History of quantum physics and gender perspective

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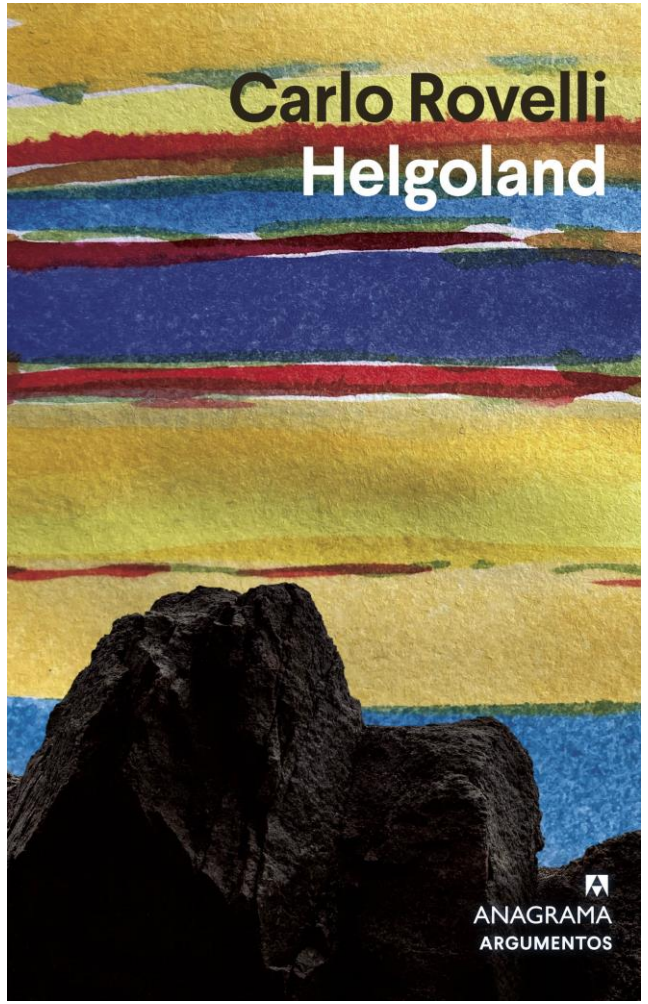
Helgoland

"[Heisenberg] was there to relieve the allergy he suffered from. Helgoland – the name means 'sacred island' – has practically no trees, almost no pollen. 'Helgoland with its one tree,' says Joyce in *Ulysses*. He was there mainly to immerse himself in the problem that obsessed him. The hot potato that Niels Bohr had handed him. He slept very little, spending his time in solitude trying to calculate something that could justify Bohr's incomprehensible rules. From time to time, he would pause to climb the island's rocks."

"Heisenberg was immersed in the problem; he had turned it into his obsession."

"Discouragement drives one to seek extreme solutions. On the North Sea island, Heisenberg, in solitude, was determined to explore radical ideas."

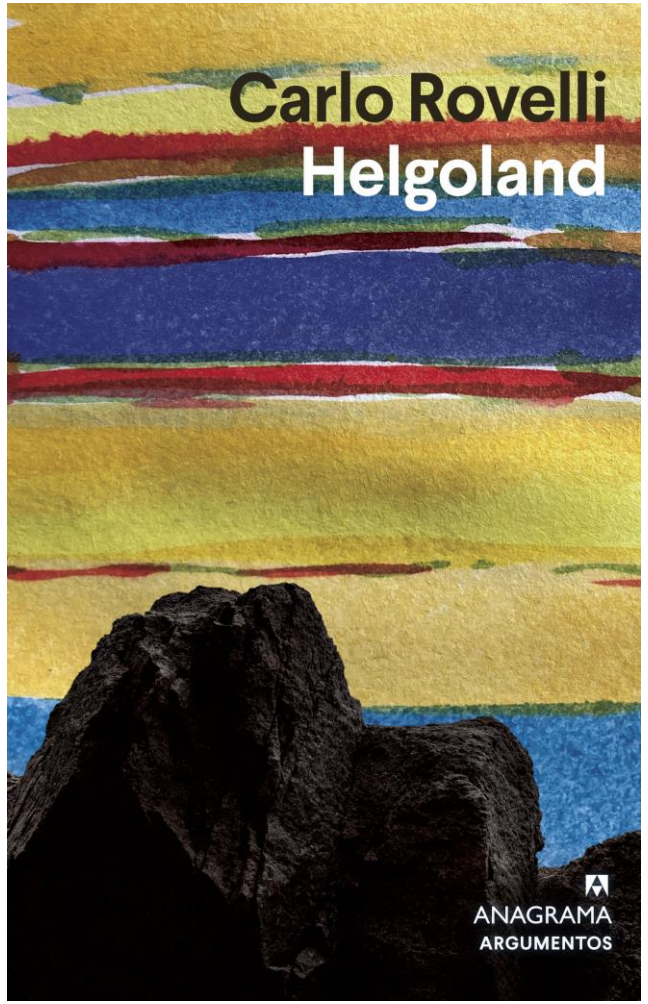
Rovelli (2022), *Helgoland*



Helgoland

Other figures: Niels Bohr, Max Born, Albert Einstein, Wolfgang Pauli, Pascual Jordan, Erwin Schrödinger, Paul Dirac, Louis de Broglie, John von Neumann.

