

Thangka D (Figure 8, left):

This is a mid-20th century thangka depicting Tsonkhapa, founder of the Gelug lineage, possibly of Mongolian or Sino-Tibetan/Amdo, in the folk art tradition. The cross-section photomicrograph (Figure 8, top right) shows chrome yellow applied over ultramarine blue. ED-XRF analysis (Figure 8, bottom right) of a green colorant revealed the presence of copper (Cu) and arsenic (As). This data in conjunction with FTIR analysis indicated the use of emerald green pigment.

Thangka E (Figure 9, left):

Thangka purchased in 21st century China, depicting the White Tara, or bodhisattva of compassion and serenity. The thangka was made specifically for the tourist trade and marketed as very old. The Raman spectrum (Figure 9, right) shows use of phthalocyanine green (633 nm laser for CAMEO reference spectrum, top; 785 nm laser for thangka, bottom spectrum). The XRF spectrum (Figure 10) suggests the use of chrome yellow. Note high manganese (Mn) content due to ‘artificial soot’ on surface: the piece has been artificially aged by darkening with a manganese-based pigment (Figure 10).

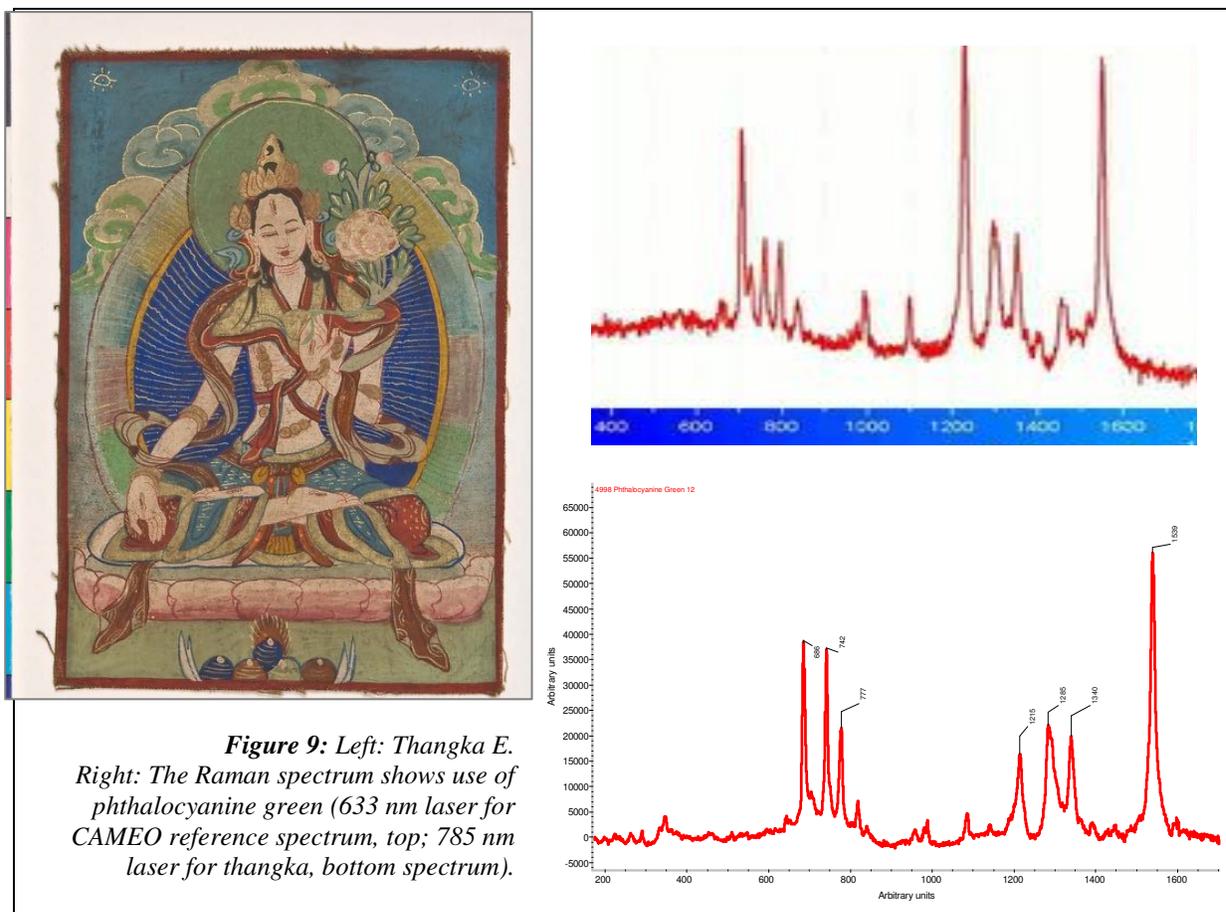


Figure 9: Left: Thangka E. Right: The Raman spectrum shows use of phthalocyanine green (633 nm laser for CAMEO reference spectrum, top; 785 nm laser for thangka, bottom spectrum).

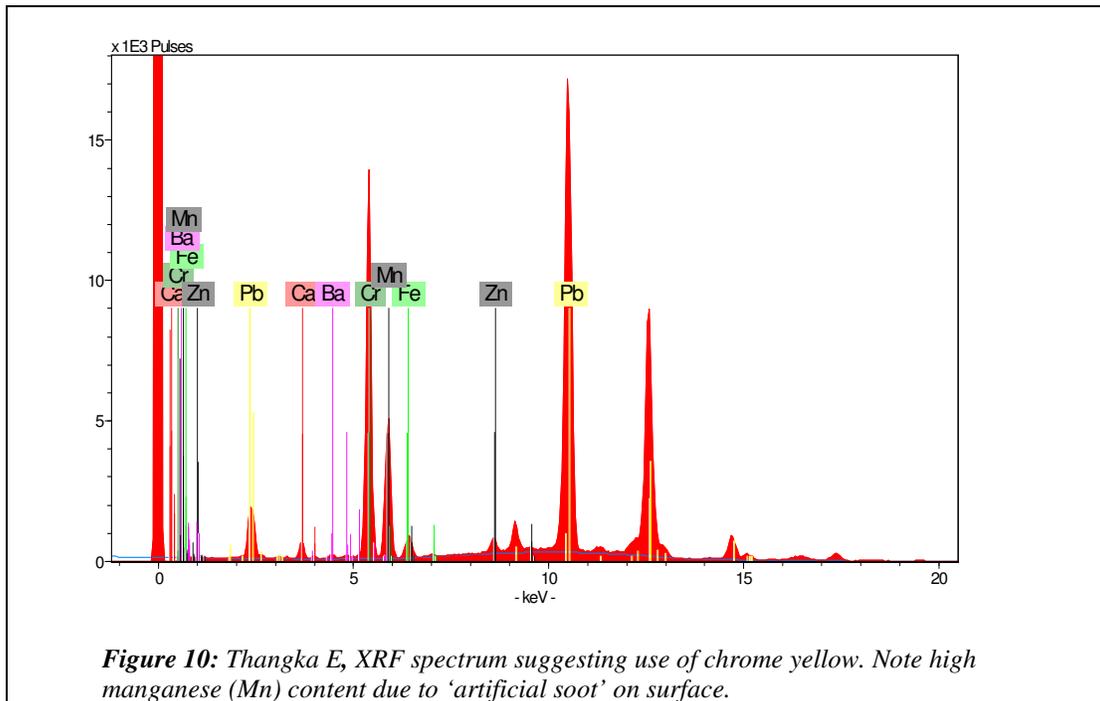


Figure 10: Thangka E, XRF spectrum suggesting use of chrome yellow. Note high manganese (Mn) content due to 'artificial soot' on surface.

