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Theoretical and experimental analysis of mylar balloons ANTONIO ROMAGUERA, Universidade Federal Rural de Pernambuco, VINCENT DÉMERY, BENNY DAVIDOVITCH, UMass - Amherst — In the present study, we present a theoretical and experimental study of the problem known as the mylar balloon shape. The problem consists of inflating a balloon made of two circular discs of an unstretchable material sewed at the edge. A solution for this problem was given by W. H. Paulsen in 1994 for constrain free. In our analyzes, we fixed the height of the balloon and measure the inflated diameter. As a result, we were able to map the constrained shape in terms of the original mylar balloon's shape. The basic assumption of this problem is that the gravitational, stretching and bending energies are negligible compared with the mechanical energy $-pV$. Controlling the pressure and the height of the balloon, we are able to find the condition where these assumptions fail, specially in the limit $h \to 0$ for fixed p. A remarkable feature of this problem is the presence of wrinkles across the equator of the balloon. A precise description for that region must include the large deformation from the flat disc initial condition. We will also present some experimental data on the wrinkle's length and its connection with the pressure and height of the balloon.

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