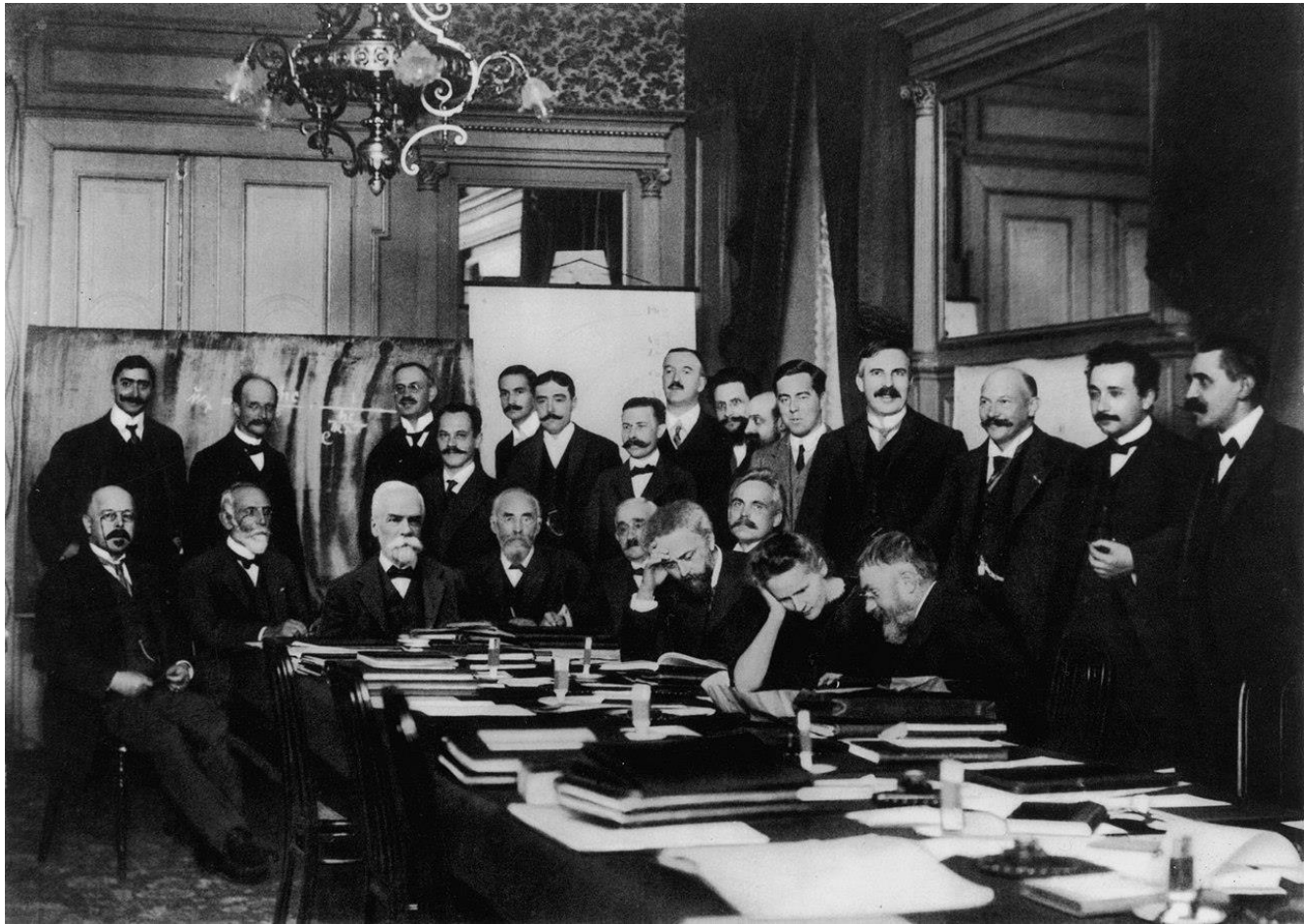
- Isolation (small circle)
- Brightness
- Genius
- Eureka moment
- Obsession
- Men



Commonplace narrative

Commonplace narrative, fueled in textbooks:

- Lineality
- Heroicity
- Only few women, those seen as heroines of science



- Is it the only part of the story?
- Does it respond to complete reality?
- Does it help students?

