FACT, FAITH AND FICTION IN THE DEVELOPMENT OF SCIENCE

BOSTON STUDIES IN THE PHILOSOPHY OF SCIENCE

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FACT, FAITH AND FICTION IN THE DEVELOPMENT OF SCIENCE

*The Gifford Lectures Given in the University
of St Andrews 1976*

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EDITORS' FOREWORD

THE BOOK AND ITS AUTHOR

This is a book in which the past of science comes alive in a way both personally coloured and generally accessible. Like all publications by the late Professor R. Hooykaas, it is at the same time a scholarly work, based from start to finish upon original, thorough research. *Fact, Faith and Fiction in the Development of Science* is the title he himself gave to the book. Its chapters started life as the Gifford Lectures he delivered at the University of St Andrews in 1976. From then on until his death in 1994 he worked on and off to expand these lectures into even more cogently argued, well-annotated and illustrated chapters. Out of that effort came what now lies before us — a book that, more comprehensively so than any other work he wrote, exemplifies the unique Hooykaas approach to the history of science.

The title is meant to express what Hooykaas regarded as the broad, threefold constitution of the scientific endeavour. 'Faith' is not to be equated here with religion, the relations of which to science were often the subject of Hooykaas's investigations. Rather, as he explains in the Introduction, in the context of the present book he meant by that term such broad, *a priori* held conceptions as may lead the scientist on his or her adventurous path towards the unknown, like the idea of unity, of order, of simplicity, or of harmony. Science in its ongoing advance, so we believe we may sum up Hooykaas's final convictions on the matter, never ceases to display quite variously mingled contributions from *faith* (in the sense just indicated), from *facts* (given by nature yet entirely subject to our mode of interpreting them), and from *fictions* in the sense of those daring intellectual tools, such as theories and hypotheses and models, which reflect the scientist's creative imagination. However much Hooykaas loved to point at recurrent patterns in scientific thought through the ages, he was also convinced that no generalized rule can tell the scientist how the three basic elements here distinguished ought to be combined in any given case — the historian of science must learn to cope with the endless and, as such, quite captivating *variety* of ways in which this triad (facts; broad, leading ideas, and specific theorizing) has gone into the making of what at any given point in time could with justice be called 'science'.

Such, then, is the leading idea of the present book.

Between 1976 and 1998 a good deal of work on the book has taken place. During Hooykaas's remaining lifetime, VMcK, who together with her late husband had been a friend of the Hooykaas family for decades, did her utmost to encourage

Hooykaas, to put chapters on disk file as they emerged from his study, to suggest and (with his consent) carry out improvements in both the content and the language of the book, and to seek for the final touch wherever possible. Out of that joint effort came eleven, either fully or almost completed chapters — a loss of five as compared to the total number of lectures, which is a great pity but not irreparable in view of the set-up of the book, which is intended not so much as a fully integrated argument, but rather as a range of case studies, each delving deeply but essentially on its own, and meant to illustrate the broad, underlying thesis outlined above.

After Hooykaas died, HFC, who had first been his student and later became his colleague, was entrusted with his intellectual legacy. A good portion of Hooykaas's well-stocked library is now in the Museum Boerhaave at Leyden; his notes and correspondence make up the Hooykaas collection at the North Holland National Archives in Haarlem, and the book project on which he was working is now in the reader's hands. In order to get it there, final touches still had to be applied. While sticking meticulously to Hooykaas's own written text, we had to make sure about hosts of leftover details like note numbers or captions or stray inconsistencies or the status of some corrections. The efforts involved were carried out in good part by HFC's one-time graduate student, JCB, who was financially enabled to do so thanks to a 3-months-grant, here gratefully acknowledged, from the Netherlands Organisation for Scientific Research NWO. Further acknowledgements and expressions of gratitude, as well as a more detailed history of the text and an account of editorial actions with regard to it, are to be found at the back of the book, starting on page 429. The remainder of this Foreword is devoted to the author and his scholarly endeavour. (Most of what follows appeared previously in an eulogy written by HFC in *Isis* 89 (1) of March 1998, pages 181-184).

In the field of history of science, Hooykaas was among the pioneers. Along with a range of other gifted loners in the 1920s and 1930s, he taught himself how to leave behind customary roots seekers' and philosophers' history of science, in a fresh search for ways and means to treat the past in its own right, for the various frames in which scientists have set themselves problems and struggled for solutions. The effort pervades the programmatic introduction to the book Hooykaas published in 1933 as his doctoral dissertation, *Het begrip element in zijn historisch-wijsgeerige ontwikkeling* ('The concept of element in its historical-philosophical development'). This introduction takes its place among several other pieces of the interbellum period in laying down rules — or, rather, sketching a mindset — required for turning the history of science into real history. The sense of personal discovery exuded by the piece, and indeed by the entire book that followed, was never to leave Hooykaas. It contributed in no small measure to the captivating

liveliness of his teaching — the message and the maxims he tirelessly sought to convey to his students were the fruit of his own, personal quest.

