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R. Wagner and A. Briggs, *The Penultimate Curiosity: How Science Swims in the Slipstreams of Ultimate Questions*, 2016

These two authors both live and work in Oxford. They conceived and wrote this book “in weekly breakfast discussions” over a period of sixteen years. Roger Wagner is a painter and poet, principally with religious themes: among his previous books is an illustrated translation of the psalms. Andrew Briggs is a quantum physicist, and Oxford’s Professor of anomaterials since the chair was created for him in 2002; but he also has a degree in theology, is an editor of *Science and Christian Belief* and a Fellow of the International Society for Science and Religion.

Their theme in this book is that, since the birth of *Homo sapiens*, religious and scientific thinking have developed together, inseparably synergistic. The interaction is epitomized by 19th Cy carvings above the doorways of the Oxford University Museum and the Cavendish Laboratory, Cambridge: respectively an angel with an open book and germ cells, and a Latin verse from Psalm 111, translated as “The works of the Lord are great, sought out of all that have pleasure therein”. But European readers need not fear that the book is narrowly focused on English university culture. Though it does not consider the Far East, its geographical coverage is otherwise almost as striking as its range in time. A simplistic summary might say that it is a history of the parallel developments of scientific and religious thinking in European and Islamic cultures over the last 100,000 yrs. But that description does not say that what we are treated to is an unconventional, brilliant, idiosyncratic, and immensely charming essay, which is a privilege to read.

As a production, too, the book is outstanding. About 40% of the pages carry illustrations, often in colour, and the margins are so generous that they easily contain all the notes – much the most convenient place to put them. At the extraordinarily low price of £25, this is another example of how outstanding British publishers, unlike run-of-the mill ones or European firms publishing in English, can still produce selected books at remarkable value. The story – like that of Wentzel van Huyssteen in his 2006 Gifford lectures, though there is no cross-reference – begins with the cave paintings of southwestern Europe. Setting the pattern for their book as a whole, Wagner and Briggs tell it in terms of the people who made the discoveries, and the controversies in which they were involved. Comparable finds in the Americas, southern Africa, Indonesia and Australia reinforced the amazement at what was being found ... while burials and decorative artifacts indicated both what we would now call religious sensibility, and proto-scientific technical skills, tens of millennia earlier still. For the eagerly exploring minds of our two authors, “The relationship between investigating the physical world and reaching out to something beyond it” [p. 53] was already beginning to

appear. Considerable space is then given to the early Greek philosophers, in whom “the conviction of an underlying order provided the rationale for studying whole classes of natural phenomena” [p. 78]. From Pythagoras, through Plato and beyond, mathematics held a leading role in thought – scientific and religious not being meaningfully distinguishable. Though Aristotle and his followers focused much more on biological and medical observation, the end – the *telos* – for which a creature was constructed “linked the study of nature to a wider theology” [p. 89].

All the major strands of Greek thought were later carried forward, for over 800 years, in Alexandria. Wagner and Briggs build their account around the intellectual confrontations of the Christian John Philoponus and the pagan Simplicius the Sicilian. Notwithstanding their conflicting religious traditions, “both shared the assumption that the truths of religion and the truths discovered by reason and observation were part of a single seamless fabric. ... [This was] the ethos of the school in which both had been students” [p. 103].

Alexandria fell to a Muslim army in 642 CE. While the religious and political upheaval imposed by the Caliphs was immense, they were broadly sympathetic to all scholarship. In 8th-10th Cy Baghdad Christian, Jewish and Zoroastrian scholars worked alongside Muslim ones, Greek, Persian and Sanskrit texts appeared in Arabic translations, and Hindu numerals (with zero, and decimal points) were introduced. Names like al-Kindhī, Averroës, Avicenna, al-Ghazali move through these pages. In the later flowering of Islamic scholarship, both in the Middle East and in Spain, John Philoponus is remarkably often invoked. And throughout this great period of scholarship, science – medical, biological, astronomical – continues to be regarded as progressing hand-in-hand with theology. From about 1200, the story can return to Europe. Universities are founded, Albertus Magnus emerges, and draws out Thomas Aquinas; unlike these two, Robert Grosseteste and Roger Bacon are directly and passionately involved in science. Yet this is a brief flowering. Wagner and Briggs mention neither the Black Death nor alchemy, both significant to my own understanding of the story, but they are clear that Gutenberg’s types and the resultant wide circulation of the Bible stirred repressionist, anti-progressive forces within the Catholic Church. Thus we are led into lovely, long treatments of that most brilliant of craftsman- experimentalists, Galileo, and his more mathematical contemporary, the “Lutheran astrologer” Kepler – respectful correspondents across a sectarian divide. And it is fascinating that Galileo’s books still allude extensively to the controversy between Philoponus and Simplicius, 1000 years before. Waiting then in the wings was Newton, who knew that he did not fully understand the forces he described, but insisted (through his expositor Clarke) to Leibniz, “if the cause is not known, is therefore the effect less true?” [p. 282]. The 70 or so pages which consider the discussion group called “Oxonians”, its evolution into The Royal Society, and the towering figures of its early period in both England and France – Boyle and Pascal were other examples – would need a review of their own to summarize. That Descartes receives only two incidental (though respectful) mentions indicates how personal is the approach of our two authors. But its liberal sweep and power is almost breath-taking, and the interface of theology and science is perpetually explored: from the counterpoint between the French Philosophes and the English Natural Theologians, to the later 18th Cy, when the German émigré in England, Wilhelm Herschel, and his equally brilliant son John, draw this extraordinary period to a close. Accordingly, the next vivid engagement we are presented is that when Charles Darwin visited John Herschel at the latter’s observatory near Cape Town. Darwin had long admired the older