Commonplace narrative

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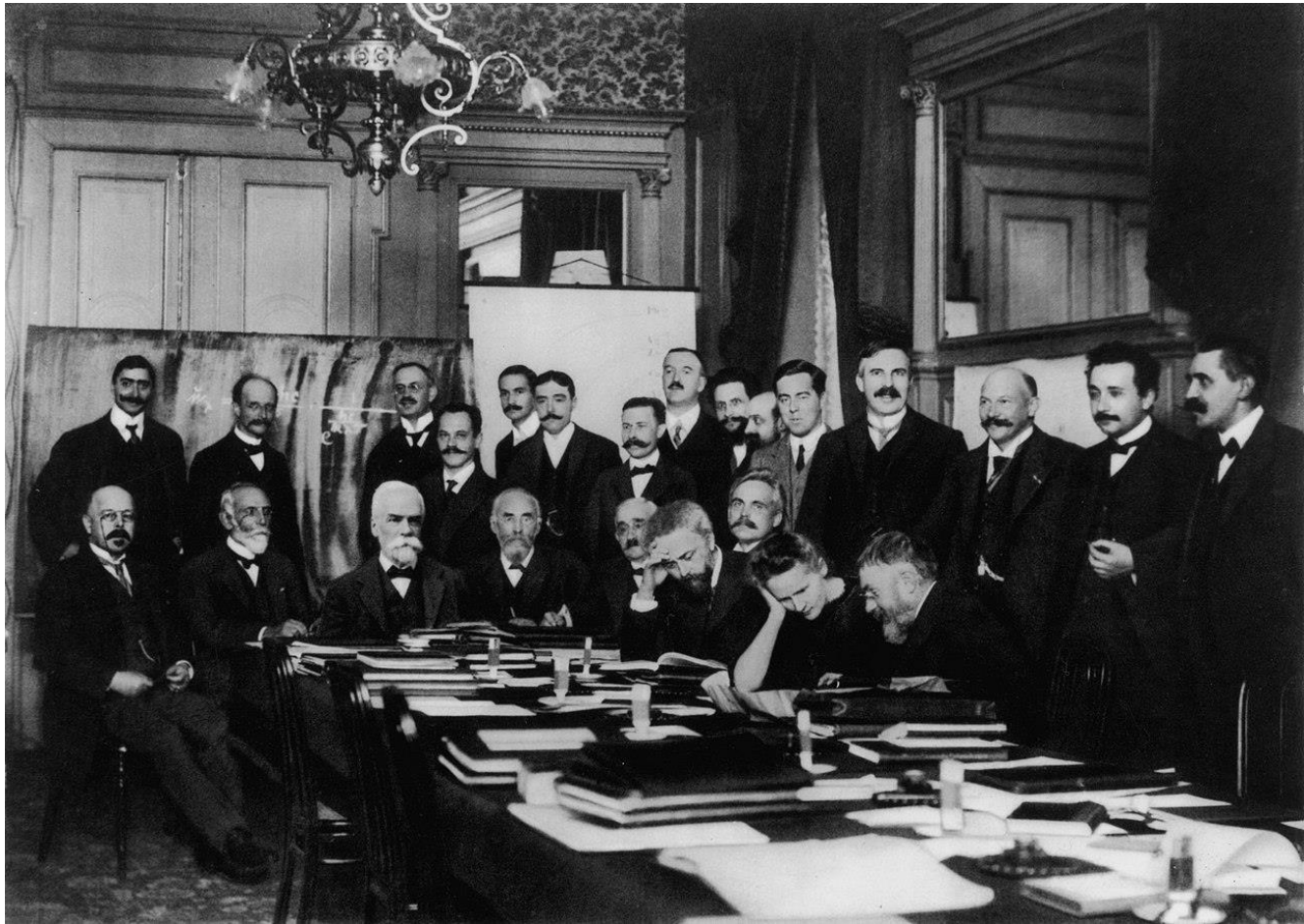
