

Abstract Submitted
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Roles of Magnetic Reconnection and Developments of Modern Theory* B. COPPI, MIT — The role of reconnection was recognized in Solar and Space Physics and auroral substorms were suggested to originate in the night-side of the Earth's magnetosphere as a result collisionless reconnection¹ well before the kind of modern theory employed for this became applied to laboratory plasmas. Experiments have reached low collisionality regimes where, like in space plasmas, the features of the electron distribution and in particular of the electron temperature gradient become important and the factors contributing to the electron thermal energy balance equation (transverse thermal and longitudinal diffusivities, or electron Landau damping² play a key role. For this an asymptotic theory of modes producing macroscopic islands has been developed involving 3 regions, the innermost one related to finite resistivity and the intermediate one to the finite ratio of the to thermal conductivities^{3,4}. A background of excited micro-reconnecting modes, driven by the electron temperature gradient, is considered to make this ratio significant⁴
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¹B. Coppi, *Nature* **205**, 998 (1965).

²B. Coppi, J.W.-K. Mark, L. Sugiyama, G. Bertin, *Phys. Rev. Letters* **42**, 1058 (1978) and J. Drake, *et al.*, *Phys. Fluids* **26**, 2509 (1983).

³B. Coppi, C. Crabtree, and V. Roytershteyn contribution to Paper TH/R2-19, I.A.E.A. Conference 2006.

⁴B. Coppi, in "*Collective Phenomena in Macroscopic Systems*" Eds. G. Bertin *et al.* (World Scientific, 2007) MIT-LNS Report 06/11(2006).

B. Coppi
MIT

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