man's *Preliminary Discourse on the Study of Natural Philosophy*, which seemed to spell out precisely the attitude of mind with which he himself would later address the question of the Origin of Species. Yet again, the tale is fascinating, not a little poignant, and different in emphasis from more common accounts highlighting such figures as Huxley, Hooker and Sedgwick.

The next section is even more unusual: an excursion into the history of Middle Eastern archeology, and the extraordinary 19th Cy pioneers of translation from the Cuneiform. "The opening of Genesis, while still evidencing a cuneiform substratum, proposes an understanding of the character of God and his relationship to the created world that was unique in the ancient world In the fullness of time it was to have a profound impact on the penultimate curiosities of science" [p. 350]. Nevertheless, "ultimate curiosity, the impulse to see beyond the rim of the physical world, has been a continuous driver for new discoveries within that world. 'The vast ontological presence that is the Hebrew God' caused the pagan myths to be rewritten in such a way that they became signs and pointers to an order which is beyond human comprehension, but could nevertheless be traced in everything from the furthest reaches of the stars to the minute intricacies of Darwin's 'entangled bank'" [p. 362].

The last three chapters of the main book are devoted almost entirely to the incomparable James Clerk Maxwell, of whose work Albert Einstein would later say that "it ended one scientific era and began another" [p. 384]. I have nowhere read a clearer exposition of Maxwell's scientific thought, nor one more sympathetic to his profound religious conviction. He perfectly embodies our authors' ideal of one in whom the pursuit of penultimate questions followed in the slipstream of ultimate ones. It is disappointing, though, to learn that Maxwell declined to join a Society promoting the harmony of science and religion. His justification was that science is always developing, never definitive. This is the only argument I have ever heard from Maxwell which has not persuaded me!

The book ends with a wide-ranging 30-page Epilogue. One section of this notes that traditional arguments about the probability of God, whether deployed by Blaise Pascal or Richard Dawkins, are vitiated by lack of a reference class. It is more fruitful to recognize that our brains are "Bayesian machines", inferring the nature of the world by continuously updating prior probability assessments [p. 424]. Also to follow Donald Mackay's picture of pointers to divinity not as serial arguments, whose strength is only that of the weakest link, but as parallel ones, whose strength is in the overall *Gestalt*. We are then offered a vividly illustrated, but for my comprehension too brief, snapshot of experimental work by Andrew Briggs' research group on some of "the radically counterintuitive predictions of quantum mechanics". But "the necessity (which science shares with art and religion) of living with the unresolved questions inherent in this approach does not ... diminish the quest for answers" [pp. 431-4].

In concluding I have to say that I find the contention around which this book is structured too simplistic: namely that the relation between ultimate and penultimate curiosity has been consistently in one direction, the penultimate following always in the slipstream of the ultimate. This was probably the case until the end of the 18th Cy, but the 19th Cy challenge to religious thought, first of geology, then of biology, was surely massive, and primary? Likewise, the epistemological upheaval of the very physics considered in the last few pages indicates a reversal of the vector which has yet to be fully grasped by philosopher-theologians. Indeed, ESSSAT members often bemoan the fact that most of the exciting

thinking now starts from the science side: ultimate questions swimming in the slipstream of the penultimate. However, the very last sentence of this infinitely civilized book does in fact express the relationship correctly, as two-way, not unidirectional: “the persistent entanglement between penultimate and ultimate curiosity cannot be wished away: it will last as long as humanity lasts” [p. 440]. YES!

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