

A TRIBUTE TO GRETE HERMANN

Patricia Shipley and Fernando Leal, Hon. Fellows, SFCP (23.03.2018).

This tribute is mainly in the form of the following review by us of a recent publication by Springer centred on the life and work of Grete Hermann.

Grete Hermann - Between Physics and Philosophy, 2016

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**Review¹ for *The Society for the Furtherance of the Critical Philosophy (SFCP)*
Patricia Shipley & Fernando Leal, Hon. Fellows, SFCP, March 23 2018**

Both editors are philosophers of science with a strong background in physics, who espouse the value of interdisciplinary collaboration and scholarship. Hence the title of their book, and the open-mindedness with which they organised and conducted the 2012 Aberdeen University Workshop, which we both had the privilege to attend, and which led to this book.

This is a well-researched scholarly text. It is also an intriguing story, a fascinating life story of a remarkable woman, whose achievements as a philosopher of science, so long and shamefully neglected by the world of scholarship we could say, may otherwise have been lost to us for even longer, if not forever. The contributions are a stimulating mixture of papers. Many are well-informed about modern theoretical and experimental physics. Other papers are by philosophers analysing Hermann's philosophical background and its context. There are rather less formal contributions to be found in the **Discussions** sections found in the second part of the book.

Grete Hermann was born in Germany in 1901 to devout Protestant Christians, became a political refugee in Britain during the Second War, and died in 1984 in Germany after a long post-war professional career. A first rate mathematician, a lifelong scientist and trained in physics, she became a humanist, educationalist, a politically-active *ethical socialist*, and, above all, a *critical philosopher* who whole-heartedly sought to practise her ethical philosophical beliefs. We could call her a polymath. But she was more than that. For her, as for her mentor, the German philosopher Leonard Nelson, theory and practice were not separate endeavours. To understand her fully is not only to recognise her scholarly ability, it is also to appreciate her admirable personal qualities, as someone who, like others, has had to struggle with her self-doubts, to find the courage to speak out boldly, to '*speak truth to power*' we may say these days, to challenge orthodoxy, to learn to be a fully free and independent thinker, always to question. Prone to reflect deeply and to question habitually she was a worthy disciple of Socrates, whose method of philosophical conversation, as renewed by her mentor Nelson, she practised all her life.

The bulk of the book is given to the discussion and interpretation of Hermann's contribution to the philosophy of quantum physics. As is well known, quantum physics emerged in the mid to late 1920s in response to the results of a series of experiments, on microscopic physical phenomena, that

¹ **Acknowledgements:** *The authors wish to thank Guido Bacciagaluppi and Dieter Krohn warmly for their helpful comments on the earlier drafts of this paper and their valuable suggestions for amendments*

had accumulated for decades, and whose strangeness defied all the usual conceptions at the time. In a few feverish years, the work of some of the greatest physicists the world has seen, from Einstein and Planck through Bohr and Heisenberg to Dirac and Schrödinger, finally put forward a theory that seemed to solve all the problems and yet was very difficult to understand. As the American physicist, Richard Feynman, put it: *"If you believe you understand quantum physics, then you don't understand it. In fact, nobody does."* One of the strangest aspects of the new theory was the rejection of the principle of causality, an axiom of scientific thinking that nobody had dared to question before.

Grete Hermann, who had been trained as a thorough Kantian philosopher, could not easily accept this, so in the 1930s she bravely challenged the physicists, who came to respect her clarity of mind and lucidity of expression (a wonderful testimony to this is Heisenberg's chapter on her in his book **Physics and Beyond**). As part of her reply to the physicists she was the first to dare to point out a hidden assumption or proposition in John von Neumann's legendary **Mathematical Principles of Quantum Mechanics**, in his proof that no hidden-variable theories are possible in quantum physics so that the principle of causality is preserved; a questionable assumption of which he seemed to have been unaware. In answer to this she offered her own paper, of 1935, **Natural-Philosophical Principles of Quantum Mechanics** - first translated on pages 239 - 278 - the last and crowning piece of Crull and Bacciagaluppi's book. See chapter 15 in the **Translations** section of the book.

