

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Edge curling that has plagued scrolls for millenniums MING-HAN CHOU, WEI-CHAO SHEN, YI-PING WANG, Department of Physics, National Tsing Hua University, SUN-HSIN HUNG, Department of Registration and Conservation, National Palace Museum, TZAY-MING HONG, Department of Physics, National Tsing Hua University, DEPARTMENT OF PHYSICS, NATIONAL TSING HUA UNIVERSITY TEAM, DEPARTMENT OF REGISTRATION AND CONSERVATION, NATIONAL PALACE MUSEUM COLLABORATION — Qi-Wa refers to the up curl on the lengths of handscrolls and hanging scrolls, which has troubled Chinese artisans and emperors for as long as the art of painting and calligraphy exists. This warp is unwelcome not only for aesthetic reasons, but its potential damage to the fiber and ink. Although it is generally treated as a part of the cockling and curling due to moisture, consistency of paste, and defects from the mounting procedures, we demonstrate that the spontaneous extrinsic curvature incurred from the storage is in fact more essential to understanding and curing Qi-Wa. In contrast to the former factors whose effects are less predictable, the plastic deformation and strain distribution on a membrane are a well-defined mechanical problem. We study this phenomenon by experiments, theoretical models, and Molecular Dynamics Simulation, and obtain consistent scaling relations for the Qi-Wa height. This knowledge enables us to propose modifications on the traditional mounting techniques, that are tested on real mounted paper to be effective at mitigating Qi-Wa. By experimenting on polymer-based films, we demonstrate possible relevance of our study to the modern development of flexible electronic paper.

Ming-Han Chou
Department of Physics, National Tsing Hua University

Date submitted: 10 Nov 2013

Electronic form version 1.4