



Grete Henry-Hermann

1901-1984

**Philosopher, Physicist and Mathematician before
her time?**

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Life

Geboren 1901. Bremen

Studium der Mathematik, Physik und Philosophie in Göttingen und Freiburg.

Promotion bei Emmy Noether.

1925-1927 Privatassistentin Leonard Nelsons.

Gemeinsame Bearbeitung seiner "Vorlesungen über das System der Philosophischen Ethik und Pädagogik.

Fortsetzung dieser Arbeit mit Minna Specht nach Nelsons Tod.
Publication 1932.

Verbleibt in Leipzig mit Heisenberg und Weizsäcker in 1935.

Joined the editorial board of the Socialist daily DER FUNKE.

Organised seminars for her political friends in the underground resistance against the Nazi regime.

Mitglied des International Sozialistische Kampfbund (ISK).

Emigration in Dänemark (1936), Frankreich und England (1938).

Rückkehr nach Deutschland (1946).

Mitarbeit am Aufbau der Lehrerausbildung in Bremen.

Professor für Philosophie und Physik an der Pädagogischen Hochschule in Bremen bis 1966.

Leiterin der Pädagogischen Hauptstelle der Gewerkschaft Erziehung und Wissenschaft.

1961-1978 Vorsitzende der Philosophisch-Politischen Akademie.

Gestorben 1984.

Mathematics

- Die Frage der endlich vielen Schritte in der Theorie der Polynomideale, *Mathematische Annalen*, 1926.

Foundations of Physics

- Die Naturphilosophischen Grundlagen der Quantenmechanik, *Abhandlungen der Fries'schen Schule*, 1935.
- Auszug (Die Naturphilosophischen Grundlagen der Quantenmechanik), *Naturwissenschaften*, 1935
- Die Bedeutung der modernen Physik für die Theorie der Erkenntnis, 1937.
- Die Kausalität in der Physik, *Studium Generale*, 1948.

Philosophy

- Politics and Ethics, 1945
- Contingency: Critical Reflections on Leonard Nelson's Scientific Foundations of Ethics, 1953.
- The Significance of Behaviour Study for the Critique of Pure Reason, *Ratio* , 1973.
- Leonard Nelson Nachlass, Gesammelte Schriften, 1975.
- Die Überwindung des Zufalls. Kritische Betrachtungen zu Leonard Nelsons Begründung der Ethik als Wissenschaft, 1985. (*posthum*)

Mathematics

Die Frage der endlich vielen Schritte in der Theorie der Polynomideale, *Mathematische Annalen*, 1926.

Ideas before their time. (Sigsam Bulletin)

The significance of the paper can be found on the first page, where we find:

The claim that a computation can be found in finitely many steps will mean here that an upper bound for the number of necessary operations for the computation can be specified. Thus it is not enough, for example, to suggest a procedure, for which it can be proved theoretically that it can be executed in finitely many operations, if no upper bound for the number of operations is known.

(Translated by M.Abramson)

The fact that the author requires an upper bound suggests that there must exist an actual procedure or algorithm for doing computations. We see in this paper the first examples of procedures (with upper bounds given) for a variety of computations in multivariate polynomial ideals. Thus we have here a paper anticipating by 39 years the birth of computer algebra (generally marked by Buchberger's invention of Groebner bases in his 1965 Ph.D. thesis).

Theorem:

Let f_0, f_1, \dots, f_n be polynomials in the indeterminates (C, X) with integer coefficients, where $C = (C_1, \dots, C_M)$ is a tuple of parametric variables and $X = (X_1, \dots, X_N)$. Then for each field K the set of c in K^M such that $f_0(c, X)$ belongs to the ideal generated in $K[X]$ by $f_1(c, X), \dots, f_n(c, X)$ is a constructible subset of K^M , that is, definable by a quantifier-free formula in the language of rings.

In other words, the ideal membership problem is doubly exponential in the number of variables. There are ideals for which singly exponential degree can be easily verified.

This classical theorem, in an equivalent formulation, is usually accredited to Grete Hermann, 1926, although it was probably already proved in some form or another by Julius König, 1903.

Politics, ethics and society.

Fries'schen Schule:

Immanuel Kant, 1724-1802

Jakob Fries, 1773-1843

Leonard Nelson, 1882-1927

A: Epistemology

Mainly Kant, but with a modification of Kantian epistemology that allowed for synthetic a priori propositions. Such as:

- (i) In mathematics grounded in pure intuition.
- (ii) In metaphysics grounded in the transcendental necessities for the possibility of experience.
- (iii) In morality grounded on categorical imperatives.

Modification:

- 1) Clarifying that Kant didn't prove synthetic a priori propositions.
- 2) Distinguishing immediate from mediate knowledge.
 - (i) Immediate knowledge is the ground of synthetic propositions.

(ii) Mediate knowledge is expressed in propositional form, possibly justified by immediate knowledge.

(Mediate knowledge is always fallible and corrigible, thus allowing for a hermeneutic dimension.)

