About the paper «**Magnetoresistance of the two-dimensional electron gas in a parallel magnetic field»** Dolgopolov V.T., Gold A. (2000)

In the paper [1] the resistance of strongly interacting two-dimensional electron gas is calculated as a function of electron spin polarization caused by external magnetic field . To avoid possible influence of orbital effects, it was assumed that the magnetic field is parallel to the plane of the two-dimensional electrons.

In the approximation in which the problem was solved in [1], one could easily solve it much earlier , at least twenty years before. In this sense, the problem can be classified as forgotten or missed task. This task became very interesting after it was experimentally found that in 2D gas of silicon high mobility field effect structures (Si-MOSFETs) one achieves complete spin polarization of electron system in parallel to interface magnetic field [2,3].

The idea of the solution is to take into account the variation in the screening of the Coulomb scattering center caused by the spin polarization increase . The effect becomes significant only at $r_s \sim 1$, where the parameter r_s characterizes the interaction strength between electrons . (In the simplest case, r_s is the ratio of the characteristic potential energy to the typical kinetic energy.) On the other hand, approximation used in [1] (RPA with Hubbard corrections) is valid also only in the region where r_s is slightly higher than unity. Thus, the formal calculation is valid in a narrow range of electron densities corresponding to the values of r_s close to unity. Another drawback is taking into account Hartree part of the scattering potential only .

Despite these shortcomings, the paper [1] gained great popularity among the experimentalists: the paper is cited about a dozen times each year. It turned out that the results adequately describe the experiment (both qualitatively and quantitatively), even in the limit of $r_s >> 1$, and in addition, the better description of the changes in the transport properties of two-dimensional electron systems caused by spin polarization is still not avaliable.

In one year after publication of [1] its results were reproduced in [4].

1. V. T. Dolgopolov, A. Gold JETP Letters 71, 27 (2000).
2. T. Okamoto, K. Hosoya, S. Kawaji, A. Yagi Phys.Rev. Lett., 82, 3875 (1999)
3. T. Okamoto, K. Hosoya, S. Kawaji, et al, Cond-mat/ 9906425 (1999)
4. Igor F. Herbut Phys. Rev. B, 63, 113102 (2001)