R. Hooykaas, *Natural Law and Divine Miracle*

Geology and Christianity

Frans van Lunteren

R eijer Hooykaas's *Natural Law and Divine Miracle: A Historical-Critical Study of the Principle of Uniformity in Geology, Biology, and Theology*, first published in 1959, is not your average classic.¹ The book starts off as a critical analysis of the use of "the principle of uniformity" in the history of geology, then gradually broadens its scope to include theories of evolution and various religious stances, culminating in what comes close to a confession of faith. In between we find some philosophical reflections on the relationship between the more recent "historical natural sciences," such as paleontology and geology, and other traditional fields, such as physics and history. The book is rather schematic, perhaps overly so. Like many works in the history of science dating from the early postwar years, Hooykaas's book falls squarely in the history-of-ideas tradition that dominated the field at the time. In discussing the ideas of his protagonists Hooykaas pays little attention to contextual factors beyond religion and metaphysics. Moreover, he confines himself to published primary sources, while consistently ignoring the (admittedly scarce) secondary literature. I noticed only two references to C. C. Gillespie's *Genesis and Geology*, itself a classic of a more conventional sort that had been published several years earlier.²

So whence its reputation as a landmark publication in the history of science—or, more specifically, the history of geology? It is, above all, in its critical capacities that we find its lasting legacy. The book effectively deconstructed a traditional and tenacious narrative that had come to dominate the literature on the history of geology. This narrative celebrated the nineteenth-century triumphal procession of sober-minded uniformitarians such as Hutton, Playfair, and Lyell, the torchbearers of progressive, empirical science. In order to secure their victory, they needed to overcome the resistance of their conservative catastrophist colleagues, who had been blinded by the tenets of biblical religion and were all too eager to find evidence for Noah's flood. In the latter group we find Cuvier, Sedgwick, and Buckland. This picture creates a false dichotomy between science and religion, overlooks both the weaknesses of the former party and the merits of the latter, and, above all, lacks an empirical basis.

By looking at the way several authors used or discussed the principle of uniformity, Hooykaas was able to show that uniformity meant different things to different actors, ranging from the in-

Frans van Lunteren is Professor of the History of Science at Leiden University and at the Vrije Universiteit Amsterdam. He has published on early conceptions of gravity, the history of Dutch physics, disciplinary formation, science popularization, the decline of natural theology, the conservation of energy, internationalism, and science and modernity. Leiden Observatory, Niels Bohrweg 2, 2333 CA Leiden, Netherlands; f.h.van.lunteren@vu.nl.

¹ R. Hooykaas, *Natural Law and Divine Miracle: A Historical-Critical Study of the Principle of Uniformity in Geology, Biology, and Theology* (Leiden: Brill, 1959) (hereafter references to this book will appear in the text in parentheses).

² Charles Coulston Gillespie, *Genesis and Geology: A Study in the Relations of Scientific Thought, Natural Theology, and Social Opinion in Great Britain, 1790–1850* (Cambridge, Mass.: Harvard Univ. Press, 1951); and N. A. Rupke, "A Second Look: C. C. Gillespie's *Genesis and Geology*," *Isis*, 1994, 85:261–270.

variability of the laws of nature (a tenet accepted by virtually all the authors discussed) to the invariability—in the nature, intensity, or frequency—of the geological processes that derive from those laws. It is one thing to assume that the forces that shaped the crust of the Earth in the deep past are similar to those that have been observed in human history, yet it is quite another to maintain that their intensity and frequency have also been constant. If such distinctions are taken into account, the entire dichotomy between uniformitarians and catastrophists rapidly evaporates. Everyone accepted some kind of uniformity; hardly anyone was consistently uniformitarian in each and every respect.

Hooykaas does not, however, deny the primary role of the principle of uniformity in geology. As he emphasizes, the historical natural sciences, such as geology and paleontology, differ in essential ways from more traditional sciences (e.g., physics) on the one hand and from human history on the other. These sciences therefore had to produce their own methodology, and the principle of uniformity was central to it. Hooykaas, however, sharply distinguishes between uniformity as a *methodological principle*—search for causal explanations that are similar to those that can be or have been observed—and uniformity as a *metaphysical creed*—causal processes in the past cannot have been different from those observed in human history. In Hooykaas's view, the former principle is essential to the practice of geology, the latter an impediment to scientific progress.

