The Emergence of Bohmian Mechanics

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Wolfgang Pauli über David Bohm

Dieser schreibt mir Briefe wie ein Sektenpfaff, um mich zu bekehren... Ich habe Bohm zwar vorgeschlagen, unsere Korrespondenz vorläufig abzubrechen, bis er neue Resultate zu berichten habe; das hat aber nichts geholfen, es kommen weiter fast täglich Briefe von ihm, oft mit Strafporto (er hat offenbar einen unbewußten Wunsch, mich zu bestrafen).

Pauli an Fierz, 6. Januar 1952

Overview

"A number of Oppenheimer's graduate students in the field of physics were quite active. Our contacts were more on their terms than ours. They lived in a more rarefied intellectual and cultural atmosphere, although they were friendly and not at all pretentious."

Steve Nelson,
CPUSA

FIG. 1. Participants at the Shelter Island conference (left to right): I. I. Rabi, L. Pauling, J. Van Vleck, W. E. Lamb, G. Breit, D. MacInnes, K. K. Darrow, G. E. Uhlenbeck, J. Schwinger, E. Teller, B. Rossi, A. Nordsieck, J. von Neumann, J. A. Wheeler, H. A. Bethe, R. Serber, R. E. Marshak, A. Pais, J. R. Oppenheimer, D. Bohm, R. P. Feynman, V. F. Weisskopf, H. Feshbach (not in the picture, H. A. Kramers). Courtesy of the Archives of the National Academy of Sciences.

Wanted: David Bohm

The following is the description of the Subject:

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NAME:            DAVID JOSEPH BOHM wa David Samuel Bohn
BORN:            December 20, 1917 at Wilkes Barre, Pennsylvania
RACE:            White
SEX:             Male
HEIGHT:          5 ft. 9½ in.
WEIGHT:          145 lbs.
EYES:            Gray
HAIR:            Brown
occupation:      Physicist, Princeton, New Jersey
MARITAL STATUS:  Single
RACE:            American, Jewish extraction
RELATIVES:       Father - SAMUEL BOHM born Czechoslovakia
                 Mother - FREIDA POPKY BOHM born Poland
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Source: David Bohm's FBI File. Photograph ca. 1943, Description 1949)

Bohm's Quantum Theory

Schrödinger-equation:

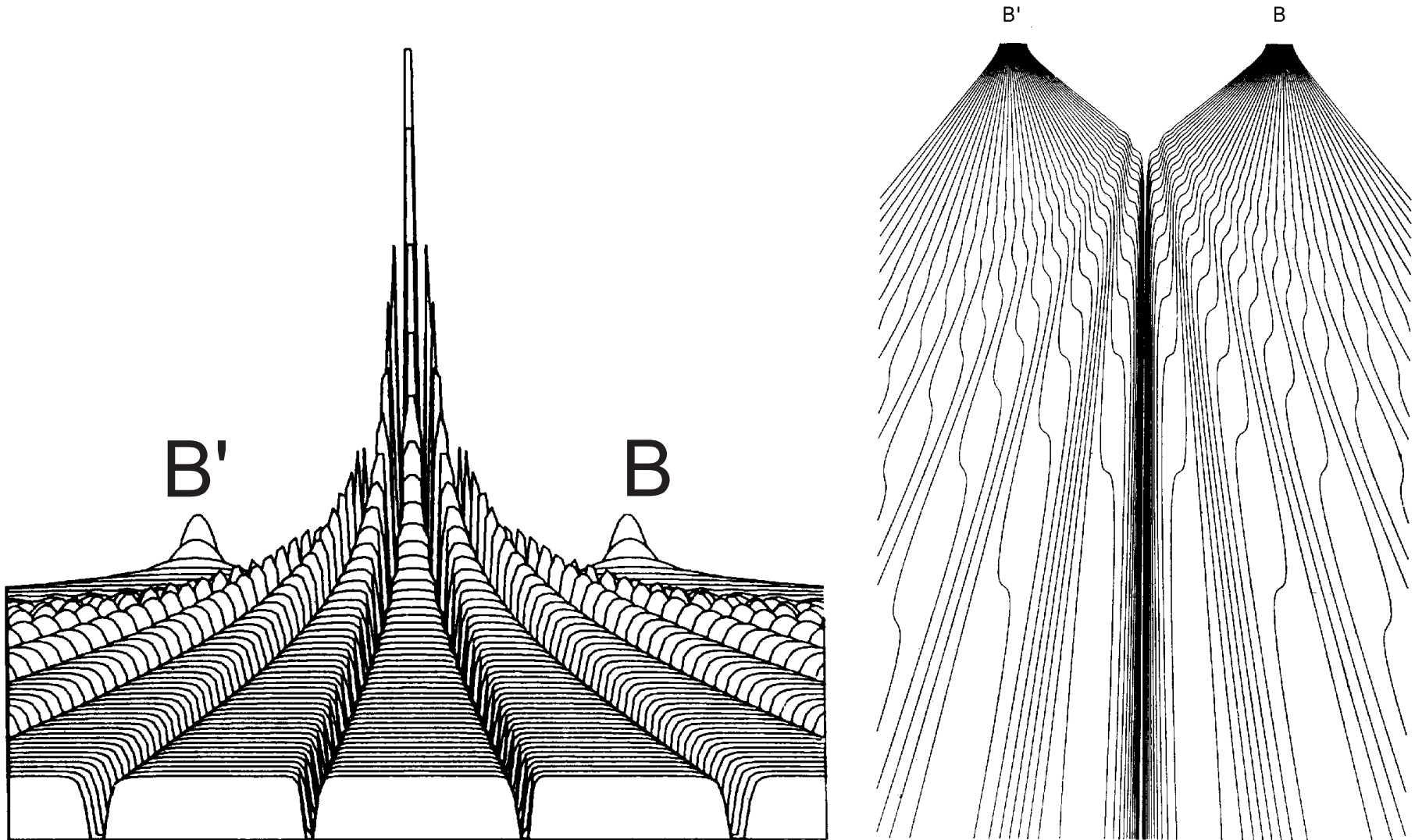$$i\hbar\frac{\partial\psi}{\partial t} = -\frac{\hbar^2}{2m}\nabla^2\psi + V(\mathbf{x})\psi$$

Use $\psi = R\exp(iS/\hbar)$ and separate real and imaginary part:

(1)
$$\frac{\partial R}{\partial t} = -\frac{1}{2m}\left[R\nabla^2 S + 2\nabla R \cdot \nabla S\right]$$

(2)
$$-\frac{\partial S}{\partial t} = \frac{(\nabla S)^2}{2m} + V(\mathbf{x}) \underbrace{-\frac{\hbar^2}{2m}\frac{\nabla^2 R}{R}}_{=U(\mathbf{x})}$$

Conclusion

- Bohm's philosophical views were not effective in the construction of physical theories until he was dissociated from the American physical community.

- With the isolation from the US community Bohm started to reconsider his theory in the light of dialectical materialism and used it as a guideline for the construction of new physical theories and entities.

- As soon as the pressure of a collective mode of thinking is away, there will be new degrees of freedom in the indiviual thinking and for the creation of new theories.