The Genesis of Science: How the Christian Middle Ages Launched the Scientific Revolution by James Hannam

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Shortlisted for the Royal Society Science Book Prize, James Hannam's *The Genesis of Science* is a work of incredible breadth, weaving a substantial pattern of medieval progress and scientific achievement. The argument is a significant one. Building on foundational studies of natural philosophy by scholars like Edward Grant, David C. Lindberg, and Lynn Thorndike, the book champions the idea that 'natural philosophy in the Middle Ages led to the achievements of modern science' [xxi]. Unlike its predecessors though, *The Genesis of Science* is written for a popular audience. Also, much of the book is an act of intellectual iconoclasm, combatively confronting the pervasive idea within pop intellectualism that the medieval world was scientifically backward. The book is directed at overthrowing the gross misperceptions, caricatures, and generalizations which depict a medieval world where 'there was no science worth mentioning' [xiv]. This metanarrative, Hannam explains, has been promulgated from the Renaissance to the present day as the dominant understanding of scientific progress. Recent books like John Gribbin's *The Scientists* continue to make claims that a figure like the 17th-century physician William Gilbert 'deserves the title of the first scientist' [2002, 68]. Hannam's book rakes at just this kind of misconception by tracing the history of the prejudice and demonstrating how in every medieval century scientific progress was made in logic, physics, mathematics, and technology.

The Genesis of Science combines a generalized survey of the history of ideas from the Fall of Rome in AD 476 to the trial of Galileo in the 17th century with a dose of historical revisionism in order to debunk the popular debasement of medieval thought. There are two very important and very different elements to *The Genesis of Science*: the historical content which is usually benign to

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the point of encyclopedic and Hannam's interpretation of the history, which is more challenging and speculative. While what Hannam has to say about the people, inventions, and discoveries in the medieval world mostly has been said before, his basic argument that this caused (or 'launched') the Scientific Revolution is highly original and deserving of further inquiry.

Taken together, the book surveys more than a dozen medieval thinkers in almost rapid-fire succession. The first eight chapters rehearse common topics, as Hannam steers his readers through the early and high Middle Ages with brief descriptions of the careers of Gerbert of Aurrillac (Pope Sylvester II) and his use of the abacus and astrolabe, and Anselm of Canterbury and his studies in logic. The 11th and the 12th centuries witnessed the advancements made by Adelard of Bath, Peter Abelard, and Peter Lombard. Then, the influx of Aristotelian philosophy—along with Aristotle's two key commentators Averroes and Thomas Aquinas—in the late 12th and 13th centuries brought about a major shift in the formulation of scientific categories and methods. Echoing the opinion of many medieval scholars, Hannam bemoans the neglected emphasis on logic and scholastic rationalism in many contemporary renderings of how science developed. For him, this Aristotelian framework laid the groundwork for modern structures of argumentation, rationality, and falsification.

Students of medieval thought will not find anything entirely novel in this extended summation. In fact, *The Genesis of Science* is highly reliant upon secondary literature for the bulk of its content, though it rarely engages with other scholars directly. Edward Grant's *God and Reason in the Middle Ages* demonstrates many of the same things about science before 1500 with a more nuanced critique of the modernist prejudice against pre-modern science [2001]. One could argue that this preliminary material, at least everything leading up to the 13th century, is tangential to the book's ultimate argument. On the other hand, the way in which Hannam has pulled these various individuals and their ideas together into a single narrative should be commended and appreciated.

In chapters 8–13, we have a better sense of Hannam's end goal, as he begins to set out exactly how the Middle Ages 'launched' the beginnings of modern science. The book positions thinkers like Roger Bacon and Robert Grosseteste as the real genesis of experimentation and scientific discovery (e.g., Bacon's ruminations on the possibilities of gunpowder, flying machines,

and spectacles). Unfortunately, the book's discussion of Grosseteste falls considerably short of A. C. Crombie's study of Grosseteste's impact on later scientific thought [1971]. From here, Hannam moves through late medieval flashpoints of scientific insight in looking at the Oxford don Richard Wallingford's 14th-century mechanical clock, Thomas Bradwardine's work on an early version of logarithms, Richard Swineshead's positing of a mean speed theorem, and John Buridan's examination of momentum and his concept of 'impetus' [179]. All of these present inaugural moments of groundbreaking achievements in science that are usually credited to much later individuals.

In these chapters, the book also carefully notes the Catholic Church's relationship to science. Hannam challenges the perception that the medieval Church was anti-science. Hallmark events like the banning of Aristotle's books in Paris in the 13th-century, the execution of Cecco D'Ascoli, and the trial of Galileo often receive a disproportional amount of attention compared to the broader history. While the Church did strongly censor scientific endeavor, the number of these suppressions pales in comparison to the times when the Church housed, funded, and promoted medieval intellectual advancement. Furthermore, the limitations placed upon thinkers, Hannam insightfully argues, 'served a dual purpose' [97]. The limitations protected theology from rationalistic materialism, which was the Church's primary intent, and it also shielded the scientists themselves 'from those who wanted to see their activities further curtailed' [97]. For much of the medieval period, the Church acted as the defender and patron as well as the regulator of scientific pursuits. Moreover, the book is quick to stress the important role that religion played in the Scientific Revolution. Galileo, Brahe, Newton, and others did not shun religious categories and ideals. Instead, the scientists employed religious structures and motivations in their explorations. As Margaret Osler determines in her *Rethinking the Scientific Revolution*, religion often shaped the questions that science was asking as well as many of the assumptions that guided the groundbreaking discoveries of the 17th century [2000]. By and large, these thinkers sought to establish more certain reasons and explanations for absolute truths about the universe, providing stronger foundations for their religious beliefs.