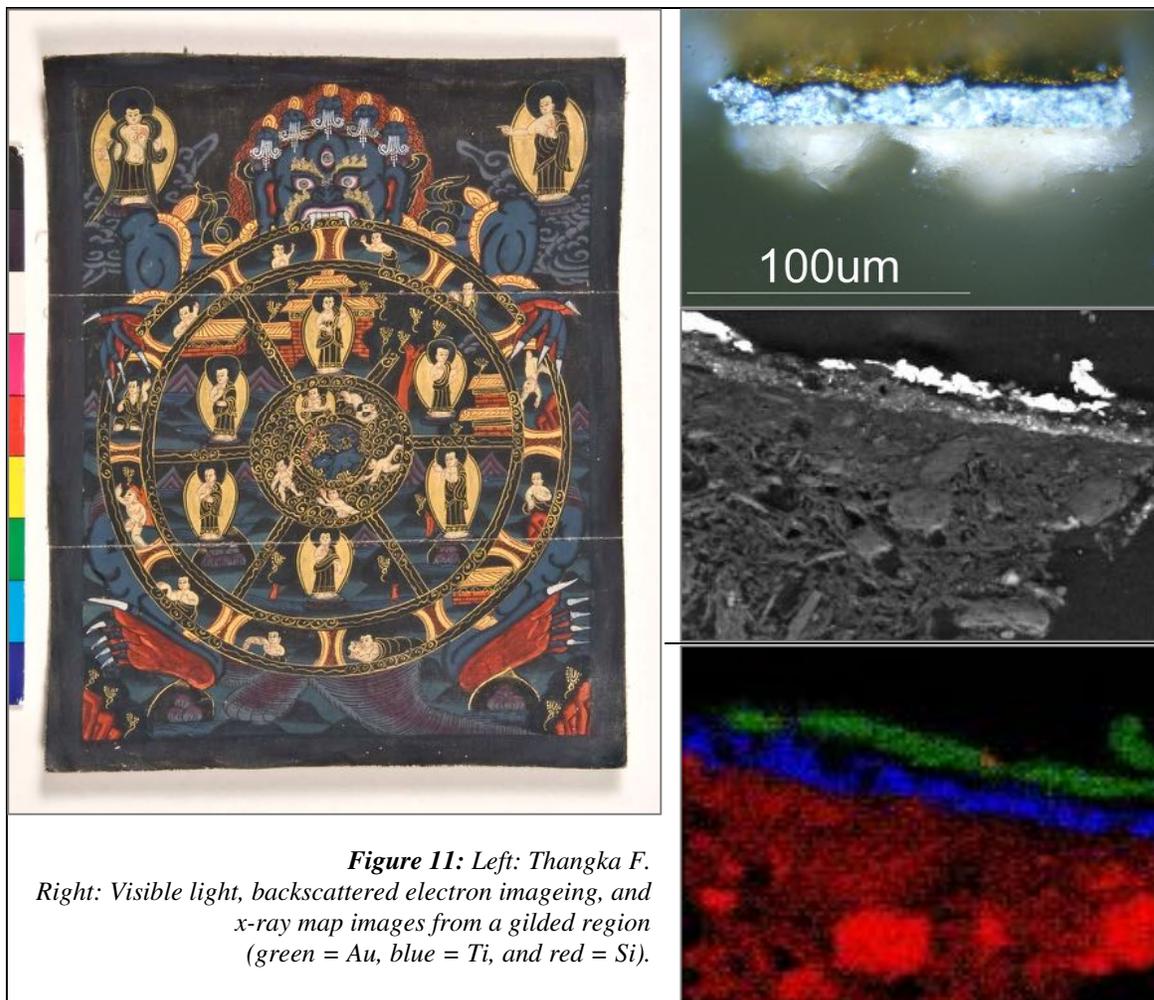
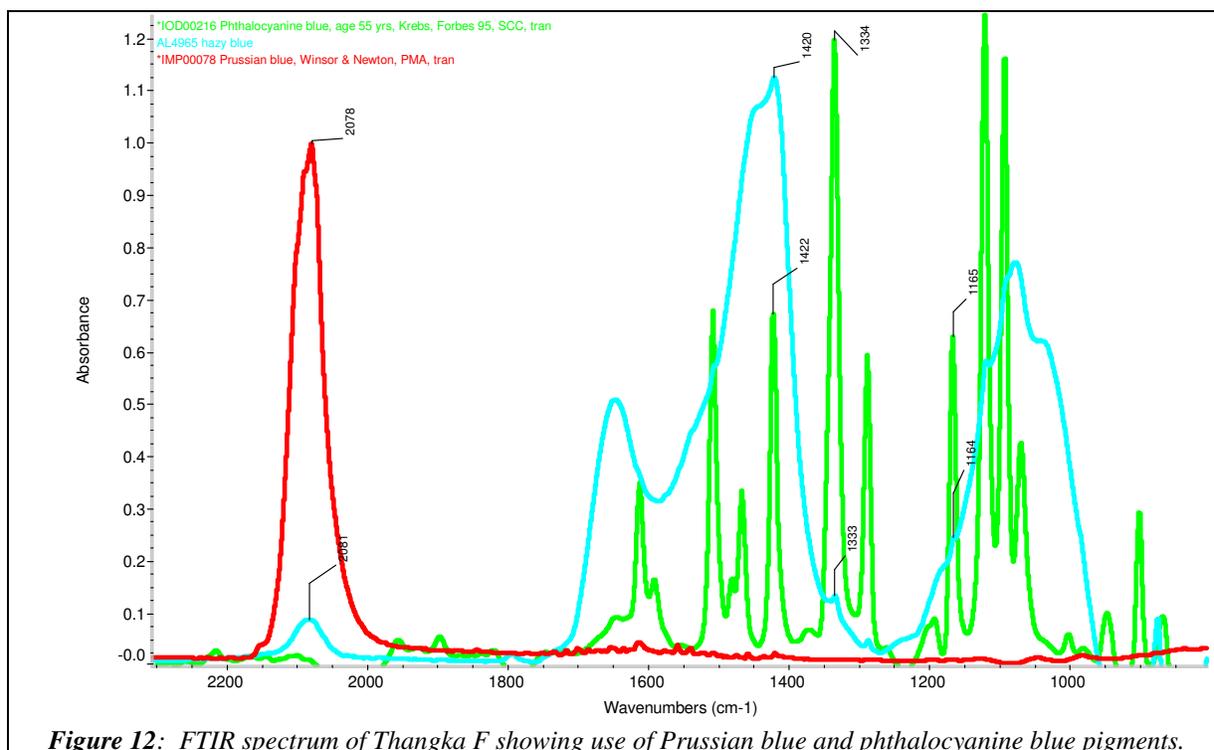


