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P. Robert Kotiuga* (prk@bu.edu), Boston University, ECE Dept., 8 Saint Mary's Street, Boston, MA 02215. *A dictionary for defining key concepts in plasma Physics in terms of Clebsch charts in contact geometry.* Preliminary report.

Terms like “tubes and slices”, which go back to Faraday and Maxwell, as well as more modern terms like “magnetic surfaces” and “reconnection points” are used extensively to describe three-dimensional vector fields in plasma physics. These terms can be rigorously defined in terms of differential forms and foliations with singularities, without reference to the underlying metric. In 3-d, this brings the Clebsch charts of contact geometry to the fore. Although this could have been anticipated by J. C. Maxwell and A. Clebsch, it is now important to develop this dictionary in a rigorous manner since recent results concerning foliations, confoliations, open book decompositions, and (over)twisted contact structures are then easily related to the (near-)force-free magnetic fields encountered in plasma physics. This in turn enables one to obtain rigorous topological characterizations of plasma equilibria with a minimum of assumptions about the mathematical model used to model the underlying physics processes. Some ties to “fillings of contact structures” and Heegaard-Floer homology will also be exposed. (Received September 21, 2009)