Most of the book under review is a series of attempts, by several authors, at understanding exactly what Hermann managed to prove in the middle of a scientific environment which was to a large extent unprepared for her subtle thinking. It seems that what she achieved was rediscovered by the Irish physicist John Bell in the 1960s to great acclaim. We are grateful, however, to French philosopher of science Léna Soler in her paper **The Convergence of Transcendental Philosophy and Quantum Physics: Grete Henry-Hermann's 1935 Pioneering Proposal**, in chapter 4 of this book, page 62, footnote 9, for emphasising the early challenge made by the physicist, David Bohm (1917-1992), another of the 20th century's great physicists, who came to the same conclusion as Hermann that von Neumann's proof did not show what it was commonly claimed to show, many years after Hermann's challenge and years before Bell's, and who seems to have acted as an inspiration to Bell. It could be said that Bohm showed that von Neumann was wrong by doing what the latter had proved was not possible, i.e. by actually constructing his own hidden-variables theory. We are not aware that either Bohm or Bell knew of Hermann's earlier challenges to quantum physics. Readers are invited to make their own judgment of the affair.

In footnote 9 of her paper in chapter 4 Léna Soler states that *"the main argument today against one of the most prominent theories of hidden variables – namely the Bohmian interpretation of quantum physics – is its alleged lack of simplicity."* Michiel Seevinck in Chapter 7 of the book, also acknowledges Bohm's contribution to this debate in his paper **Challenging the Gospel: Grete Hermann on von Neumann's No-Hidden-Variables Proof**. See pages 111 and 114. His title alludes to the belief that von Neumann enjoyed something of a cult-like status at the time among his physicist peer group. In this respect we find Thomas Filk's paper **Carl Friedrich von Weizsäcker's 'Ortsbestimmung eines Elektrons' and its Influence on Grete Hermann** in Chapter 5, as also of interest because, after his own detailed analysis of Hermann's 1935 paper (op.cit.) Filk considers that in it *"one senses an abrupt change in style and argumentation which gives the article a twist in a different direction."* See page 72 of Filk's paper. Later, from the end of Section 8 of her paper, he confesses that some parts of Hermann's arguments remain for him *"mysterious and unclear"*. He surmises that she may have been under *"a certain social 'pressure' from her discussion partners in physics"*. See page 82. If this was actually so, using modern psychological parlance we could call this social pressure a possible form of 'group think'; a

potentially destructive form of collective, or establishment close-mindedness.

After her solitary and prescient contribution to the philosophy of physics, Hermann turned to the more pressing matters of the horrific political situation created by the Nazis in her native Germany and soon enough in the whole of Europe. For a while, together with other members of the Nelsonian movement, she worked in the underground resistance in Germany, until her life was in danger and she eventually went into exile in Britain. In 1940 when the **Society for the Furtherance of the Critical Philosophy (SFCP)** became a registered British charity, Grete was one of its founders. In later years, her main scientific interest moved more toward a human and social sciences perspective, specifically toward the psychological, its social as well as cognitive aspects. We would not imply by this that she had lost interest in physics. Indeed, her lengthy and remarkable essay of 1953, translated into English by Peter Winch, and published in 1991 in the journal *Philosophical Investigations*, 14,1, with the English title **Conquering Chance: critical reflections on Leonard Nelson's establishment of ethics as a science**, confirms this continuing interest. In the essay's **Prefatory Note** Hermann is clear that for her modern physics has “*thrown new light on crucial issues and doctrines in critical philosophy.*” In her **Concluding Remark** to the essay, on pages 78 and 79, she stresses the need to relinquish the absolutist tendencies in her mentor's philosophy, “*the claim of absoluteness*”, while preserving its true core, its “*kernel of truth*”, *i.e.* the claims in his doctrine that for her “*stand fast*”. At one point in the essay she reveals her concerns that sometimes the ethical demand in Nelson's scientific model can be “*something superhuman, that no one can do justice to it.*” See page 191 in the **Discussions** section of the book we are reviewing.

On page 14 of the book in chapter 1 **A biographical sketch of Prof. Grete Henry-Hermann (1901-1984)** we learn from Inge Hansen-Schaberg that post-war in Germany Grete secured a period of leave around 1956/7 from her post at that time with the Bremen State Department for Education. (Hermann became Professor of Philosophy and Physics at the Bremen College of Teacher Training). During the leave period she joined Professor Heinrich Düker at the Psychological Institute in Marburg in Germany. Düker, we are told, was imprisoned by the Nazis during the War for his resistance activities. To quote Hermann from the chapter, on page 14, “*the philosophical interpretation of modern physics must also draw on psychological research on perception and experience.*” At this point, readers may like to turn to the **Endnote** of our review, to the two quotations from the book *The Special Theory of Relativity* by David Bohm. These serve as examples of Bohm's thinking as being, we suggest, along similar lines to Hermann's. They are preceded by our short preface.

