About the article MAGNETO-RESISTANCE OF TWO-DIMENSIONAL SYSTEMS A.I. LARKIN

JETP LETTERS , **31,** *219 (1980)*

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15 Feb 2015

Sent to publication in January of 1980, this short paper finalised the stormish development in 1979 of what was later called *the weak localisation*. The year begun with publication of the famous "gang of four" paper [1], in which its authors proposed the scaling theory of localisation and claimed that all states in a 2D conductor with an arbitrary disorder are localised. A microscopic derivation of the scaling equation and the arguments in support of the conjecture of renormalisation group (RG) were given in the paper [2]. One month later, F. Wegner [3] proposed - phenomenologically - a model of the Field Theory, which possessed the RG and, in the limit of a weak disorder, gave the scaling equation conjectured by the authors of Ref [1].

The further development of the microscopic theory indicated

the strong dependence of the quantum correction to conductivity on magnetic field [4], which led to suppression of the negative corrrection to conductivity and contributed to a negative magnetirestance. This finding shifted attention to dependence of the resistance on magnetic field, which proved to be an easier way to conduct an experimental study of the whole phenomenon. It also brought up the necessity to discuss the influence of various factors on magneto-resistance. One month later, Hikami, Larkin and Nagaoka investigated effect of spin-orbit interaction on magnetoresistance [5] and found out that the latter changes its sign. Now, in this paper, Larkin attracted attention to the contribution to magneto-resistance of the Maki-Thompson correction to conductivity[6], discovered ten years earlier. The Maki-Thompson correction is connected to the scattering of the electrons on the Cooper pairs, which arose due to fluctuations. Originally, this correction was studied at the temperature close to the critical temperature of superconducting transition because it results in a smoothing out the sharp resistance drop. Still, the Cooper pairs could arise due to fluctuations far from superconducting transition and even for the repulsive sign of electron-electron interaction.

Larkin pointed out that the sensitivity of the wave function of the Cooper pair to external magnetic field results in the contribution to magneto-resistance. Dependence of this contribution upon the magnetic field turned out to be identical to that due to weak localisation and its magnitude being dependent on the magnitude of the strength g of electron-electron interaction in the "Cooper channel". As the result, the magnitude of magnetoresistance due to weak localisation must be corrected by the account of new contribution. The factor a ($a = 1$ for po-

tential scattering and $a = -.5$ for the case of strong spin-orbit interaction) at the front of the standard expression for magneto-resistance must be replaced by the combination $a - \beta$.

After exposition of the argument in favor of the new effect and the analytical derivation of the formulae, Larkin presents - in the forme of a tableaux - the results of numerical calculation of the factor β for different values of the coupling constant g. For all the values of the coupling constant, the factor β remains positive.

The results of this paper were quickly adsorbed by all practicing researchers and remain now a part of the uniformorly used formula for magneto-resistance.

References

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