Figure 11: Left: Thangka F. Right: Visible light, backscattered electron imaging, and x-ray map images from a gilded region (green = Au, blue = Ti, and red = Si).

Thangka F (Figure 11, left):

This thangka is modern in both its iconography and origin. Similar to Thangka E, it was purchased on the tourist market in Asia in 2006 as an ‘old’ thangka. A gilded area was examined by visible light, by backscattered electron imaging, and by x-ray mapping (**Figure 11, right**); the latter technique identified the presence of gold (Au), titanium (Ti) and silicon (Si), which are indicative of modern materials. The FTIR spectrum (**Figure 12**) showed the use of Prussian blue and phthalocyanine blue synthetic pigments.



Discussion and Conclusions

Thangkas A, B and C, the 18th and 19th century thangkas, were found to have a traditional Himalayan palette, consisting of vermilion, red lead, and lac dye reds, orpiment (As_2S_3), and iron ochre yellows, malachite, antlerite [$\text{Cu}_2\text{Cl}(\text{OH})_3$], and brochantite [$\text{Cu}_4\text{SO}_4(\text{OH})_6$] greens, azurite and organic blues (likely indigo), carbon blacks, calcite whites, and grounds of clay, magnesite (MgCO_3), or a mixture of the two.

The mid-20th century Thangka D palette documents the importation of synthetic and Western pigments into the Himalayan region. These pigments include chrome yellow PbCrO_4 , artificial ultramarine, and emerald green [$\text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 3\text{Cu}(\text{AsO}_2)_2$], as well as a barium white ground. They are used in conjunction with more traditional artists' materials, including vermilion and red lead, magnesite and gypsum.

In Thangkas E and F, the 21st century thangkas, we see the use of the phthalocyanine blue and green pigments, in addition to as yet unidentified synthetic red lake pigments.

