

# Mary Brenda Hesse

15 October 1924 – 2 October 2016

elected Fellow of the British Academy 1971

by

NICHOLAS JARDINE



MARY HESSE

on the occasion of her being awarded an Honorary Doctorate by the University of Cambridge in 2002

Mary Brenda Hesse was born in Reigate, Surrey, on 15 October 1924.<sup>1</sup>

Following a wartime course in electronics and work on the building of transmission receivers, Mary Hesse studied at Imperial College of Science and Technology, London, proceeding to a BSc in special mathematics in 1945, an MSc in 1946 and a PhD in electron microscopy in 1948. She then studied history and philosophy of science under the supervision of Herbert Dingle at University College London, gaining a second MSc in 1950. From 1947 to 1951 Hesse taught mathematics at the women-only Royal Holloway College London, then from 1951 at the University of Leeds. From 1955, following the retirement of Herbert Dingle, she took over the teaching of history and philosophy of science at University College London. In 1960, she was appointed to a university assistant lectureship in philosophy of science at Cambridge, then promoted in 1962 to a lectureship, in 1968 to a readership and in 1975 to a professorship. In 1965, she became one of the founding fellows of the newly formed postgraduate Wolfson College, Cambridge, of which she served as Vice-President from 1976 to 1980. She was elected a Fellow of the British Academy in 1971. In 2002, she was awarded an Honorary Doctorate by the University of Cambridge.

Mary Hesse was active and effective in promoting the recently formed discipline of history and philosophy of science, playing a major role in the 1972 establishment of an independent Cambridge University department in the subject. She served as Vice-President of the British Society for the Philosophy of Science (1970–1), Vice-President of the British Society for the History of Science (1975–7), President of the Philosophy of Science Association (1979–80), on the Council of the British Academy (1979–82), and on the University Grants Committee (1980–5). She edited the *British Journal for the Philosophy of Science* from 1965 to 1969, and from 1975 she was first co-editor then a consulting editor of *Studies in History and Philosophy of Science*. Hesse was widely welcomed as a visiting professor, at the universities of Yale in 1962, Minnesota in 1966, Chicago in 1968 and Notre Dame in 1970. At Cambridge, from 1977 to 1980 she delivered the Stanton Lectures on Philosophy of Religion, and at Edinburgh in 1983, with Michael Arbib, the Gifford Lectures on Natural Theology.

The bulk of Hesse's major contributions to the history and philosophy of science is to be found in her five books (the last of them co-authored).<sup>2</sup> In 1954, aged thirty

<sup>1</sup>For further details of her life and career, see M. Hallberg, 'Hesse, Mary Brenda', in S. Brown (ed.), *Dictionary of Twentieth-Century British Philosophers*, vol. 1 (Bristol, 2005), pp. 406–9; M. Hallberg, 'Revolutions and reconstructions in the philosophy of science: Mary Hesse (1924–2016)', *Journal for General Philosophy of Science*, 48 (2017), 161–71.

<sup>2</sup>For a full bibliography, with reviews and secondary literature on Hesse's life and work, see M. Collodel, 'Website in Honour of Mary Hesse', <http://www.collodel.org/hesse> (accessed 15 March 2018). On her major contributions to the philosophy of science as represented in articles in the *British Journal for the Philosophy of Science*, see S. French, 'Models and meaning change: a brief introduction to the work of Mary Hesse', *British Journal for the Philosophy of Science*, Special Virtual Issue on the Work of Mary Hesse (2017), [https://academic.oup.com/bjps/pages/Mary\\_Hesse](https://academic.oup.com/bjps/pages/Mary_Hesse) (accessed 15 March 2018).