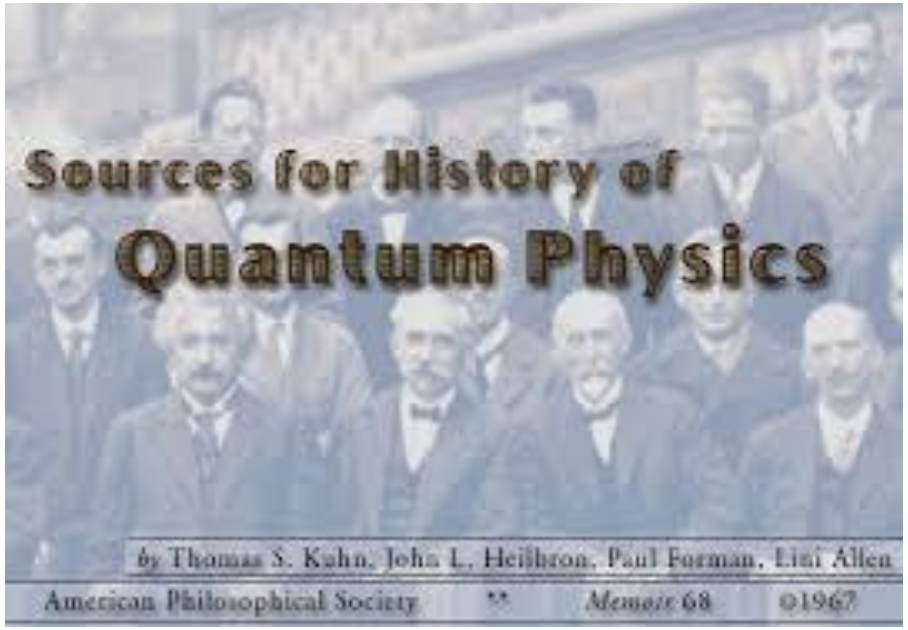
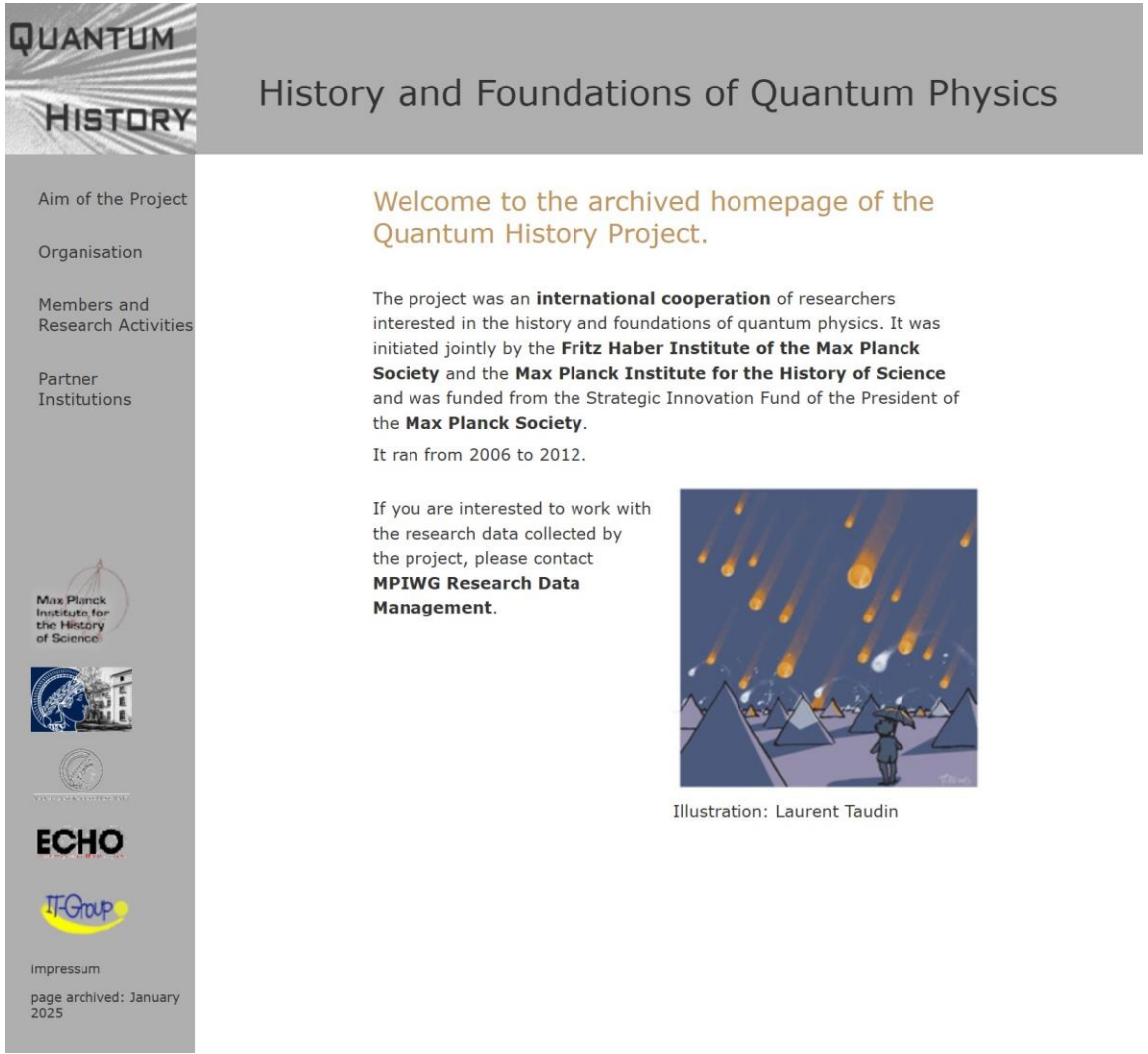
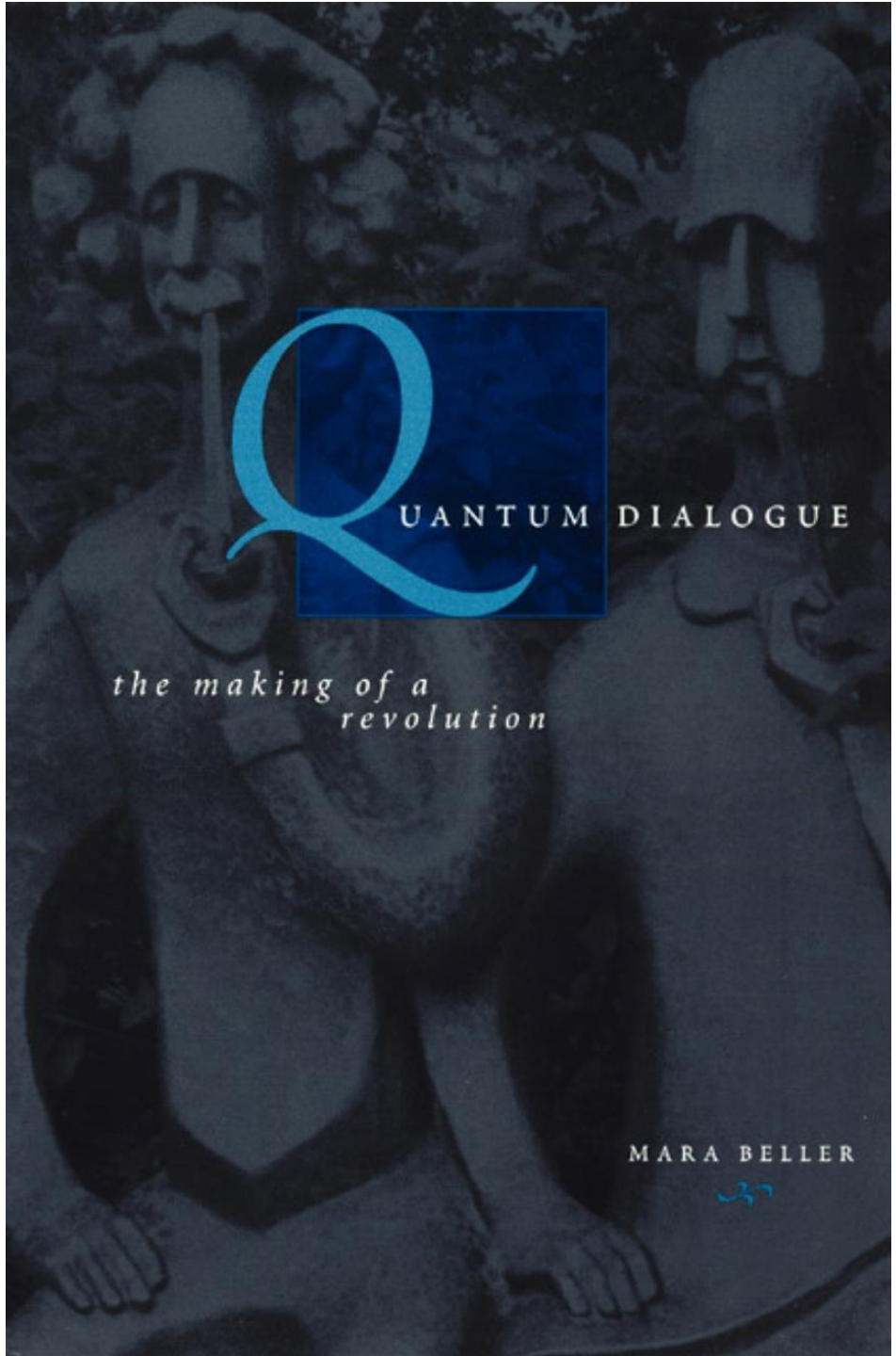


