Meeting: 1001, Evanston, Illinois, SS 10A, Special Session on Differential Geometry

1001-53-271 **brian smyth*** (smyth.1@nd.edu), Dept. of Mathematics, 255 Hurley Hall, Univ. Notre Dame, Notre Dame, IN 46556. *Soliton surfaces in the mechanical equilibrium of closed membranes.*

For a *closed* material membrane in equilibrium in a force field we investigate whether the external observables (membrane geometry and force field) determine the internal membrane response (the stress tensor T), when the mean stress $\frac{1}{2}$ Tr T is known. For membranes with boundary the indeterminacy of the response is classical.

For closed membranes the geometry decides the question. We show uniqueness for all but a class of soliton surfaces — the *globally isothermic surfaces*; the physical phenomenon exhibited by any closed globally isothermic membrane in equilibrium is that, with all observables static, there is in total a 1-parameter family of responses with the same mean stress — all canonically determined by membrane geometry (Theorem 1). There exist closed embedded globally isothermic surfaces of every genus (Theorem 2).

The recognition of the role of these soliton surfaces settles the old classification problem for the space of static shears in any closed membrane, explicitly identifying all static shears, where before only a genus-dependent dimension bound was known (Theorem 3).

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