and lecturing on mathematics at Leeds, Hesse produced *Science and the Human Imagination*, a work of extraordinary richness and originality based on her MSc dissertation at University College London and the lectures she had given there. In this book, which contains the germs of much of the later work for which she is renowned, Hesse challenges on historical and philosophical grounds the view of science as an isolated, disinterested activity showing inexorable progress, arguing that ‘the sciences, exemplified here by dynamics and astronomy, have always been closely related to their cultural and religious environment’.<sup>3</sup> The first part of the book is largely historical, emphasising practical craftsmanship and medieval Christianity as roots of the Scientific Revolution, and going on to spell out the subsequent ever-sharper divorce of science from religion. The second part of the work provides a detailed critique of positivistic accounts of the status of scientific theories. There follows her own account of their status as analogies, drawn from a wide range of familiar types of experience and reflecting cultural attitudes and preoccupations. In the epilogue, she concludes that ‘the practice of scientific research therefore has room for the creative imagination and for recognition of the transcendent, and is not necessarily an arid and impersonal affair, incapacitating the scientist for life in the world of personal encounter’.<sup>4</sup>

In 1961 there appeared the heftiest of Hesse’s books, *Forces and Fields*.<sup>5</sup> Meticulously researched, and ranging from the pre-Socratics to quantum field theory, this is widely acknowledged as a major contribution to the history of science. Though the preface acknowledges indebtedness to Karl Popper, the opening chapter on the logical status of theories and the case studies throughout effectively contest hypothetico-deductive accounts of theory justification of the kinds promoted by Popper and Carl Hempel, demonstrating the plurality of criteria for acceptability of scientific hypotheses—empirical adequacy, support by analogical inference, falsifiability, formal simplicity, universality of scope and so forth. The final chapter considers with striking open-mindedness the claims for action at a distance involved in telepathy and clairvoyance.

*Models and Analogies in Science* came out in 1963.<sup>6</sup> In this, the shortest of her books, Hesse offers a rigorous development of her ideas on the fundamental roles of metaphorical description and analogical inference in the sciences. The first part is cast as a dialogue between Pierre Duhem, dismissive of models as dispensable psychological aids favoured by the broad but shallow English mind, and Norman Robert

<sup>3</sup> M. B. Hesse, *Science and the Human Imagination: Aspects of the History and Logic of Physical Science* (London, 1961), pp. 9–10.

<sup>4</sup> *Ibid.*, p. 161.

<sup>5</sup> M. B. Hesse, *Forces and Fields: the Concept of Action at a Distance in the History of Physics* (London, 1961).

<sup>6</sup> M. B. Hesse, *Models and Analogies in Science* (London, 1963).

Campbell, proponent of essential roles for models in the formation and justification of theories. The second part analyses the types of analogy involved in scientific models, showing how they involve both horizontal analogies, that is, similarities of properties, and vertical analogies, that is, correspondences between causal relations. Hesse emphasises the heuristic role of neutral analogies, those whose validity is as yet unknown, as bases for further investigation. In the third part, she provides logical accounts of support of hypotheses through various types of analogical inference. This has proved to date the most influential of Hesse's books, widely cited not only by philosophers but also in cognitive psychology and linguistics, where the past twenty years have seen an escalation in studies of the cognitive roles of analogy and metaphor.<sup>7</sup>

Hesse's most technical production in the philosophy of science, *The Structure of Scientific Inference*, was published in 1974. In this wide-ranging collection, she starts by building on insights of Duhem and Quine on the theory-laden nature of scientific observations and on the semantic status of theoretical terms. According to her network model, the applications of all predicates of the sciences are dependent on their entrenchment in a network of generalisations; and the modes of entrenchment of all predicates, both the relatively observable and the relatively theoretical, are liable to modification. The heart of the work provides rigorous inductive logical explications of confirmation, generalisation and argument by analogy.<sup>8</sup> In the final chapter, Hesse suggests that her network model supports a form of scientific realism, one that can meet the challenges of underdetermination of theory by data and radical discontinuities in the history of scientific theory. This moderate realism can, she claims, explain the instrumental success of the sciences in terms of accumulation of approximate truths.

In 1980 there appeared *Revolutions and Reconstructions in the Philosophy of Science*, a collection of articles from the previous fifteen years. Chief among the revolutions referred to in the title is the then recent move of many philosophers of science, including herself, away from logical-analytic accounts of scientific method and the status of theories to more naturalistic accounts, grounded in the past and present practices of scientists.<sup>9</sup> One major consequence of this shift that she draws

<sup>7</sup>See, for example, J. M. van der Meer (ed.), 'Focus: articles on Mary Hesse and metaphor', *Philosophical Inquiries*, 3 (2015), 41–181, and the references to her work in S. Maasen and P. Weingart (eds.), *Metaphor and the Dynamics of Knowledge* (London, 2000); note that the index of the latter lumps together under 'Hesse, A.' references to Mary Hesse and to the political economist Albert Hesse.