3) Distinguishing intuitive from non-intuitive knowledge.

In "The Significance of Behaviour Study for the Critique of Pure Reason" Grete Hermann rejects the idea of immediate knowledge. This means a break with the principles of Kant-friesian epistemology.

B: Ethics:

Nelson's principle: "Not leaving something to chance."

Ethical reason can give rise to activity on its own, independently of the accident of outer impressions.

Critique by Grete Hermann in "Overcoming Contingency" (1953):

I wish to understand by what modification the core truth in Nelsonian philosophy can be freed from its misleading absolutist claim and its true meaning vindicated. (1983)

- (i) Conceptual analysis of judgement on the one hand, introspection – what takes place in us –on the other.
- (ii) Cooperation of reason and sensibility.
- (iii) Ethical truth both in practical experience and scientific ethical analysis.

What is scientific ethical analysis?

For Nelson and Grete Hermann **scientific rigour in philosophy** is analogous to Hilbert's way of doing geometry.

(i) All propositions involved in an assertion are made explicit.

To think consciously: to specify all the propositions which are used. (Hilbert)

(ii) Sentences should if possible always be proven from axioms. If not, they are axioms, and their independence is to be demonstrated.

Second World War.

1926 Internationale Socialistische Kampfbund (ISK) gegründet.

Grete Hermann wird Mitglied.

1931 Alle Kräfte gegen Hitler.

1932 Tageszeitung Der Funke herausgegeben in Berlin.

1933 Nationalsozialisten verbieten den ISK.

1933-1945 Im Exil Widerstand gegen Nationalsozialismus durch
den ISK.

1936 Emigration in Dänemark.

1938 Emigration in England.

1946 Rückkehr nach Deutschland.

Foundations of Physics

Die Naturphilosophischen Grundlagen der Quantenmechanik, *Abhandlungen der Fries'schen Schule*, 1935.

Central Thesis: Kant's Kritik der Reinen Vernunft is *the* central body of thought. Attempt to maintain causality as a transcendental requirement for any knowledge and any experience whatsoever, also in quantum mechanics.

(A) Der Zirkel in NEUMANNs beweiss.

$$\begin{aligned} \text{Erw}(R + S) &= \text{Erw}(R) + \text{Erw}(S) && \iff \\ \langle \psi, (R + S)\psi \rangle &= \langle \psi, R\psi \rangle + \langle \psi, S\psi \rangle && (1) \end{aligned}$$

"Mit diese Voraussetzung steht und fällt der NEUMANNsche Beweis."

Two points of criticism:

1. "Not trivial however is the relation [Eq. (1)] for quantum mechanical quantities for which indeterminacy relations hold. In fact the sum of two such quantities is not even defined: Because a sharp measurement of one

of them excludes sharp measurement of the other one and thus because both quantities can not have sharp values at the same time, the commonly used definition of the sum of two quantities breaks down. Von Neumann requires can not even be defined. (Quote from Grete Hermann (1935).)”

2. Eq.(1) holds, according to Von Neumann for arbitrary ensembles ψ . However, there is an implicit extra assumption that sub-ensembles are undistinguishable. This implies that any further criteria (hidden variables) are excluded right from the start.

Conclusion: Circularity.

Grete Hermann was before her time, only after John Bell (1964, published 1966) this becomes general knowledge.

Nevertheless, Heisenberg and von Weizäcker certainly knew about this.

Why was it ingnored, or at least not picked up?

- (i) She was a woman?
- (ii) Von Neumann' proof was Holy.

He [Bohr] came for a public lecture.... At the end of the lecture he left and the discussion proceeded without him. Some speakers attacked his qualitative arguments –there seems lots of loopholes. The bohrians did not clarify the arguments; they mentioned the alleged proof by von Neumann and that settled the matter.[...]. Yet, like magic, the mere name of "von Neumann" and the mere word "proof" silenced the objectors". (Paul Feyerabend).

(B) Causality can be maintained in quantum mechanics.

”Die theorie der [Quanten] Messung verfügt bereits hinreichende Erklärungsgründe.”

Fundamental Idea: Distinguish between causality and predictability.

Die Schranken der Vorausberechenbarkeit künftiger Ereignisse haben sich in der Tat als prinzipiell unüberwindbar erwiesen, und doch gibt es kein Geschehen, zu dem sich nicht im Rahmen des Quantenmechanischen Formalismus Ursachen aufweisen liessen. (Quote from Grete Hermann (1935).

Future events have a causal effect on past events.

No extra hidden variables are possible.

Causal chain is already there, yet only after the measurement.

Events only exist after the measurement and they are as events causally explainable (reconstructable).

The usage of causal notions is relative to the measurement (Beobachtung).

Speculation: Relationship with Everettian ideas:

Relative not only to the phenomenon (Bohr), but also to the *particular* outcome of a measurement.

Final Words

Grete Hermann was rather revolutionairy in mathematics and in the foundations of physics. The latter perhaps because of her conservatism in philosophy.

Reading German is great.