There are gems in the book under review. There is, for example, the anecdote of the recent discovery in the library of Churchill College, Cambridge, of Hermann's lost **1933** manuscript, translated as Chapter 14 of the book, whose importance Elise Crull and Guido Bacciagaluppi discuss in detail in chapter 8 of the book, comparing it with the better-known **1935** paper of Hermann's on the '*hidden variables*' question in quantum mechanics. There are some big underlying themes too, such as the issue of whether there can be a value-free science, Hermann expressing deep regret for example, over the conduct of those of her colleagues and countrymen who did not sacrifice their comfortable lifestyles and cultural, intellectual and scientific pursuits to resistance against growing fascism in her country. See page 12 in Chapter 1. See also references to her concerns about the role of nuclear physics and the development of the atomic bomb, in pages 193 and 194 in the **Discussions** section of the book, and in pages 208 and 209 in that section.

Some readers may want to regard Crull's critique in Chapter 10 of the book: **Hermann and the Relative Context of Observation**, from Crull's deep and detailed analysis of Hermann's seminal paper of 1935, as possibly the most interesting contribution, primarily because it is a rigorous and

convincing attempt to see matters as Hermann may have done. The main idea is that Hermann as a Kantian philosopher was haunted by the issue of causal determinism and the challenge to it posed by the seemingly indeterministic and acausal nature of quantum physics, (see the questions raised by the concept of *wave-particle duality*), and whether her own study of quantum mechanics would throw light on these issues. Frequently using the word '*nuanced*' to describe Hermann's argument Crull shows how well Hermann was able to provide plausible answers to these questions drawing on Kantian critique and critical philosophy. Here are some of Crull's words about Hermann in this chapter, about her "*unique understanding of the classical-quantum divide..the splitting of truth..her relationism and belief in the fracturing of truth or worldviews..her changing opinions about the question of completeness and determinism in quantum mechanics*", and so on. See page 167.

The intriguing issue of '*the context*' to include all aspects of the early experimental set-ups used in quantum mechanics, including the researchers' choices, crops up in many of the papers under our review, including in Crull's in Chapter 10. At issue is whether and how the experimental system and its variations, may have created some form of '*interference*' and specifically an '*observer effect*' in these experiments which could have influenced the results and their interpretation. The following quotation from the editors' **Preface** to the book, on page vii, is a prior warning of this issue: "*if one considers as fundamental and central to the whole 1935 essay Hermann's specific thesis regarding the relative context of observation uniquely necessitated by quantum mechanics, novel aspects of the paper come to lightstemming from observational contextuality.*"

We are reminded here of Frappier's contribution to the book, Chapter 6, **In the No-Man's-Land between Physics and Logic: On the Dialectical Role of the Microscope Experiment**, where the author discusses the philosopher Karl Popper's views about the limitations of '*thought experiments*' such as those used in the early physics experiments, and the influence on Popper of Nelson's dialectic method. She refers in Section 6.6 of her paper, in pages 103 -104 on **Welcoming Ignorance**, to the value of Socratic questioning and open-mindedness, in a discussion of the common practice among scientists of ignoring valuable lessons, the further insights, that could have been learnt from experiments deemed by them as having failed.

Nelson seemed to believe, as did Kant himself, that psychology could not be a proper science because it could not be mathematised. In fact, probability theory and statistical data analysis techniques may be used to good effect in psychology. Empirical research in the applied field, however, in the messy multi-variate real world, of people at work for example, is arguably the ultimate challenge to the discipline. The late **Paul Branton** (1916-1990), who was formerly an SFCP trustee for many years and an experienced applied psychologist, was a master at empirical fieldwork research in psychology, as well as at experimentation, to which his studies on responsibly-minded train drivers and hospital anaesthetists while at their work, well testify. Branton was greatly influenced by Hermann's essay on **Conquering Chance** (op.cit.) mainly because it was an inspiration for his theorising about the purposeful (his word was '*purposive*') and ethical conduct of working people and the decisions they have to make, often under constraining and limiting conditions, in an uncertain, (we may say an 'indeterminate') world.²

Hermann's quest to discover how far being a moral person need not be wholly a matter of chance or luck led her to propose in this essay a critical distinction between causes and reasons as contrasting determinants of human conduct, two different and complementary bases to individual human action.

² Interested readers will find a fuller description of Branton's philosophy of action in **Person-Centred Ergonomics: a Brantonian View of Human Factors**, edited by D. J. Osborne et al, Taylor and Francis, 1993.