<sup>8</sup>M. B. Hesse, *The Structure of Scientific Inference* (London, 1974), chs. 3–11.

<sup>9</sup>Hesse reflects on judicious appeal by philosophers of science to the history of science in 'The hunt for scientific reason', in P. D. Asquith and R. N. Giere (eds.), *PSA 1980: Proceedings of the 1980 Biennial Meeting of the Philosophy of Science Association*, vol. 2: *Symposia* (East Lansing, MI, 1981), pp. 3–22.

attention to has been recognition of the extent to which theories are underdetermined by data; and Hesse presents the articles in the volume as her attempts, faced with such underdetermination, ‘to steer a course between the extremes of metaphysical realism and relativism’.<sup>10</sup> The first part of the book explores the consequences of this revolution for the historiography of the sciences. It focuses on two drastic alternatives to the discredited ‘inductive’ histories of scientific progress culminating in current orthodoxies: abstinence from all evaluation, in order to understand past sciences in terms of the thought processes of their ages; and the so-called ‘Strong Programme’, seeking to explain past science in terms of pursuit of social interests. Both are granted limited approval. In the first case, Hesse fully concedes that historians of science should seek to understand past scientific beliefs in the conceptual settings of their periods, while insisting that an element of evaluation from our present standpoint is inevitable if we are to judge what in the past is to count as science.<sup>11</sup> As for the Strong Programme, far from attacking it head on, Hesse welcomes a watered-down version, endorsing the view that ‘rational norms and true beliefs in natural science are just as much explananda of the sociology of science as are non-rationality and error’, while rejecting ‘social determinism’ and insisting that the ‘cultural norms’ appealed to in social explanations of scientific theory should include ‘rational rules’ adopted in a society.<sup>12</sup> The second part of the book elaborates on the roles of models and analogies in the sciences, and on the complex interactions of theory with observation. Here we see a notable shift away from her previous moderate realism. Where before Hesse had argued that appeal to experientially based models and other conditions for theoretical coherence suffices to defend a moderate realist view of science against the arguments from underdetermination of theory by data, she here concedes that the plurality of experientially based models undermines her earlier position. By way of reconstruction, she moots how the notion of scientific objectivity might be rescued in the context of a pragmatic account of truth as consensus achieved through mutual interpretation and reasonable dialogue. The final chapter touches on truth in theology; and there she declares her commitment to a Christian theology that would ‘address the real conditions of our society’.<sup>13</sup>

In *Revolutions and Reconstructions* and her final book (co-authored with Michael Arbib), *The Construction of Reality*, Hesse engages closely with Jürgen Habermas’s *Knowledge and Human Interests* and his postscript to that work.<sup>14</sup> This, incidentally, is

<sup>10</sup>M. B. Hesse, *Revolutions and Reconstructions in the Philosophy of Science* (Brighton, 1980), p. xiv.

<sup>11</sup>Ibid., ch. 1.

<sup>12</sup>Ibid., pp. 56–7.

<sup>13</sup>Ibid., p. 252.

<sup>14</sup>J. Habermas, *Knowledge and Human Interests* [1968], trans. J. J. Shapiro (London, 1972); J. Habermas, ‘A postscript to *Knowledge and Human Interests*’, *Philosophy of the Social Sciences*, 3 (1973), 157–89.