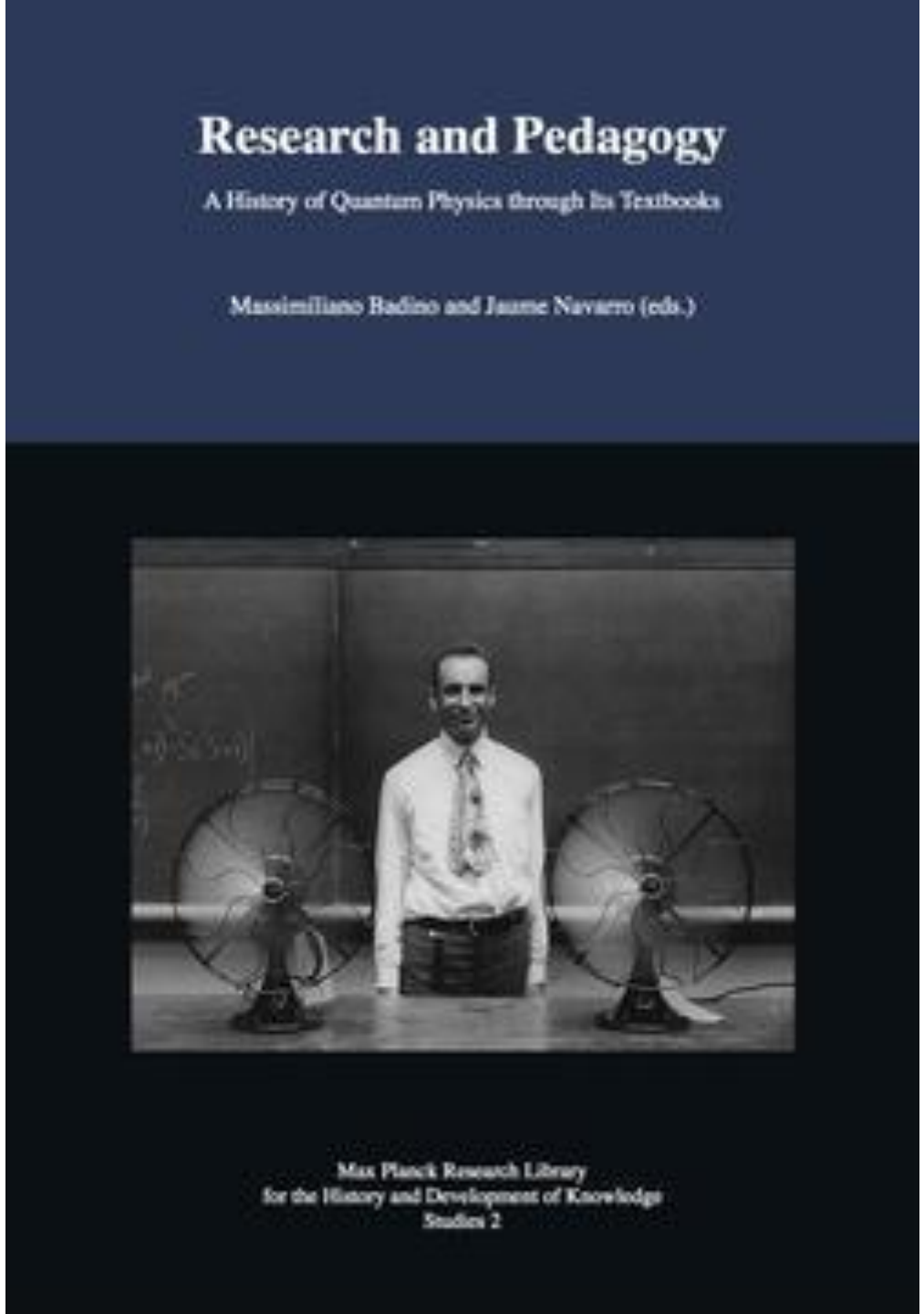
“The marginalization of women in science is a predictable consequence of heroic rhetoric…” (Oreskes, 1996).

