1023-49-308 **Frank Baginski** and **Michael Barg*** (mc_barg@gwu.edu), Department of Mathematics, The George Washington University, 1922 F St. NW, Washington, DC 20052, and **William Collier**.
Existence Theorems for Thin Inflated Wrinkled Membranes Subjected to a Hydrostatic Pressure Load. Preliminary report.

In this paper, we establish rigorous existence theorems for a mathematical model of a thin inflated wrinkled membrane that is subjected to a shape dependent hydrostatic pressure load. We are motivated by the problem of determining the equilibrium shape of a strained high-altitude large scientific balloon. Unlike a standard membrane, the balloon is unable to support compressive stresses and will wrinkle or form folds of excess material. Our approach can be adapted to a wide variety of inflatable membranes, but we will focus on super-pressure pumpkin shaped balloons. We briefly outline the shape finding process for the balloon design, formulate the problem of a strained balloon in an appropriate Sobolev space setting, and establish rigorous existence theorems using direct methods in the calculus of variations. (Received September 05, 2006)