of Species, and to remediate the distortions of the history and role of biostratigraphy that have been and continue to be put forth by the proponents of flood geology, will profit from these volumes.

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THE GREAT RIFT: Literacy, Numeracy, and the Religion-Science Divide by Michael E. Hobart. Cambridge, MA: Harvard University Press, 2018. xiv + 506 pages, with appendices, endnotes, and index. Hardcover; $39.95. ISBN: 9780674983632.

Michael Hobart's book *The Great Rift* presents a novel and provocative perspective on the age-old conflict between religion and science. In his words:

> My central thesis may be baldly and succinctly stated: the shift between two distinct information technologies—literacy and numeracy—resides at the source of how science and religion went their separate ways, producing the Great Rift between them. (p. 4)

To be clear, Hobart does not specifically address the alleged discord between science and religion but delineates how a chasm (his word) opened up to drive them apart. Nevertheless, Hobart holds that as life became ever more secularized, religion became less relevant to science and was "not so much conquered as ignored" (p. 10), so that "from the late nineteenth century to our own times we have reached the point where observers and participants alike … have come to view the widening separation between science and religion as an impasse, or even a war zone" (p. 323).

To support his thesis, Hobart fleshes out and refines some research begun two decades earlier with a colleague on transitions between the three stages in the history of information technology: literacy, numeracy, and computerized information processing. The result here is a well-researched book, based on a lifetime of work, that extensively examines medieval and Renaissance developments in mathematics as well as Galileo's seminal role in the rise of modern science. The detailed scholarly treatment given these topics, which we cannot adequately recapitulate here, makes the book well worth its modest price, completely aside from its take on the science-religion divide.

Hobart begins his narrative with a brief look at the ancient world, which introduced and developed the information technology of recorded language. Greek writing is epitomized by its literature and philosophy, which make extensive use of definition and classification to capture the essence of things. Aristotle systematically codified forms of deductive reasoning based on this type of thinking in his logic. Medieval schoolmen later adopted this mode of knowledge acquisition in their educational practices and intellectual debates. Classification and fine distinctions permeated the writings of those who studied the quadrivium (arithmetic, music, geometry, and astronomy) as well as the writings of those dedicated to more advanced topics in theology and philosophy.

During this time period, there was a methodological unity overall to science and religion. Thinkers described the observed behavior of natural phenomena in terms of causes related to their essential natures, leaving room for divine purposes at the head of it all. They employed the same sort of reasoning that explained the structure of the natural world to incorporate religious ends and means. Science and religion in medieval Europe formed a fairly harmonious whole.

As people began to use mathematics more consistently in the late Middle Ages and Renaissance in order to relate things in everyday arenas such as commercial transactions, music, perspective painting, and astronomy, the explanatory focus for natural phenomena moved away from appealing to the intrinsic nature of things to demonstrating how they functioned quantitatively. Mathematically relating numerical features of events or activities via ratio and proportion (the rule of three was an omnipresent mainstay) became the new mode of accounting for natural phenomena. This approach was fruitfully employed by Galileo in his scientific analysis of terrestrial motion, yielding his times-squared law for falling bodies and parabolic paths for projectiles. Such an approach left both traditional philosophy and theology on the outside, creating a fault line between science and religion. Galileo's clash with the Roman Catholic Church over the factual status of Copernican astronomy, the nature of scientific demonstration, and the legitimacy of theological incursions into science only exacerbated this rift.

Hobart attributes the new analytic approach in natural philosophy to changes in information technology, indeed, to the rise of numeracy. He sees developments within mixed/applied mathematics during the Renaissance and early modern period as embodying a new understanding of the nature of mathematics and the role of symbols. Using terms proposed in 1959 by Jagjit Singh (but for distinguishing formalistic late nineteenth- and twentieth-century mathematics from its more concrete antecedents), Hobart brands classical and medieval mathematics as "thing mathematics" and Renaissance and early

modern mathematics as "relation mathematics." This characterization works to some extent, but it has shortcomings.