This could be construed as the distinction between the constraining causal effects of natural laws, on the one hand, and on the other the potential for a more liberating autonomous capacity for more independent action, from reasoning things out for oneself. This idea resonated with Branton's conviction that routinely we must keep thinking and deciding ahead (his '*preview*' concept), when complex decisions are often coloured by our values - what he referred to as our potential for *reasonableness*. This capacity depends on self control, on self-determination. To exercise this we need the freedom, the discretion to do so, raising the thorny psycho-philosophical issue of whether we have *free will* or not. It is not a '*level playing field*', however, because, for material circumstances or other reasons many of us have less freedom, less luck than others. Evenso, ethics could be a useful guide to individual action. The potential for rational, reasonable and ethical action at a group and cultural level is another matter, however. Individuals are not normally solitary isolated creatures. We are social beings, embedded in cultures and social networks, in which we have to try to get on with each other. There is a growing science of free will in psychology, focussed at the level of the individual, and much more work needs to be done in social settings.

The editors' **Preface** on page viii of their book lists several ideas for further study flowing from their exploration of Hermann's rich legacy, including a comparison between physical sciences and what they see as the '*teleological aspect*' of the life sciences. By teleology we take them to mean the aims and purposes of human beings, as individuals and as members of social groups. Branton's studies of people on the job raised questions about organisational structures, cultures and norms and how far these contribute to worker welfare and effectiveness. Research about organisations, on the social psychology of culture and its effects on working life for example, already has much to say about this and other relevant issues. How far are the formal goals of the organisation promoted by, or compromised and undermined by informal processes, many of these hidden and subtle in their effects. What are those processes and how well can they be evaluated? Are the organisation's goals and the means to those ends ethical and in the public interest, for the common good? There are many questions, many challenges for research in this field. For sure, those early quantum physicists had their own culture, as did Leonard Nelson's political and educational organisations.

We were moved to learn in the Aberdeen Workshop about the life-changing event for Hermann when she made the decision to continue working with the Nelsonian group in Hamburg as was requested of her, instead of visiting her mother in nearby Bremen, and who she did not see again. She was known to be very close to her mother who died during the second War. We are told that this conflicting episode, where she exchanged her heartfelt wish to visit her mother for that of fulfilling her strong sense of duty to the Nelsonian cause, was an important personal example for her of how Nelson's ethics could be wrong if interpreted too rigidly. See pages 183 and 184 in the **Discussions** section of the book. Moral and ethical dilemmas frequently occur in our lives. The question of what is the right thing to do in the prevailing circumstances is often not an easy one to resolve, especially if it contains the strong risk of personal cost, particularly emotional cost. We can only agree, therefore with Paparo's conclusion on page 49 in her paper entitled '**Understanding Hermann's Philosophy of Nature**', in Chapter 3 of the book, that "*Grete Hermann pursued a widening of the Friesian perspective of nature, but made valuable and original contributions to it.*"

The editorial quality of this book strikes us as of high order. The occasional typographic error is too trivial to mention. Perhaps the error in the referencing of one key paper of Hermann's is not so trivial however, since it may result in interested readers failing to notice this - if otherwise they would have wanted to follow up the cited paper. See page 32 and page 195 where the author should have been given as Henry-Hermann G, rather than Henry G. The paper in question is **The significance of behaviour study for the critique of reason**, published in the journal *Ratio*, 15, 2, pages 206 -220, 1973. (The Henry part of her surname was because of a political marriage she made

to an Englishman during her wartime exile in Britain). A remaining thought is whether some of the content in the **Discussions** sections located in the second part of the book might have helped some less technically-minded readers had it been placed earlier on in the text, soon after the biographical sketch in Chapter 1, say. A moot point, though.

We suggest that this scholarly work has an over-riding attribute – that of viewing Grete Hermann *'in the round'* as a whole person, as a compassionate woman who also valued highly the capacity for reason, and whose personal life with its many challenges, struggles, losses and successes, deserves, nay commands, just as much attention and admiration as her scientific and mathematical gifts and achievements. Above all, she was a woman of carefully-considered and worked-through principles and values who lived and worked by those values. She was, for us, an exemplary critical philosopher.

The book may appeal to physicists interested in the insights that philosophers of science can offer their discipline. It will surely interest philosophers of science themselves. Not least, we hope and expect it will appeal to feminist scholars who are concerned about the many neglected women scientists, whose excellent contributions to their disciplines have been overlooked or downplayed over the many years. This book is a welcome addition, we feel, to the long-overdue and small body of literature we have about Grete Hermann, standing in testimony to this humane and brilliant scholar-activist and her remarkable life. It does her a great service. We can only regret she did not live to read it, but then, modest and unassuming as she was reputed to have been, may she perhaps have been a little embarrassed by it?