Many uniformitarians, however, tended to conflate the two principles, turning method into dogma. Hooykaas gives several examples of actors who ignored, denied, or twisted empirical data that contradicted their uniformitarian creed or who showed themselves highly inconsistent in their application of the principle of uniformity. Indeed, many uniformitarians struggled to make sense of the fossil record, which showed a linear progression of life forms interrupted by sharp breaks. Both these characteristics failed to fit with their uniformitarian convictions. All they could offer to address this problem were meager ad hoc solutions. On the other hand, many catastrophists, following Cuvier, based their theory on these empirical findings rather than on their reading of the Bible. Conversely, as Hooykaas points out, Hutton's theory was deeply informed by his religious outlook.

Moving from strata to life forms, Hooykaas argues that Darwinian evolution, far from being a natural consequence of Lyell's geology (as Thomas Huxley had suggested), was wholly at odds with the principle of uniformity. Strict uniformity required the constancy of life forms; and it would, moreover, be improper to project onto the past processes not observed in the present, such as the transformation of species. Lyell had long been hostile to evolutionary speculations, and his later conversion to Darwinism implied a betrayal of the very principles he had cherished and defended during much of his career. Even more inconsistent was his unwillingness to exempt God from the task of providing for the human mind through a special act of creation.

In his philosophical interlude Hooykaas suggests that, unlike Hutton's and Lyell's endless cyclical processes, progressive evolutionary theories were inspired by biblical influences through the prevalent notion of a linear, "historical" notion of time. As Hooykaas puts it: "The biblical religion is a distinctively 'historical' religion" (p. 146). Hooykaas even claims that "the psychological effect of Genesis 1 upon those believers [catastrophists such as Cuvier and Buckland] was to induce them to put their theories in a historical setting" (p. 147).³ He regards Lyell's warning to the catastrophists—that their theory would inevitably lead to evolutionary conceptions of life—as "prophetic" (p. 147).

The final part of the book deals with the religious or metaphysical outlook of the so-called uniformitarians and catastrophists. While he warns against hasty generalizations, Hooykaas points

³ This suggestion was later taken up by Martin Rudwick; see also Stephen Jay Gould, *Time's Arrow, Time's Cycle* (Cambridge, Mass.: Harvard Univ. Press, 1987).

out that deists and scientific naturalists are predominantly found among the former and the religiously orthodox among the latter. He does, however, discuss several deeply religious theists who willingly accepted the theories of both Lyell and Darwin and who were unable to find in those theories any threat to their religious outlook, even though it was based on a personal and providential deity.

Hooykaas's book has been read primarily as an attempt to restore the balance in the historical judgment of the uniformitarians and the catastrophists. Although it is certainly true that Hooykaas himself was a deeply religious, even orthodox, Calvinist, and although he repeatedly points out in his book that Lyell's critics made valid points, it would be wrong to conclude that he sympathized with the catastrophists. Hooykaas's loyalty lay simply with those who above all respected the facts and were prepared to give up their cherished principles or beliefs in the face of facts that contradicted them.

Hooykaas was certainly not naive. He was fully aware that facts are highly problematic and that our preconceptions at least partly determine how we interpret them. And yet, to Hooykaas, the essence of the truly scientific spirit was to free the mind as much as possible from such preconceptions and to be open to every imaginable explanation that best accords with the empirical facts, no matter how absurd, irrational, or pernicious it may seem. As a true Calvinist, he was only too aware of the weaknesses of the human mind and its propensity to stray. All those who put their religious beliefs, their metaphysical worldviews, or their carefully crafted systems above the facts posed a threat to science, be they religiously inspired catastrophists or dogmatic uniformitarians. Indeed, as a historian he has no qualms about taking such authors to task.

