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Reading Ernst Ising's dissertation hundred years on

Tuesday, 24 September 2024 11:00 (40 minutes)

The Ising model is an archetype describing collective ordering processes. As such, it is widely known in physics and far beyond. Less known is the fact that the thesis defended by Ernst Ising 100 years ago under supervision of Wilhelm Lenz [1] contained not only the solution of what we call now the 'classical 1D Ising model' but also other problems. Some of these problems are the subject of this report [2,3]. In particular, I will discuss (i) a model proposed in 1922 by Walter Schottky and its relation to the Ising model [2]; (ii) the combinatorial method Ernst Ising used to calculate the partition function for a chain of elementary magnets [3]; (iii) the generalizations of the two-state model suggested in Ernst Ising's thesis but not exposed in his paper [3]. The talk is a part of an ongoing project that aims to prepare a bilingual, commented edition of the doctoral thesis of Ernst Ising [4].

[1]. Beitrag zur Theorie des Ferro- und Paramagnetismus. Dissertation zur Erlangung der Doktorwürde der Mathematisch–Naturwissenschaftlichen Fakultät der Hamburgischen Universität vorgelegt von Ernst Ising aus Bochum. Hamburg 1924; E. Ising. Beitrag zur Theorie des Ferromagnetismus. Zeitschr. f. Phys. 31 (1925) 253–258.

[2]. R. Folk, Yu.. Holovatch. Schottky's forgotten step to the Ising model. Eur. J. Phys. H 47 (2022) 9.

[3]. R. Folk, Yu. Holovatch. Ising's roots and the transfer-matrix eigenvalues. Entropy 26(6) (2024) 459.

[4]. B. Berche, R. Folk, Yu. Holovatch, R. Kenna, in preparation

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