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**Thangka Production in the 18th – 21st Centuries: Documenting the
Introduction of Non-Traditional Materials into Himalayan Painting Practice**
*Jennifer Mass, Jo-Fan Huang, Betty Fiske, Ann Shaftel, Xian Zhang, Richard Laursen,
Courtney Shimoda, Catherine Matsen and Christina Bisulca*

ABSTRACT: This project investigates the materials and techniques used by Tibetan artists. Six Tibetan thangkas were analyzed by infrared reflectography, energy dispersive x-ray fluorescence, Fourier transform infrared microspectroscopy, Raman spectroscopy, scanning electron microscopy-energy dispersive spectroscopy, and high-performance liquid chromatography. The analysis has suggested that three thangkas of the eighteenth - nineteenth century have a traditional palette, which includes azurite, vermilion, orpiment, bronchantite, red lead, dolomite, magnesite, organic red with calcite or magnesite substrate, and alumino-silicate clay minerals. Another late nineteenth or early twentieth century thangka shows the use of Western pigments such as emerald green, ultramarine, calcite, gypsum, chrome yellow, gold color from brass powder, and red and yellow dyes with barium sulfate substrates. Two twentieth century thangkas made for the tourist trade revealed a twentieth century palette such as titanium dioxide, phthalocyanine blue, phthalocyanine green, and other pigments such as red lead, chrome yellow, barium sulfate, and gypsum.

BIOGRAPHIES:

Jennifer Mass, Betty Fiske, Courtney Shimoda, W. Christian Petersen and Catherine Matsen are from Winterthur/University of Delaware Program for Art Conservation (WUDPAC), USA.

Jo-Fan Huang is from the Philadelphia Museum of Art.

Xian Zhang and Richard Laursen are from Boston University.

Ann Shaftel is a Fellow of IIC, a Fellow of AIC and a member of CAPC in Canada. She has an M.A. in Asian Art History and and M. S. in Conservation. She has worked preserving thangkas since 1970, including work for major museums worldwide and monasteries in Bhutan, Sikkim, Nepal and Tibetan communities in Northern India, including the Dalai Lama's museum.

CONTACT: Ann Shaftel, Tsöndrü Thangka Conservation, 6201 Shirley Street, Halifax, Nova Scotia B3H 2N3, Canada. Tel. (902) 422-2327. Web: www.TSONDRU.com. Email: annshaftel@mac.com.