what provoked the entry by Hesse's colleague Hugh Mellor in the satirical *Philosophical Lexicon*: 'Hessean, noun. A kind of sackcloth worn at a habermass by those renouncing hemple mindedness.'<sup>15</sup> Hesse was, in fact, no blind devotee. She calls into question several of Habermas's central positions—notably his commitment to a universal conception of rationality and the sharp distinction he draws between natural sciences, grounded in pursuit of prediction and control, and human sciences, grounded in pursuit of mutual understanding. However, there is much that she adopts. In particular, the pragmatic account of truth that she sketches for all fields of inquiry draws on Habermas's account of truth as consensus achieved through free and reasonable dialogue; and she endorses much of his hermeneutic theory, while insisting on its relevance to the natural as well as the human sciences. Hesse also engages with Habermas's views on critique, the quest for liberation from political and ideological domination; and in this connection she considers religion as emancipatory. Where her *Models and Analogies* and *Structure of Scientific Inference* are exemplary in their meticulous arguments from clear premises to clear conclusions, in *Revolutions and Reconstructions* and her contributions to *Construction of Reality* she conducts open-ended explorations and virtual dialogues, in line with her Habermasian vision of conversation as the proper route to consensus. Readers seeking rigorous advancement of specific doctrines may be frustrated; but those who value novel questions and indications of new lines of inquiry will find these works immensely rewarding.

*The Construction of Reality* appeared in 1986, a year after Hesse took early retirement. This remarkable work attempts nothing less than to 'reconcile an account of the individual's construction of reality ... with an account of the social construction of language, science, ideology, and religion'.<sup>16</sup> Such reconciliation is sought through the development of 'schema theory', which sets out to specify the processes through which stable representations are achieved. Hesse's main contributions are in the chapters devoted to social schemas. Her emphasis is on the values in pursuit of which social consensuses are formed. Religion, for example, is presented as the product of social search for a good life, a life freed from evil through communion with God.<sup>17</sup>

On retirement, Hesse launched herself into a new career in landscape history.<sup>18</sup> In 1985 and 1986, she completed Certificates in Landscape History and Archaeology,

<sup>15</sup> D. Dennett and A. Steglich-Petersen, *The Philosophical Lexicon*, 2008 edition, <http://www.philosophicallexicon.com/> (accessed 15 March 2018).

<sup>16</sup> M. A. Arbib and M. B. Hesse, *The Construction of Reality* (Cambridge, 1986), second cover.

<sup>17</sup> *Ibid.*, p. 102.

<sup>18</sup> This account of Mary's post-retirement research is based on 'Philosopher to local historian: Mary Hesse', in D. Wilson and F. Midgley (eds.), *Ringling True: Memories of Wolfson College, Cambridge, 1965–2015* (Cambridge, *The Cambridge Review Committee*, 2015), pp. 89–90. My thanks to Fiona Brown for a copy of this anonymous article and to Susan Oosthuizen for sending me her contribution to it,

and in Local History, at Cambridge University's then Board of Extra-Mural Studies (now Institute of Continuing Education). She was active in the Cambridge Antiquarian Society from 1991 to 2001, serving successively as its Honorary Secretary, President and Vice-President; and in the late 1990s she founded the Landscape and Local History Group, a discussion forum for researchers in and outside the University. Her first publications in landscape history dealt with fields, boundaries and land tenure around the Creake villages in north Norfolk.<sup>19</sup> These were followed by studies of Suffolk, including widely cited articles on the arable exploitation and settlement patterns implied by Domesday Book entries.<sup>20</sup> Hesse was a leading member of the South-West Cambridgeshire Project, a community landscape history enterprise run from the University's Institute of Continuing Education from 1997 to 2007. In this capacity, she worked on the reconstruction of medieval field systems in a number of parishes. That material was published both in journals and in informal reports of the project, which she edited with Susan Oosthuizen.<sup>21</sup> At the same time, she researched the identification of Anglo-Saxon and medieval boundaries and hundred meeting places across the Cambridge region.<sup>22</sup> In her final article, of 2007, she reconstructed the development of Cambridge's medieval East Fields.<sup>23</sup>

What holds together this quite extraordinary range of original research and speculation? To borrow three terms from theology, I suggest that Hesse's work can be seen as *eirenic*, *ecumenical* and *syncretic*. It is *eirenic* in its generous and charitable handling of positions at odds with her own. One instance, already noted, is her conciliatory critique in *Revolutions and Reconstructions* of the Strong Programme in the sociology of science; another is one of her last philosophical articles, 'How to be post-modern without being a feminist', published in 1994, in which she approves of feminist contributions to the history and philosophy of science, while distancing herself from the notion of a distinctive feminist epistemology.<sup>24</sup> In line with this charity

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together with a listing of Hesse's publications on landscape history, and for checking and improving my account of Hesse's work in this area.

