

A Variational Perspective on Wrinkling Patterns in Thin Elastic Sheets

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Abstract: Thin elastic sheets exhibit a daunting array of patterns. A key difficulty in their analysis is that while we have many examples, we have no classification of the possible “patterns”. We do, however, know that the stable configurations are (local) minima of a suitable elastic energy. This minicourse will explore a variational perspective, whose central goal is to identify the “scaling law” of the minimum energy (with respect to the sheet thickness, and the other parameters of the problem). Success requires proving upper and lower bounds that scale the same way. The upper bounds are often nontrivial, but nature gives us a hint. The lower bounds are more subtle, since they must be ansatz-independent. In many cases, the arguments used to prove the lower bounds help explain “why” we see particular patterns.