Classical mathematics was certainly about mathematical entities encountered in everyday life (numbers, spatial figures), but it also treated their basic properties (being prime, being isosceles) and relations (being divisible by, being congruent to). Hobart correctly notes that late medieval, Renaissance, and early modern mathematics made extensive and productive use of relations such as ratio and proportion (a significant part of what qualifies them as being relation mathematics) to formulate functional dependencies, but these relations were also prominent in earlier mathematics—in the works of Euclid, Archimedes, Apollonius, Heron, and Ptolemy, and even in the mathematical practice of earlier cultures.

Another aspect of the new relation mathematics, as Hobart conceptualizes it, is an emphasis on the use of abstract or empty symbols. In one sense, this was not new. As far back as the end of the third millennium BC, for instance, the Mesopotamian sexagesimal place-value system made abstract computations possible, so that the differing concrete metrological systems still in use could be bypassed. But, in another sense, applying this characterization to late medieval, Renaissance, and early modern mathematics is anachronistic. Hindu-Arabic numerals referred to quantities such as goods, weights, and monetary value in commercial arithmetics; musical notation denoted temporal duration, pitch relations, harmonies, and time signatures; and letters used in the analysis of motion stood for speeds, times, and distances. More-abstract symbols were introduced in algebra by Viète and others to stand for numerical operations as well as unknown and known quantities, and these were used to formulate and solve equations, but they were not vacuous—they had numerical meaning in some assumed domain of quantities. Furthermore, while Viète made some major notational advances in algebra for solving equations prior to 1600, Galileo remained rooted in an older geometric form of ratio arithmetic that he learned from the recently recovered Book V of *Euclid's Elements*. In his earlier work, Hobart highlighted Viète's role in the new numeracy, but here Galileo is his protagonist. Galileo does use mathematical symbolism to analyze relations among physical quantities, but these are neither empty of meaning nor related by equations.

However, there is some validity to Hobart's assertion that the symbols of modern relation mathematics were becoming empty. As mathematics was increasingly being used to quantify empirical realities such as cost, distance, harmony, time, speed, and so on, time-worn metaphysical and occult connotations of numbers and spatial configurations became superfluous, and, as a result, symbolic representations were emptied of enchanted meaning. This practice became more widespread as time went on, though as Hobart acknowledges, it was not uniformly followed even by the start of the 1600s. Mystical associations of mathematics were often deemed as important as practical applications; in fact, this development encouraged some to believe that mathematics would unravel the secrets of nature. Kepler's astronomical writing, for example, contains hard-nosed calculations about elliptic planetary orbits and also religious and mystical ruminations about Platonic solids and the ability to think God's thoughts after him.

More could be said about Hobart's defense of his thesis—particularly his idiosyncratic use of the notions of cardinality and ordinality in connection with mathematicians beginning to join the fields of number and space in their practice of mixed mathematics—but I will end with a question and follow that with a few concluding remarks.

What is gained, I wonder, by conceptualizing the transformation of natural philosophy (from using Aristotelian teleological argumentation to employing mathematical analyses of functional dependencies) as a sweeping shift in information technology, exchanging words for empty quantitative symbolism? Why is this not seen instead, for instance, as a renewed neo-Pythagorean/Archimedean emphasis on the primacy of quantifying (mathematization) combined with a more experimental and mechanistic bent in physical investigations? That is, why concentrate so exclusively on the how of information technology—"the humanly constructed screen between the knowing mind and the world outside" (p. x)—rather than on the what of the discovered numerical connections between meaningful content? Hobart would no doubt respond that the latter does not occur without the former and that his stated aim is to determine the extent to which a change in information technology is implicated in the new mode of doing science, but I think more could have been done with developments on the religion and philosophy side of the divide to contextualize the shift.