Such epistemic judgments in a scholarly work have become rare nowadays. But then, this is a highly personal book. The last part of *Natural Law and Divine Miracle* contains a clear exposition of Hooykaas's own views on the proper relation between science and religion. In a sense, it reveals much of his own struggles. Hooykaas was a committed Christian who had been trained as a chemist in a secular academic environment. After the war he was employed by a private institution, the Free University of Amsterdam, which aimed to construe a Christian science and frowned on Darwinian evolution. Caught between these camps, Hooykaas found his role models in the past: devoted Christians for whom the study of God's creation was an act of worship and who, unfettered as they were by the systems and prejudices of their times, were open to the unexpected and simply followed wherever the facts led them. In doing so, they were able to keep their science free from religious doctrine. He repeatedly refers to the examples of Kepler, Boyle, Newton, and, above all, Pascal.⁴

To the modern reader, familiar with scholarly attempts to relate Newton's science to the fine structure of his anti-Trinitarian creed, such a view may sound naive. But perhaps one should see Hooykaas's view of these scientists as, above all, a worthy ideal. In Hooykaas's view, Christian humility in the face of God's works is the proper attitude for the scientist. For him, it is hardly a coincidence that modern science arose in a Christian culture: "This attitude of complete surrender is a legacy from the spirit of Christianity bequeathed to science." In this regard, he approvingly quotes the high priest of scientific naturalism, Thomas Huxley: "Sit down before fact as a little child, be prepared to give up every preconceived notion, follow humbly wherever and to whatever abysses nature leads or you shall learn nothing" (p. 210).

Of course, Hooykaas is aware that many Christian scientists have not lived up to this ideal. He is remarkably critical of authors who appeal to science in order to support their religious (or

⁴ See R. Hooykaas, "Pascal: His Science and His Religion," *Tractrix*, 1989, 1:115–139; the article originally appeared in 1939 in Dutch in the journal *Orgaan van de Christelijke Vereeniging van Natuur- en Geneeskundigen in Nederland* (pp. 147–178).

antireligious) convictions. In his view, true science is neutral with respect to metaphysical beliefs. Whatever the outcomes of science, they support neither theism nor naturalism. He is not impressed by physico-theological arguments, and he has even less patience with those who, like some catastrophists, look for evidence of divine intervention in nature. According to Hooykaas, it is an imperative of science to look consistently for natural explanations.

Most importantly, for Hooykaas there is no meaningful difference between miraculous events, attributed to direct divine interventions, and events that conform to natural laws. From a truly theistic and biblical perspective, God's constant activity shines through to the same extent in both cases. As he puts it: "The scientist, even when he is a believer, is bound to try as far as possible to reduce miracles to regularities; the believer, even when he is a scientist, discovers miracles in the most familiar things" (p. 206). Those who invoke miracles in support of divine providence buy into the naturalistic worldview of the deists who artificially separate natural laws from divine activity. For this reason, Hooykaas ranks several catastrophists in the category of semi-deists—an interesting, although from a historical point of view somewhat dubious, suggestion.

Like his role models from the past, Hooykaas showed a highly independent mind. He rejected the scientific naturalism of most of his academic colleagues, but he also rejected the attempts of theologians at his own university, as well as members of the synod of his own denomination, to meddle in scientific questions about geology and evolution. When the Calvinist Free University of Amsterdam developed in a direction not to his liking, he gave up his chair in the history of science for a similar one at the secular state university of Utrecht. Although averse to sociological and especially Marxist approaches in historical work, he readily accepted Edgar Zilsel's thesis relating the birth of modern science to the social rise of several groups of artisans. And in spite of his aversion to atheism and naturalism, he repeatedly praised Huxley for his clear and just insights.

In Amsterdam, Hooykaas found a worthy successor in Martin Rudwick. For Rudwick, Hooykaas's *Natural Law and Divine Miracle* was a "pioneering book" and a major source of inspiration.⁵ Given Rudwick's extraordinary achievements in the history of geology and paleontology, this judgment in itself justifies the assignment of the label "classic" to the book. Like Hooykaas, Rudwick was trained as a scientist; and, like Hooykaas, he sees himself as a Christian. Rudwick too displays an independent mind, and he also relinquished his Amsterdam chair after a clash with the board of the ("sadly misnamed") Free University.⁶ In his subsequent publications Rudwick achieved a level of scholarly sophistication that went far beyond the more traditional approach of Hooykaas.

