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1003-35-127 **A Majumdar**, **J M Robbins** and **M Zyskin*** (M.Zyskin@bris.ac.uk), Department of Mathematics, University of Bristol, University Walk, BS8 1TW Bristol, England. *Harmonic map problems for a nematic liquid crystal in polyhedral cells.*

Stable configurations of a nematic liquid crystal in a simply-connected polyhedral cell $P \subset R^3$ are described by continuous unit-vector fields (ie, maps to S^2), which are local minima of the harmonic map energy functional. In the case of tangent boundary conditions, unit-vector field is required to be tangent to the faces of P . Homotopy classes of continuous tangent unit vector fields on P (without vertices) are classified by edge signs (two possible directions along an edge), kink numbers for pairs of edges with a common vertex (relative degrees of $S^1 \mapsto S^1$ maps in their common face), and wrapping numbers (relative degrees of maps on surfaces in P separating a vertex from other vertices). It is shown that for continuous tangent maps, C^∞ tangent maps are dense in the Sobolev norm. A lower bound for the energy is obtained in terms of homotopy invariants. On a rectangular prism, an upper bound is obtained for a large family of homotopy types which differs from the lower bound by a constant factor depending on the aspect ratios of the prism. Transitions between regular and singular-on-edge minimal-energy configurations are observed as a function of the aspect ratios. Research is relevant to bi-stable LC display design. (Received August 10, 2004)