Hobart successfully documents the changing methodology of science in the early modern period, especially in his expert examination of Galileo's work, but his thesis does not account for other important issues concerning the relationship of science and religion, even in this time period. I remain convinced that much more than information technologies are involved in the rise of modern science and its con-

nection to religion. To be fair, some of these factors are acknowledged in passing by Hobart. He admits that changing attitudes toward the roles of religion and philosophy in the pursuit of natural knowledge were influenced by historical developments such as the rise of nominalism, the Reformation, Renaissance humanism, the revival of Platonism, gradual secularization, and so on, but these lie mostly outside the scope of his thesis. More importantly, Hobart does not probe the significant ways that Christian religion—in both its medieval and early modern versions—provided a hospitable intellectual environment in which modern science could develop and thrive, Galileo's conflict with the church notwithstanding. Readers who recognize God as the author of nature (and of creation more broadly) will not be persuaded by Hobart's allegation that "the deep incompatibility of religion and science" is now "simply too great to overcome" (p. 323). Distinct epistemic methodologies or information technologies do not automatically create territorial conflicts, and what discord there is, can often be attributed to other factors, such as the opposition between Christian faith and a strong commitment to naturalism.

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ORIGINS

KNOWING CREATION: Perspectives from Theology, Philosophy, and Science by Andrew B. Torrance and Thomas H. McCall, eds. Grand Rapids, MI: Zondervan, 2018. 341 pages. Paperback; $39.99. ISBN: 9780310536130.

The late modern unfurling of interdisciplinary studies continues to produce innumerable volumes. The relationship between theology and science is no exception. Zondervan recently released two volumes exploring "perspectives from theology, philosophy, and science," edited by Andrew Torrance and Thomas McCall, each with over a dozen qualified contributors. The first is *Knowing Creation* and the second *Christ and the Created Order*. This review looks at the first.

As one skims the introduction, it seems the volume might be just another opinionated survey of the stale debates over "creation, science, and intelligent design." But in reading through each chapter, it quickly becomes apparent that the book is far broader. In fact, readers generally interested in and familiar with this intersection of disciplines might find it a simple pleasure to read (as I did), without worrying about locating arguments within a contemporary context and making judgments. At any rate, the book fulfills its purpose: to give a microphone to the multiplicity of dimensions in this arena, all without reducing or overemphasizing one aspect over another.

It is not possible to review each contribution, but I do want to highlight points from some of them to give readers a sample of the contents.

Christoph Schwoebel, in "We Are All God's Vocabulary," focuses on a topic vital for any discussion about interacting disciplines: language. Although many of us tend to think we understand basic concepts such as "metaphor" and "analogy," we often don't. "Metaphors do not simply add a coat of meaning to things which underneath remain what they are," he writes. "They change the way things are for us and how we are to relate to them" (p. 49). In a modern age that privileges the literal, propositional, and measurable/quantifiable and downplays the symbolic, metaphorical, and qualitative (that is, "it's *just* a metaphor"), getting a handle on the linguistic dimensions of the science-theology enterprise cannot be overstated.[1]

Andrew Torrance, in "Not Knowing Creation," attempts to clarify methodological naturalism. There's much to comment on here, but the essay is more thoughtful and persuasive than those in *Theistic Evolution* (2017) edited by J. P. Moreland et al. on the same topic. Inevitably, there remain loose ends—especially with regard to the main assumptions of this discussion, such as models of God and creation, "special divine action," and how science done by Christians is substantially different than that done by non-Christians. Torrance writes, for example, that "there should be a difference between the way in which the Christian scientist and the naturalistic scientist approach and interpret the structure, behavior, and history of the natural world" (p. 101); this view gets the ball rolling but does not take us too far.

John Walton, in "Origins in Genesis," condenses some of his published research. In contrast to modern thought, he presses the superficiality of the natural/supernatural distinction. This default way of thinking simply is not part of biblical consciousness. "We cannot claim the Bible says something that makes no sense in the original context; it cannot make a categorical distinction if it does not have the categories" (p. 109). Walton is by no means the first to make this observation, but his repeated focus is justified given that many of those speaking and publishing on this topic still talk in ignorance; for instance, "miracles" are said to be part of the "supernatural" realm (that is, where God does stuff) in the Bible whereas "natural events" are said to be distinct and in the "nature