Collective effort in the history of quantum physics






QUANTUM DIALOGUE
the making of a revolution
MARA BELLER


Research and Pedagogy
A History of Quantum Physics through Its Textbooks
Massimiliano Badino and Jaume Navarro (eds.)
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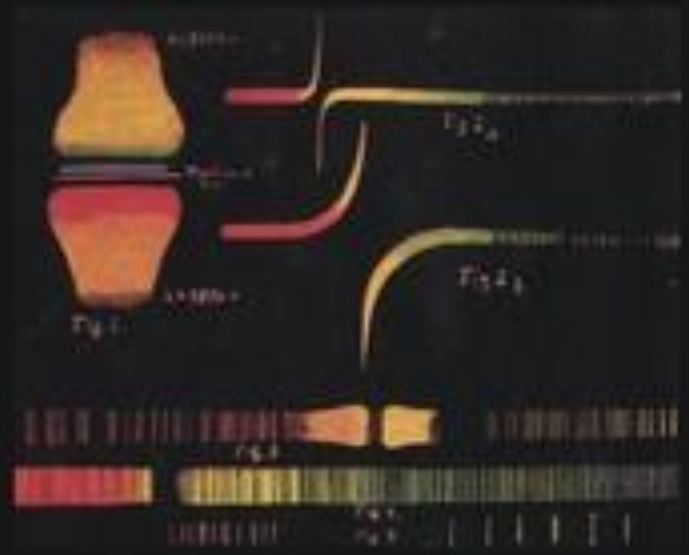
Studies 2

Traditions and Transformations in the History of Quantum Physics

Shaul Katzir, Christoph Lehner, Jürgen Renn (eds.)



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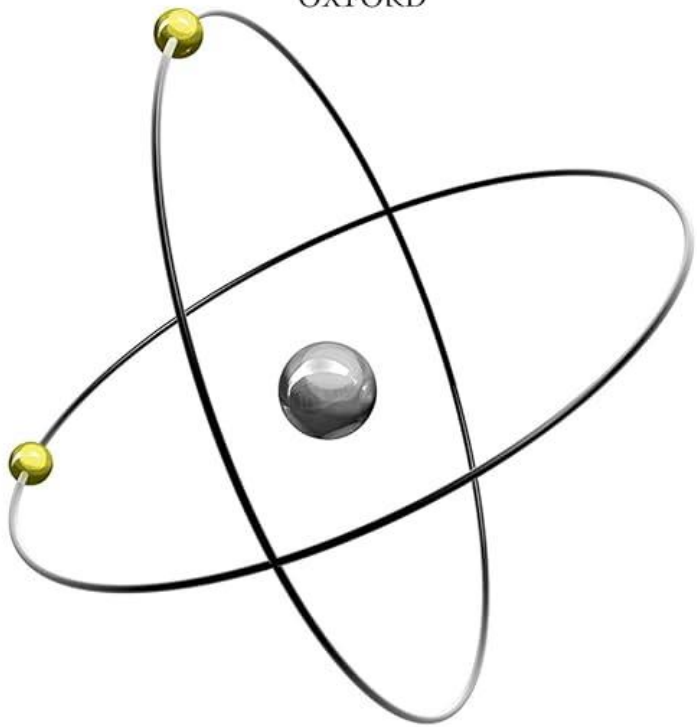
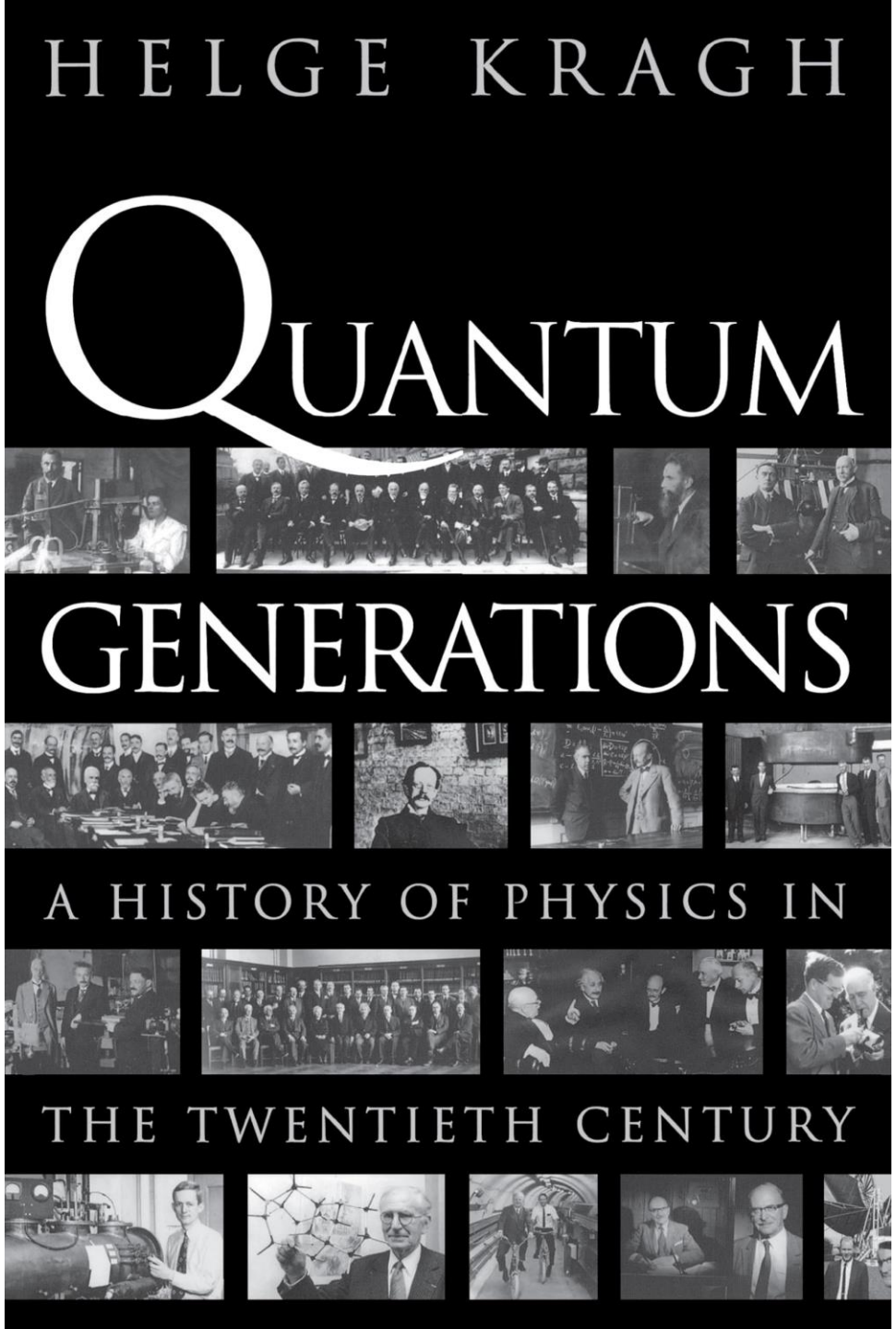
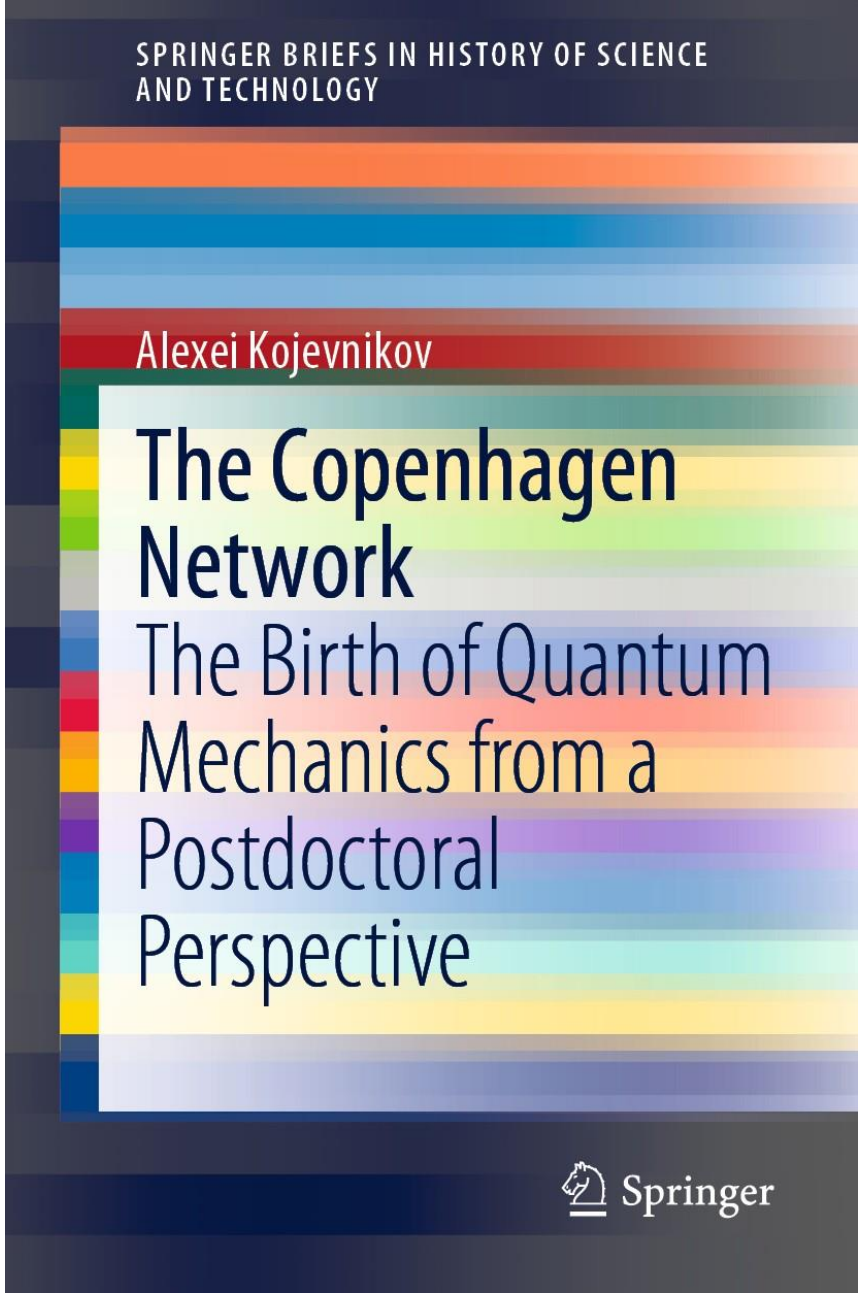


