

## **Grete Hermann and von Neumann: the lady and the colossus**

Grete Hermann (1901-1984) was a many-faceted woman of great versatility, talent, and character. She is known for her criticism (1935) of John von Neumann's widely acclaimed 'no-hidden-variable' proof (1932) that played a crucial role in establishing the credentials of quantum theory as one superior to the Newtonian-classical one. However, she received only scanty recognition for this highly significant work of hers, and is seldom mentioned even in studies on the history of quantum theory. The reasons appear to be manifold, and are even now not understood or elaborated by historians of science with adequate clarity.

It appears that Hermann herself did not devote much energy or time to publicize her criticism of Neumann's proof, though that does not explain why her work was pushed into oblivion. During her time physics, especially theoretical physics, seems to have been burdened with a heavy baggage of gender bias (which raises the question: by how much has the baggage become lighter to-day?). Added to this was the prestige and stature of von Neumann himself among mathematicians and physicists – that of a colossus possessed of a freak genius.

While there can be little doubt that von Neumann did deserve much of that stature (which is not to say that he earned a similar stature as a perceptive and sensitive human being), his 'no-hidden-variable' proof was once again put to question much later by John S. Bell (1965), and this time the critic received wide recognition which, however, was at first rather slow to come. The irony is in the fact that Bell's work paved the way towards a renewed vindication of the quantum viewpoint, the same viewpoint that Neumann espoused along with other stalwarts like Pauli, Dirac, and Feynman though, at the same time, there were new insights resulting from Bell's work and subsequent developments (originating, in part, in the work of Neumann himself). And, in the great resurgence that followed, Hermann got lost yet again.

Grete Hermann received her early training under Emmy Noether, another great name in physics and mathematics who had to overcome heavy odds to earn a reputation in a male-dominated academic world (in which endeavor she received strong support from the likes of Hilbert and Klein). Later, Hermann worked in the same ambience where Heisenberg and von Weizsacker were active. There is little doubt that some of these stalwarts were aware of Hermann's work and chose to ignore it, possibly because of the fact that Neumann's 'proof' had already become gospel.

However, Hermann did not seem to care. She had her own priorities and interests in life which included mathematics, philosophy, education, and social and political work. She had strong socialist leanings, was active in the resistance movement against the Nazis, and had to flee her country in the face of Nazi repression. Her later years saw her primarily as an educator, social worker, and philosopher, when she evinced little awareness of having had proven wrong none other than the great John von Neumann in the early days of her career which, perhaps, she herself chose to forget.

### **Suggested reading**

- *Grete Hermann: An early contributor to quantum theory*, by C.L. Herzenberg (2008), at

[arXiv:0812.3986](https://arxiv.org/abs/0812.3986) [physics.gen-ph]

- For a recent re-appraisal in support of Neumann's point of view, see

*Von Neumann's 'No Hidden Variables' Proof: A Re-appraisal*, by J. Bub (2010), at

[arXiv:1006.0499](https://arxiv.org/abs/1006.0499) [quant-ph]

Avijit Lahiri, Laketown, Kolkata, November 2013.

**This item was posted earlier under a different title.**