Endnote

The American physicist David Bohm, who left the USA for political reasons where his doctorate had been supervised by Oppenheimer, went on to work in South America before coming later to Britain in 1957 to Bristol University, and arriving at London University at Birkbeck College (1961-1983) where he eventually became Emeritus Professor in Theoretical Physics. Bohm's book **'The Special Theory of Relativity'**, Routledge Classics, 1996, first published in 1965, was based on his physics lectures at Birkbeck which were recognised as well-received by his College students.

The book contains an extensive **Appendix** in which Bohm detailed, as he saw it, the relevance of the psychology of cognition and perception to the field of physics, drawing mainly on the research and ideas of Piaget, Gibson and Hebb. Until his death Bohm continued a strong, some might say radical, interdisciplinary interest in the significance for the philosophy of science of the structure and psychology of perception, language and thought, and the conundrum of mind-body dualism. In the latter part of his life he developed, and practised his theory of a free-flowing, rule-free dialogue method, sometimes referred to by dialogue practitioners as *'Bohmian Free Dialogue'*. One of the SFCP's 'Advisers' - Peter Garrett of the UK-based charity **Prison Dialogue** - worked with Bohm for many years on dialogue theory and practice, and has since founded the charity, the **Academy of Professional Dialogue** that holds recordings of many of the early *Bohm Dialogues* (1984-1990) in its archives.

For his Birkbeck colleague B.J.Hiley, in the Foreword to Bohm's book (ibid), Bohm was able to show " *...how, through perception and our activity in space, we become aware of the importance of the notion of relationship and the order in these relationships.*" Following are two quotations from this book, (a) and (b) in Bohm's own words.

a) "*... back to the old question first formulated by Kant, as to whether our general mode of*

apprehending the world is ordered and structured in space and time and through causal relationships, etc.,... is objectively inherent in the nature of the world, or whether it is imposed by our own minds.....It would seem that Kant's proposal was right in some respects but basically wrong in that he had considered the problem in too narrow a framework.” (Bohm, *ibid*, page 254).

b) “...one of the basic problems that has to be solved in every act of perception is that of taking into account the special point of view and perspective of the observer.” (Bohm, *ibid*, page 266).

NB. The authors of the Review wish to point out that SFCP Trustees may not agree with all the views expressed in this paper.

Some Explanatory Notes

Fernando Leal's paper is chapter 2 in the book under review, pp 17-34, and entitled '**Grete Hermann as a philosopher**'. It is a modified, updated and edited version of the two handouts he delivered beforehand to the 2012 Aberdeen University workshop participants : '**Philosophical Background of Grete Hermann's Work**'* and '**Complementarity in Ethics?**' In chapter 2 of the book Leal also includes a brief description of modern social sciences research on types of thinking and decision-making termed '*dual process theory*', with specific reference to Kahneman's work in what is known as '*fast and slow thinking*'.

(*An earlier version of this paper by Fernando Leal is available on the Society's website and found [here](#)).

Patricia Shipley's two pre-workshop handout papers are also available at this place on the website and are entitled: '**Grete Henry-Hermann (1901-1984): a personal account for the trustees of the SFCP**' and '**Notes for Aberdeen University Workshop on Grete Henry-Hermann, May 5-6 2012**'.)

It may be of help to readers without access to the afore-mentioned Springer book to see our following brief notes on two papers about Grete Hermann 's contributions to physics by the French philosopher of science Léna Soler:-

Paper (a) '**The contributions of Grete Hermann to the philosophy of physics**', by Léna Soler, with an **Introduction** by Fernando Leal on p23, in *Occasional Working Papers in Ethics and the Critical Philosophy*, vol. 3, 2004, p24-31, edited by Patricia Shipley and Heidi Mason.

This paper was based on a version in French of a conference presentation Léna Soler made in Bremen at the invitation of the PPA , on the occasion of the PPA's centenary celebration dedicated to Hermann in March 2002. The presentation was delivered in German, and the English translation of the original French version was commissioned later by the SFCP. [see (a) above].

Paper (b) '**The convergence of transcendental philosophy and quantum physics: Grete Henry-Hermann's 1935 pioneering proposal**', in Crull and Bacciagaluppi, *op.cit.*, Chapter 4, p 55-69.

This is, as far as we can discern, a substantially similar argument presented here by Soler to her earlier papers on the subject, including paper (a) above.

The 2004 Léna Soler paper referred to as paper (a) above which is from the SFCP's series: *Occasional Working Papers*, vol 3, 2004, *ibid*, can be found [here](#).