ordered all things in measure and number and weight" (11:20). Newton subsequently described the cosmos in terms of an "infinite and omnipresent spirit" in which matter was moved by "mathematical laws."

Crediting God as the author of mathematics was thus a crucial step in asserting the reality of mathematical relations, and this enabled the subsequent application of mathematics to the field

of physics.

The atom and God's machine

Consistent with their belief in divinely-imposed laws of nature, the new cadre of Christian scientists jettisoned Aristotle's notion that changes in the behavior of material things derived from a "final cause" that drove them to fulfill their natural functions. In its place they developed atomic matter theory and the idea of nature as a vast machine, running smoothly according to God's mathematical laws.

A number of seventeenth-century thinkers revived the ancient Epicurean view that all matter was made up of minute particles that were qualitatively identical. The various interactions of matter were to be accounted for not by inherent virtues and qualities, but by the motions and collisions of the various particles. Thus heat, once regarded as a quality inherent in an object, could now be explained quantitatively in terms of the motions of its particles.

This new theory of matter had momentous implications. One was that matter's microscopic components could be explained by the laws of nature. Just as motions in heavenly bodies were described in terms of mathematical laws, so too were motions of atomic particles. In this manner, the government of matter came under the direct jurisdiction of God.

The "final causes," which Aristotle had located within nature itself, were now understood as God's externally imposed purposes.

God thus was seen to be more intimately involved in the operations of nature than he had been before. This motivated the quest to discern divine purposes in the natural world.

Each of these developments reflects a renewed emphasis on the sovereignty of God. This paralleled the change in the theology of justification. Just as the new scientists stripped natural bodies of their inherent causal virtues, Protestant Reformers insisted that human virtues could not achieve, or cause, justification. The whole initiative lay with God, whose eternal decree determined who would be justified. In theology as in nature, all ran according to God's unchangeable laws.

Could modern science have arisen outside the theological environment of Western Christendom? It is hard to say. What is certain is that it did arise in that environment, and that theological ideas underpinned some of its central assumptions.

Those who argue that science and religion are at odds will draw little comfort from history. When modern science assumes mathematical laws and the constancy of nature—assumptions essential to its development—it echoes the theological presuppositions that attended its birth.

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