CONSTRUCTING QUANTUM MECHANICS

Volume 1: The Scaffold 1900–1923

Anthony Duncan
and Michel Janssen





Knabenphysik

Another history of quantum physics

- Nuanced and complex stories, with no eureka moments
- Collective efforts
- Continuitites and discontinuities
- Theory and experiment
- Agreements and disagreements
- Social institutions
- Cultural context
- Personal lifes
- Scientific practice

No gender analysis in the history of quanum physics until 2025

Contributions of
Twentieth-Century Women
to Physics

OUT OF THE SHADOWS

EDITED BY
Nina Byers and Gary Williams

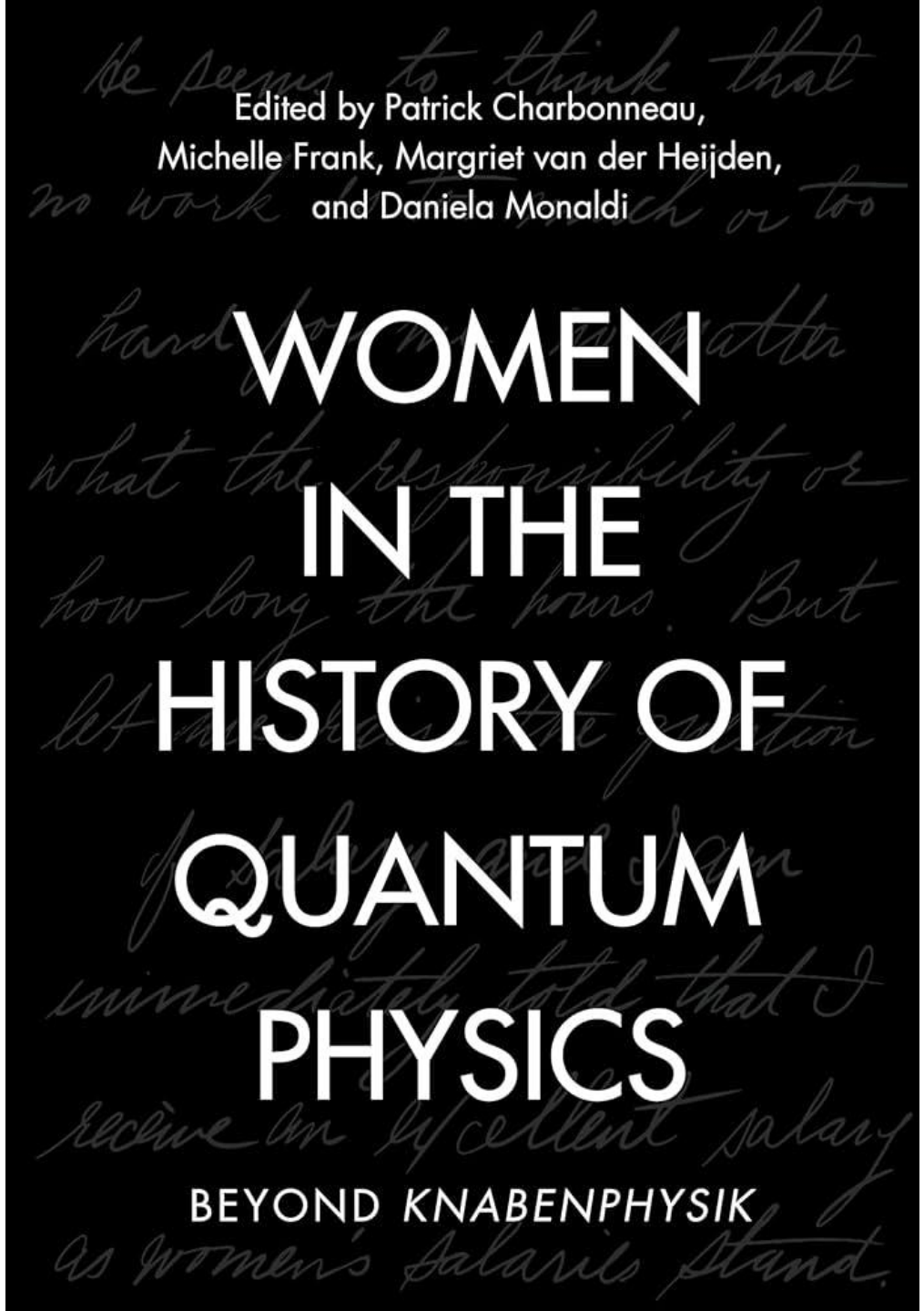
Women *in their* Element

Selected Women's Contributions To The Periodic System

Edited by | *Annette Lykknes* | *Brigitte Van Tiggelen*

World Scientific

- Women in the History of Quantum Physics Group (since 2021): “to add a new dimension to the prevailing narrative that suggests quantum physics resulted from the efforts of small group of brilliant men”.
- Not heroines, that reinforce the exceptionality of women in science
- 16 chapters
- From early XXth century until today
- Europe, America, Asia



Hendrika Johanna van Leeuwen (1887-1974), by Miriam Blaauboer and Margriet van der Heijden

- Born in The Hague, Netherlands
- Studied at The Hague Boy's School from 1901
- Studied physics at Leiden University. Lorentz support.
- Earned her PhD in 1919 on magnetism. Her sister followed the same path until she married, without PhD.
- Contributions:
  - 1916: H2 as a resonator.
  - 1919: any dynamical classical-mechanical system in a magnetic field in termal equilibrium has not net magnetic dipole moment, and cannot give rise to magnetism.

Hendrika Johanna van Leeuwen (1887-1974), by Miriam Blaauboer and Margriet van der Heijden

- In 1932, John Van Vleck called it “Miss van Leeuwen’s theorem”. In 1977, he credited Bohr.
- Isolation in Leiden, out of Paul Ehrenfest’s circle of students. Lorentz continued supporting her.
- Assistant at the TH Delft, from 1920. Supervision of physics laboratory courses.
- She was promoted to lector in 1947 for theoretical and applied physics. She retired in 1952.
- Not married.

Laura Chalk (1904-1996), by Daniela Monaldi

- Born in Quebec
- 1921 enrolled to Mac Gill University. Physics profesor Arthur S. Eve as inspiring figure for her.
- Graduated in 1925, earned a MSc in 1926 and PhD in 1928. J. Stuart Foster as her supervisor.
- Chalk's work: new and extremely precise experiments on the intensities of the Stark effect of the Balmer series. Foster-Chalk's letter in *Nature*, 1926. Agreement with Schrödinger's calculations. Extension 1928.
- 1929-1930: postdoctoral experience at King's College of Longon. Helium.
- Upon her return to Montreal, teaching position at the Maddonald College of Agriculture of Mac Gill University, where her husband William Rowles had become the head of the physics department. 1936: no wife's could hold position in their husband's departments, only if "needed".

Laura Chalk (1904-1996), by Daniela Monaldi

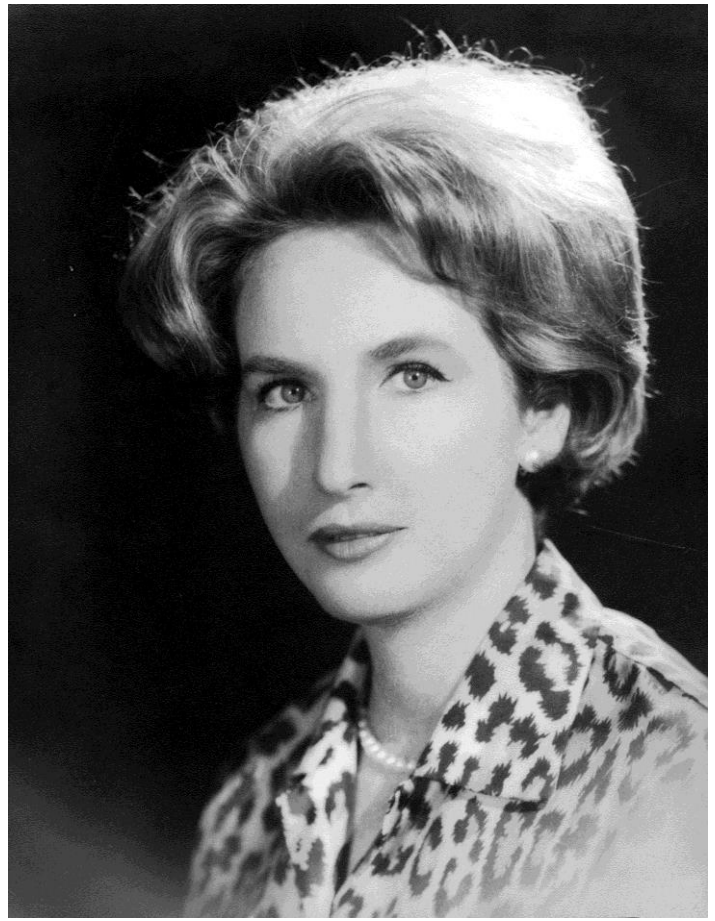
- Disappearance of her experiment from historiography, even forgotten by Foster himself, for whom his work on helium overshadowed that with Chalks.