Reijer Hooykaas was born in 1906 in Schoonhoven, into a Calvinist family of local silversmiths. He studied chemistry at the University of Utrecht. The choice of a topic for his dissertation was hardly an obvious one — the more so since, in the 1930s, it was not at all clear whether he would ever have a chance to pursue the history of science other than as a spare time occupation. Hooykaas became a chemistry teacher at two grammar schools in succession, using his spare time first for completing his PhD thesis and then for writing a range of articles published mainly in two Dutch periodicals: a chemists' weekly, for which he elaborated findings of his dissertation, and a journal for Protestant scientists and physicians, which became the somewhat unlikely recipient of profoundly original studies on Kepler's concept of hypothesis and on Pascal's science and religion. The latter publications, in particular, aroused sufficient interest in the history of science at the Free University of Amsterdam (the intellectual centre of Calvinism in the Netherlands) that a chair was created immediately after World War II — the first anywhere in the country — which Hooykaas was called to occupy. From 1948 to 1960 he added mineralogy and crystallography to his university teaching schedule. In 1967 he moved to the University of Utrecht in order — after an interregnum involving Struik and Ravetz — to succeed E.J. Dijksterhuis. Here he stayed until he retired in 1976, using the time not only to pursue his own studies and to create a certain amount of *Nachwuchs* but to turn what had been little more than a room in a large building into a sparingly housed yet full-fledged and well-equipped Institute for the History of the Exact Sciences. In no way did his retirement mark a break in his research — he undauntedly went on to make contributions to the field almost to the end.

As the reader of the present book will readily appreciate, the most striking aspect of Hooykaas's historiographical legacy is its versatility. Atomism both ancient and modern, alchemy, iatrochemistry, the Chemical Revolution — all broached in the dissertation — were the subjects of many articles, some written in English for *Janus* or the *Archives Internationales*, some in German for *Sudhoffs Archiv*. The history of science in the Netherlands naturally received some in-depth study — for example, essays on Isaac Beeckman, on Christiaan Huygens, on Dutch scientific societies, on Copernicanism in the Netherlands, and on what science meant for government policy in the Golden Age of the Dutch Republic. Historical problems of science and religion provided food for many articles and some books, including an authoritatively edited and annotated edition of Rheticus' lost theological defence of heliocentrism rediscovered by Hooykaas. In the early 1960s he taught himself Portuguese, going on to do pioneering work on the significance for science of the Voyages of Discovery and the intellectual upheaval these created

in a humanist culture — here *Science in Manueline Style*, which appeared both separately and as a part of Volume 4 of the *Obras completas de D. João de Castro* was the principal fruit. The history of crystallography caught his attention, leading to lengthy studies of, among others, Romé de Lisle and Haüy. Uniformitarianism and other basic issues in the history of geology likewise made for several path-breaking books and articles, most of them written in English. Petrus Ramus was the subject of a book, this one in French. Methodological issues came in for scrutiny in yet other contexts. Nor is this quite an exhaustive list. Still, it should go far to explain how in 1971 Hooykaas could publish (in Dutch, to be sure) a 'History of the sciences from Babel to Bohr,' which provides a continuous story by blending summaries of his own publications and little else. It seems safe to say that no other serious historian of science could have pulled off such a feat.

Where, amidst all this variety, was the heart of the history of science located in Hooykaas's view? Not in one single feature; not in some all too beautifully fitting system. He detested monolithic thinking and, for all his love of order and orderliness, abhorred grand systems. 'The Bible has no system', he wrote repeatedly of that primary source of inspiration to him. Rather, basic to Hooykaas was his concrete, almost tangible conception of nature. He was certainly not a simple-minded apologist for Protestantism in his many studies on the historical relations between science and religion, as a glance at his masterful 1939 article on Pascal or his 1943 book on Boyle or many a passage in the present book will reveal, yet it is clear that a biblical conception of nature as freely created by a sovereign God in accordance with His own ways (as distinct from the ways of human beings) stood at the centre of Hooykaas's historical thought. Hooykaas found the historical drama of humanity's ongoing search to gain a grasp on nature to reside in this: how the human mind, with all its subjectivity and its capacity for self-deception, but also its piercing gifts of discovery, has through the ages come to terms with what he once felicitously called 'the whimsical tricks of nature'. Time and again our intellect seems to have caught nature in its net; time and again nature, induced by our very search to do so, breaks out of the net by displaying novel features that time and again may fail to comply with what we had been led to expect. And it is precisely this ever-recurring interplay between nature and the scientist, between 'facts' on the one hand and 'faith' and 'fiction' on the other, which Hooykaas never sought to bring out more cogently than in the present work.

Its chapters, accordingly, achieve this aim in quite different ways. Some are mostly centred on one individual (e.g., Copernicus and contemporary reasons for accepting or rejecting heliocentrism). Others pursue one topic through the centuries (e.g., how one side-issue treated by Newton in the *Principia* both stimulated and blocked research up to Dalton and beyond). Again others focus on a particular

period (e.g., medieval efforts to turn Aristotelian natural philosophy into mechanical science). The joint effect these varied chapters are likely to have on the reader is to get across a feeling for the boundless richness of humankind's efforts to come to grips with nature. This is accomplished without drowning the reader in an equally endless sea of historical facts, but rather by confronting him or her with a range of very learned yet quite accessible variations upon one common theme. The inspiration Hooykaas's oral presentations so abundantly exuded has been preserved here in written form. What the reader may certainly *not* expect is an up-to-date inclusion and/or discussion of the secondary literature on topics here treated. What he or she *may* expect is a coherent, erudite vision of science through the centuries, vividly illustrated by means of instructive examples chosen from all over its many branches, spiced by countless flashes of typical Hooykaas insight, and invariably taken straight from original, published sources. Whether a historian or not, every reader with an interest in the realities of the scientific pursuit may benefit from Hooykaas's wisdom here collected in concentrated form.

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[NB Aspects of Hooykaas’s life and work are examined in a range of obituaries, e.g., one in *Perspectives on Science and Christian Faith* 48, 2 (June 1996) by Arie Leegwater, or the one in *Isis* already mentioned; also in several sections of HFC’s book *The Scientific Revolution. A Historiographical Inquiry*. Chicago: University of Chicago Press 1994, and in J.H. Brooke’s and M. Hunter’s 1997 Foreword to the translated version of Hooykaas’s book on Boyle listed above].

Professor R. Hooykaas
(1 August 1906 – 4 January 1994)