The real culprit in the book is not religion but Renaissance humanism because of its demeaning view of the Middle Ages. In Hannam's opinion, the mark left by humanism on scientific thought is more negative than positive.

Figures like Desiderius Erasmus, he exclaims, 'almost managed to destroy 300 years of progress in natural philosophy', because humanism despised medieval logic and scholasticism [218]. However, it is here [chs 14–17] that Hannam's argument begins to reveal its own limitations. The book takes the first of several missteps in an effort to confute the popular myth of medieval science by conflating humanism and Protestantism. While they are different, Hannam contends that the more important fact is that the two both protested medieval science. He goes so far as to suggest that 'Protestant writers' like Locke and Hobbes refused 'to give an ounce of credit to Catholics', compounding the assault on the Middle Ages because of their religious prejudice [xv]. Here, Hannam seems to overlook the fact that Hobbes saw Rene Descartes, a devout Catholic, as a worthy opponent for debate over Descartes' theory of light. Likewise, Locke almost certainly borrowed from both Blaise Pascal and Descartes, as John Marshall has pointed out [1994, 138, 196]. Instead, what the *The Genesis of Science* portrays is a pattern of long, continuous progress in scientific thought—which is itself largely synthetic—until Renaissance humanism, followed closely by the Reformation, began demeaning the entire medieval tradition.

Another problematic issue is that the book struggles to communicate the sort of indisputable, direct links and associations between natural philosophers and the Scientific Revolution which are essential to substantiate the argument for causation. Its innovative and bold assertion about the launching of modern science seems to be the book's Achilles' heel. Certainly, it is enlightening to find out that Galileo's work on the mean speed theorem was likely borrowed in part from William of Heytesbury [338]. Also, the book notes that Buridan's mathematics were essential in the curriculum at the University of Paris well into the 16th century, indicating their continued influence over the early modern period [278]. However, these examples are few and far between. In fact, there is an unmistakable sense that the impact of the Middle Ages on the Scientific Revolution was slightly more indirect than Hannam would like to admit. This is exemplified in the book's assessment of Nicholas Copernicus' theory of the Earth's orbit, which is similar to insights found in works by Buridan and Nicholas of Cusa in the 14th century. Unfortunately, Hannam admits, while the three offer essentially 'the same argument' for planetary motion, we still do not know if Copernicus had 'direct access to Buridan's work' [278]. This kind of qualification places serious limitations on his causation thesis. There were certainly seeds planted in the 13th and 14th

centuries that produced fruit later on. Medieval thinkers wrestled with many of the ideas that built the Scientific Revolution; but it remains uncertain, on the whole, how much was borrowed from these wrestlings and how much of the similarity was simply happenstance.

A final point of concern with this book is the somewhat bizarre and jarring statement toward the end:

> You could call any century from the twelfth to the twentieth a revolution in science, with our own century to end the sequence. The concept of the scientific revolution does nothing more than reinforce the error that before Copernicus nothing of any significance to science took place at all [350].

If this is the case, then what exactly is the book about? This comment exposes an unresolved tension for Hannam's overarching argument. What is the significance of the Scientific Revolution in Hannam's view? Was it merely an extension of the previous three or four centuries? Or was it something that the Middle Ages launched? Erasing the Scientific Revolution as a historical period devalues one of the more monumental socio-cultural paradigm shifts in Western science. Alongside the cultural shift of the Renaissance and the philosophical shift in the Enlightenment, science was being reoriented along a different axis, addressing questions from new vantage points and with new ideals. Over the course of the early modern period, science came to be seen no longer simply as a means of understanding the world. Science became a means of manipulating, altering, and reshaping nature to conform the world to human needs and purposes. In *The Scientific Revolution: A Historiographical Inquiry*, H. F. Cohen explains, 'The idea of the applicability of science is…one of the great novelties of the Scientific Revolution' [1994, 192]. The book radically reduces the innovative nature of the Scientific Revolution. In an effort to overthrow the misconception of a rebirth of learning and science from the backwardness of the Middle Ages, it seems that Hannam falls into the opposite trap of not recognizing any major transition at all. This relatively smooth narrative of progress from medieval to modern is unique and useful to a certain extent because it offers an alternative to the dominant perspective of a backward Middle Ages. By positing such a grand story, however, Hannam opens himself up to charges of creating his own kind of historical positivism, wherein the Middle Ages are positioned as just another step in the slow progress toward the present day. Such a characterization is

something that *The Genesis of Science* cannot shake easily as the end goal always seems to be the modern world.

It is difficult to overlook the lack of nuance with which some of the material is handled and the book's attempt to prove a causal relationship ultimately does not quite hit the mark. However, *The Genesis of Science* is an important contribution to challenging the current misconceptions about medieval thought within pop intellectualism and such a counter-assault is long overdue. The fact that it is written as a popular history of science makes it a unique and valuable contribution to the discipline. The book provides an accessible, well-contextualized recitation of often unnamed and relatively unknown thinkers who are too easily forgotten. For his efforts to memorialize these individuals, Hannam should be praised. The analysis of Galileo's impact and importance [chs 19–20] is equally insightful and should be read as a germane summary of the events surrounding the astronomer's career. In general, the book is a piquant introduction to the intellectual world preceding the Scientific Revolution. Few readers will walk away being able to deny the ingenuity and variety of medieval science.

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