Variational Modeling of Paperboard Delamination under Bending

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Paperboard is an engineering material consisting of a number of separate sheets of paper, that have been bonded together. Experimental evidence shows that paperboard undergoing bending develops phenomenologically plastic hinges. We consider a nonlinearly elastic mathematical model for paperboard, allowing debonding of the sheets at a given cost per unit area. Analysis of our model predicts a number of different regimes, including some where bending is concentrated in delaminated hinges, where the midplane of each individual layer may deform isometrically. This is joint work with Sergio Conti (Bonn) and Julia Orlik (Kaiserslautern).