1038-35-175 **Gui-Qiang G. Chen*** (gqchen@math.northwestern.edu), Department of Mathematics, Northwestern University, 2033 Sheridan Road, Evanston, IL 60208-2730, and **Mikhail Feldman** (feldman@math.wisc.edu), Department of Mathematics, University of Wisconsin-Madison, Madison, WI. *Shock Reflection, Transonic Flow, and Free Boundary Problems (Part I).*

When a plane shock hits a wedge head on, it experiences a reflection-diffraction process and then a self-similar reflected shock moves outward as the original shock moves forward in time. The complexity of reflection configurations was first reported by Ernst Mach in 1878, and experimental, computational, and asymptotic analysis has shown that various patterns of shock reflection may occur, including regular and Mach reflection. However, most fundamental issues for shock reflection have not been understood, including the transition of the different patterns of shock reflection. Therefore, it becomes essential to establish a mathematical theory on the existence, stability, and regularity of global configurations of shock reflection, especially for potential flow which has widely been used in aerodynamics.

In Part I, we will start with various shock reflection phenomena and their fundamental scientific issues. Then we will describe how the shock reflection problems can be formulated as transonic flow problems/free boundary problems for nonlinear conservation laws of mixed-composite hyperbolic-elliptic type and will address some recent developments, further trends, perspectives, and open problems in this direction. (Received February 07, 2008)