- Chalk's conformation to gender norms:

> "(…) she made a deliberate choice of self-representation. For ther years as a graduate student, Chalk Rowles fashioned a narrative of ther and her future husband's joint experiences. She chose to downplay her abdication from a potentially brilliant career and instead foregrounded the success of her marital relationship. In her story, the significance of her data for the development of quantum mechanics was barely notable."

Maria Lluïsa Canut (1924-2005)

- Born in 1924 in Maó
- Studied physics in Valencia and Barcelona. She graduated in 1952.
- Earned her PhD on X-ray Crystallography in 1955 in Barcelona. Thermal dynamics of crystals. Research stay with Kathleen Londsdale.
- Collaborative couple:
  - 1956: scientific collaborator at CSIC
  - X-ray crystallography school. Stays abroad.
  - More than 60 papers. More tan 50 together with Amorós.



Maria Lluïsa Canut (1924-2005)

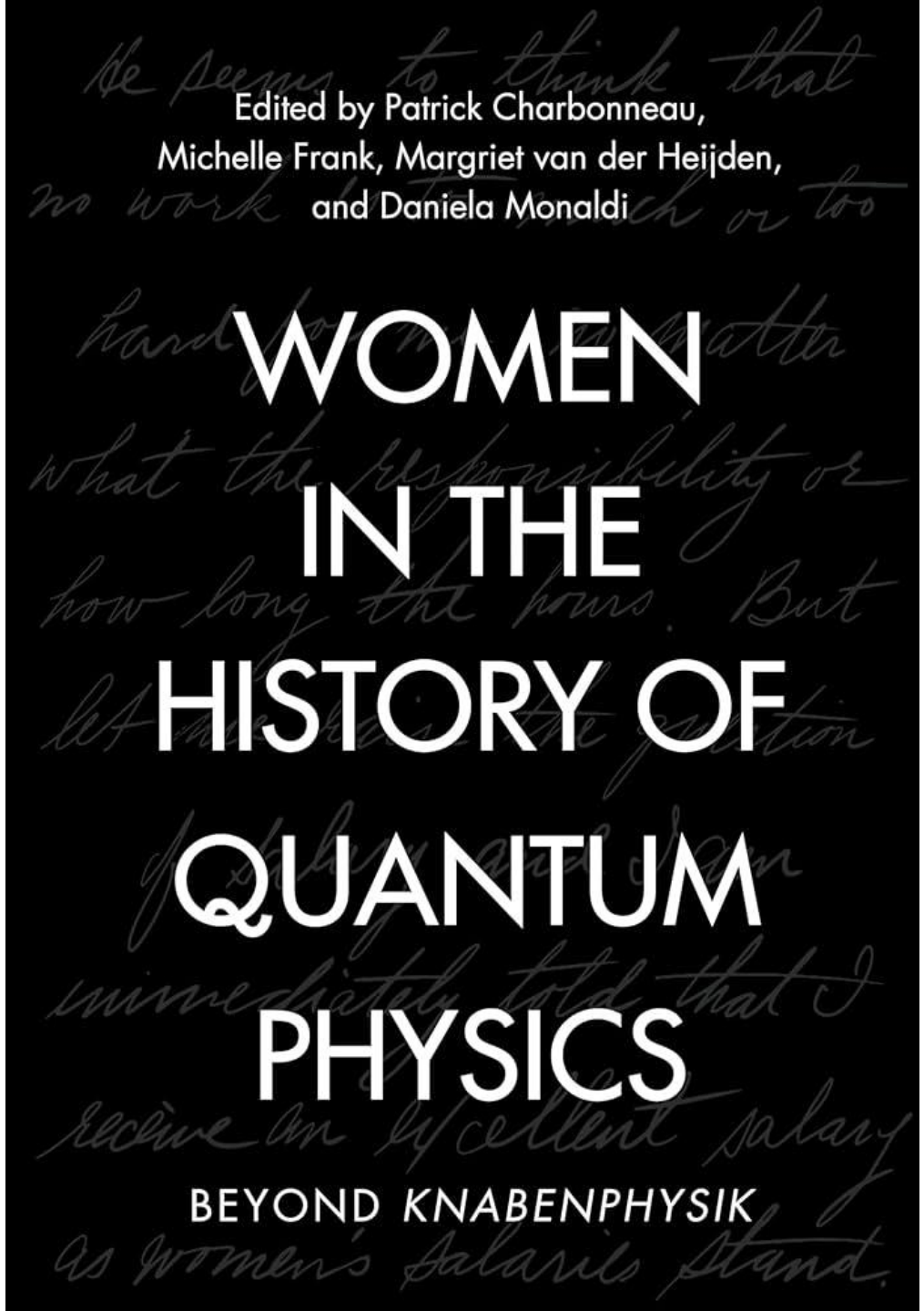
- Recruitment at the Southern Illinois University together in 1963.
- Three prizes together.
- 1971: Canut filed a formal sex discrimination at SIU. **She was quitted**.
- 1975: back to Madrid, at CSIC. Change of research interests.
- Supportive partner vs overshadowing.

Some trends

- Invisibility, invisibilization and isolation
- Self-representation conforming gender rules
- Interrupted careers: marriage, feminist struggles
- Collaborative couples vs overshadowing

Others:

- Intersectionality
- Culture of competition



“If the science of physics itself is gender free, the style of physics has everything to do with gender. The physis cultures in the United States can be summed up in a single methaphor: chest beating. To suceed as a physicist, one must not only do good job but also aggressively promote one’s ideas and accomplishments. Part of self-promotion is a precise calibration and articulation of where one stands relative to other physicists (that is, how far above). Comfort with this hierarchical approach and unself-conscious elitism is essential for success” (Megan Urry, “Are photons gendered?”, 2008).

Final remarks

- Heroic narratives do not help learn about women's (and other collectives') contributions to science.
- Gender perspective changes the focus to non-heroic figures: non-linearity in science, collective effort, preconceptions and science culture, institutions, private lifes… all play a role in the way of doing physics. Success and not success are both part of the history.
- It is not (only) about adding female names to a list of contributors to science. It is about telling a different story about science, in which diverse people have a place.

What can we do?

- Read *Women in the history of quantum physics*!!
- Do not to promote heroic narratives, but inclusive narratives
- More exchange between the two communities: physicists and historians of physics. How to build exchange spaces?