<sup>19</sup>M. B. Hesse, 'Fields, tracks and boundaries in the Creakes, North Norfolk', *Norfolk Archaeology*, 41 (1992), 305–24; M. B. Hesse, 'Field systems and land tenure in South Creake, Norfolk', *Norfolk Archaeology*, 43 (1998), 79–97.

<sup>20</sup>M. B. Hesse, 'Domesday land measures in Suffolk', *Landscape History*, 22 (2000), 21–36; M. B. Hesse, 'Domesday settlement in Suffolk', *Landscape History*, 25 (2003), 45–57.

<sup>21</sup>M. B. Hesse, 'Field systems in Southwest Cambridgeshire: Abington Pigotts, Litlington and the Mile Ditches', *Proceedings of the Cambridge Antiquarian Society*, 89 (2000), 49–58.

<sup>22</sup>M. B. Hesse, 'The Anglo-Saxon bounds of Littlebury', *Proceedings of the Cambridge Antiquarian Society*, 83 (1995), 129–39; M. B. Hesse, 'The field called "Augey" in Ickleton: an Anglo-Saxon enclosure?', *Proceedings of the Cambridge Antiquarian Society*, 85 (1997), 159–60.

<sup>23</sup>M. B. Hesse, 'The East Fields of Cambridge', *Proceedings of the Cambridge Antiquarian Society*, 96 (2007), 143–60.

<sup>24</sup>M. B. Hesse, 'How to be postmodern without being a feminist', *The Monist*, 77 (1994), 445–61.



in disputation is Hesse's constant modesty and generosity in acknowledging sources and precursors of her own innovative views. Notable examples include: the references to works of Alfred North Whitehead, Herbert Dingle and Stephen Toulmin in *Science and the Human Imagination* in connection with her arguments against the privileging of science as the sole form of knowledge and insight; her acknowledgement in *Models and Analogies in Science* of indebtedness to Norman Robert Campbell and Max Black; her citations of the views of Pierre Duhem and Willard van Orman Quine as precursors to her own network theory of meaning; and throughout her later works the credit given to Jürgen Habermas as a source of inspiration.

Hesse's work is *ecumenical* in its perennial concern to overcome false and damaging dichotomies. In her earliest and latest works, she seeks to disarm the conflict between science and religion, reason and faith. As I found in conversations with her, she disapproved of the opposition between Anglo-American analytic philosophy and so-called 'Continental philosophy'. This took courage in Cambridge, where other philosophers did not always react kindly to people such as Gerd Buchdahl, her colleague in the Department of History and Philosophy of Science, and Mary herself when they used such words as 'hermeneutics' and 'phenomenology'. She opposed the isolation of the human sciences from the natural sciences, insisting that the former have to employ some of the techniques of the latter, for instance in 'dating of archaeological findings, and of manuscripts, and reconstruction of historical events from circumstantial evidence'.<sup>25</sup> Indeed, her own work on agricultural history combines 'scientific' environmental history with human history, manifesting an exemplary combination of sensitivity in interpretation of documents and monuments with scientific rigour in matters of authentication, dating, measuring and mapping. As a historian of science, she regretted the isolation of the discipline from mainstream history; and as a philosopher of science, throughout her works Hesse insisted that worthwhile philosophy of science is not an armchair business, but demands scholarly and expert engagement with the contents and practices of the sciences, past and present.

Mary's *syncretism*, her quest for an overarching structure that would bring together the worlds of everyday experience, poetry, the sciences and religion, is most evident in her first and last books. In *Science and the Human Imagination* this unity is glimpsed through values shared in the practices of science and Christianity; and in her final reflections in *The Construction of Reality* schema theory yields intimations of a transcendent reality, a 'God schema' that grounds all human worlds.<sup>26</sup>

<sup>25</sup> Hesse, *Revolutions and Reconstructions*, p. 183.

<sup>26</sup> Hesse, *Science and the Human Imagination*, pp. 161–4; Arbib and Hesse, *The Construction of Reality*, pp. 236–43.

*Note on the author:* Nicholas Jardine is Emeritus Professor of History and Philosophy of Science, University of Cambridge. He was elected a Fellow of the British Academy in 2004.

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