One of Hooykaas's main strengths was his versatility. He did not confine himself to the history of chemistry and geology but also worked on Copernican astronomy and, in another pioneering project, on the history of crystallography. He was fluent in several foreign languages. Well into his fifties, he learned Portuguese in order to establish the decisive role of Portuguese seafarers in triggering the Scientific Revolution by breaking the spell of classical authorities. In Hooykaas's view, these plain, nonscholarly mariners made their mark by establishing simple facts that failed to conform to the elaborate classical doctrines of their time.⁷

⁵ Martin J. S. Rudwick, "The History of the Natural Sciences as Cultural History," inaugural lecture, Free University of Amsterdam, 23 May 1975, p. 13; see also Rudwick, "Historical Analogies in the Geological Work of Charles Lyell," *Janus*, 1977, 64:89–107, esp. p. 89.

⁶ Martin J. S. Rudwick, *The Great Devonian Controversy: The Shaping of Scientific Knowledge among Gentlemanly Specialists* (Chicago: Univ. Chicago Press, 1985), p. xxiv.

⁷ For biographical details on Hooykaas see H. F. Cohen, "Eloge: Reijer Hooykaas, 1 August 1906–4 January 1994," *Isis*, 1998, 89:181–184.

As outdated as much of Hooykaas's work may appear to the modern historian, the personal commitment displayed in his writings, his intellectual independence, and his reverence for bold, unadorned facts still hold a valuable lesson for us all, especially in these times of fierce academic competition, where intellectual fashions and the need to impress one's peers tend to take precedence over plain curiosity. Humility and openness to the unexpected no less become the historian.

Four Books for the Price of One

Abraham (Ab) C. Flipse

The first time I came across *Natural Law and Divine Miracle: A Historical-Critical Study of the Principle of Uniformity in Geology, Biology, and Theology* was during my study of the discussions about religion and science in Reformed (neo-Calvinist) circles in the Netherlands.¹ Since the late nineteenth century there had been in those circles debates about themes like miracles, causality, the relation between God and the world, and the influence of worldviews on science. A great deal of energy was put into opposing the view that religion and science were necessarily in conflict. On the other hand, some conservative theologians sympathized with Young Earth creationism, which instead reinforced the idea of conflict. In this environment Calvinist scientists organized, as late as 1950, a congress to convince their fellow believers that the Earth was really very old.²

In this context—and more in particular in reaction to that congress—Reijer Hooykaas, at the time a professor at the Calvinist Vrije Universiteit (Free University) in Amsterdam, began his study of the history of geology. He was convinced that the contemporary discussion would be improved by a clarification of the concepts involved and that the best way to achieve this was by acquiring more insight into their origin and historical use. During the following decades Hooykaas's research would result in numerous publications on the history of geology, one of the first among them being the present book.³

When I first read the book I interpreted it primarily as part of the discussion in Calvinist circles. But it is much more than that. It actually played very little role in the discussion in the Netherlands, perhaps largely because Hooykaas had published it in English. It was certainly noticed internationally among historians of science, particularly among the first generation of historians

Abraham (Ab) C. Flipse is a historian of science and the university historian at the Vrije Universiteit Amsterdam. His research focuses on the history of universities in the twentieth century and the historical relationship between science and religion. Department of History, Faculty of Humanities, Vrije Universiteit Amsterdam, De Boelelaan 1105, 1081 HV Amsterdam, Netherlands; a.c.flipse@vu.nl.

¹ R. Hooykaas, *Natural Law and Divine Miracle: A Historical-Critical Study of the Principle of Uniformity in Geology, Biology, and Theology* (Leiden: Brill, 1959) (hereafter references to this book will appear in the text in parentheses); and A. C. Flipse, "Against the Science-Religion Conflict: The Genesis of a Calvinist Science Faculty in the Netherlands in the Early Twentieth Century," *Annals of Science*, 2008, 65:363–391.

² A. C. Flipse, "The Origins of Creationism in the Netherlands: The Evolution Debate among Twentieth-Century Dutch Neo-Calvinists," *Church History*, 2012, 81:104–147; and G. J. Sizoo *et al.*, *De ouderdom der aarde* (Kampen: Kok, 1951).

³ On Hooykaas see, e.g., H. F. Cohen, "Eloge: Reijer Hooykaas, 1 August 1906–4 January 1994," *Isis*, 1998, 89:181–184; and A. C. Flipse, "Reijer Hooykaas (1906–1994)," *Studium*, 2013, 6(3/4):287–291.