Many geometric variational problems involve unknown critical surfaces, manifolds, functions, or vectorfields, etc. whose boundary conditions topologically preclude some regularity of the minimizer. But even in the absence of such topological obstructions, singularities may occur for energetic reasons. We will first consider some old examples of such behavior, including the interior or boundary regularity of area-minimizing surfaces, energy-minimizing maps, or sections of bundles. There is also an interesting interplay between topological and energetic considerations for energy-minimizing maps to cones. In 1985 J.L. Ericksen suggested including a scalar Landau-type parameter $s(x)$ for a variable probability of orientation order to models for nematic liquid crystals as unit vectorfields. F.H. Lin then made the important interpretation of such a functional as the energy of a map into a (positively or negatively curved) cone over the 2 sphere (in either Euclidean space $\mathbb{R}^3 \times \mathbb{R}$ or Minkowski space $\mathbb{R}^{3,1}$). He showed existence of minimizers, their Hölder continuity, and higher regularity away from the zero set $s^{-1}\{\text{vertex}\}$. In 1993, Lin and Hardt prove that this set must, in the positively curved case, consist of isolated points. The 1993 paper also considers the model with the cone over the projective plane. Then the zero set is shown always to be at most 1 dimensional, and there are specific examples with 1 dimensional zero sets. A 2011 paper of of J. Ball and A. Zarnescu show relations of a related model with the de Gennes $Q$-tensor theory and some topological consequences. We will describe what is known about the general regularity and structure of the zero set.