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Half integer features in the quantum Hall Effect: experiment and theory TOBIAS KRAMER, University Regensburg, E.J. HELLER, R.E. PARROTT, Harvard University, C.-T. LIANG, National Taiwan University, C.F. HUANG, National Measurement Laboratory, Taiwan, K. Y. CHEN, National Taiwan University, L.-H. LIN, National Chiayi University, Taiwan, J.-Y. WU, S.-D. LIN, National Chiao Tung University, Taiwan — We discuss experimental data and a new model of the integer quantum Hall effect (IQHE), which explains an intriguing substructure within Landau levels observed at higher currents. The experiments show inflection points in the Hall resistivity around filling factors 5/2 and 7/2. The experiments require to revisit the foundations of the IQHE and to establish an injection model which incorporates the correct boundary conditions imposed by a real Hall device and the Lorentz force. We have to follow the electrons to their source: one corner of the Hall bar and its steep electric field gradients, rather than focusing on the middle of the Hall device. We find the entire Hall resistivity curve is calculable as a function of magnetic field, temperature, and current. In contrast to previous theories of the IQHE, disorder plays no fundamental role in our theory. Contrary to the standard picture of Landau levels in disorder system, we predict and observe gaps right in the middle of certain Landau levels. The Hall plateaus and half integer inflections are shown to result from the LDOS appropriate to the magnetic field and the strong electric field at the injection corner.

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