While Prussian blue was identified in the previously mentioned study of a 18th-19th century Bonpo thangka⁵, it is notable that pigments introduced in the early 19th century in the West do not show up in Himalayan thangkas until the 20th century. However, further analysis of late 19th and early 20th century thangkas is necessary to more precisely determine the date of introduction of these materials. An 1840s account of pigments imported into Nepal and then into Tibet by the British East India Company included lead white, indigo, verdigris and sandalwood.⁶

Endnotes

1. Duffy, K. and J. Elgar, 1995, “An investigation of palette and color notations used to create a set of Tibetan Thangkas”, in book: *Historical Painting Techniques, Materials, and Studio Practice*, edited by A. Wallert, E. Hermens, and M. Peek (The Getty Conservation Institute: Los Angeles), pp. 78-84.

2. Duffy, K. and J. Elgar, 1999, “Examination of thangkas from Central and Eastern Tibet”, in book: *Sixth international conference on ‘non-destructive testing and microanalysis for the diagnostics and conservation of the cultural and environmental heritage’*, Rome, 17-20 May 1999, edited by M. Marabelli, C. Parisi, S. Gagliardi, G. M. Parisi and G. Torcinaro, vol. 3, pp. 1751-66.

3. Duffy, Kate and Jacki Elgar, 2003, “Five Protective Goddesses (Pancaraksha): a study of color notations and pigments”, in book: *Scientific Research in the Field of Asian Art: Proceedings of the First Forbes Symposium at the Freer Gallery of Art*, edited by Paul Jett, Janet G. Douglas, Blythe McCarthy and J. W. Winter (Archetype Publications Ltd: London). pp. 164-169.

4. Leona, Marco and Sandhya S. Jain, 2005, “Crossing the line: the interplay between scientific examination and conservation approaches in the treatment of a fifteenth-century Nepali thangka”. In book: *Scientific Research on the Pictorial Arts of Asia: Proceedings of the Second Forbes Symposium at the Freer Gallery of Art*, edited by Paul Jett, John Winter and Blythe McCarthy (Archetype Publications Ltd: London), pp. 125-134.

5. Richard R. Ernst, “Arts and Sciences. A Personal Perspective of Tibetan Painting”, *Chimia*, 55 (2001), pp. 900-914.

6. Hodgson, Brian Houghton, 1972 (1831). “The Commerce of Nepal”, in book: *Essays on the Languages, Literature, and Religion of Nepal and Tibet: Together with further papers on the Geography, Ethnology, and Commerce of those Countries*. Philo Press: Amsterdam, pp. 91-121. Hodgson was a British East India Company resident of Nepal for nearly two decades. In this paper originally published in 1831, Hodgson used Nepal as the subject and recorded its import and export with special commentary about Tibet. He briefly touched upon the early trade between Newar people of valley of Nepal and India and Tibet and then demonstrated Nepal as a trade center and bridge between British India and Tibet. Notable imported goods from India to Nepal and some of them were further exported into Tibet. Those were fabrics of many kinds, threads, coral, diamond, precious stones (emeralds, rubies, and sapphires), ambers of various kinds, chank,

coweys, gold mohur, golochan, indigo, animal skin of various kinds, saltpeter, brimstone, quicksilver, "singraf" or vermilion cinnabar, "China" and "Country" red lead, ruskappor, camphor, white sandal, Zangar or verdigris, white lead, minerals of various types, hardware, dried fruits, spices, and misc. Hodgson commented that there was a huge demand for opium and indigo from China and Mongolia through Tibet. Tibetan liked English broad cloth for clothing, and purchased some cotton fabric to cover paintings. Hodgson also mentioned another trade route between Russia and China. The Russian imports to China consist of products from Russia, England, and North America; the later two were often in large quantity, usually about half of the imports. Hodgson also noted the direct trade between Nepal and China.

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, Sikkém, 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 .

Disclaimer

These conference session papers are published and distributed by the International Council of Museums – Committee for Conservation (ICOM-CC), with authorization from the copyright holders. They are published as a service to the world cultural heritage community and are not necessarily reflective of the policies, practices, or opinions of the ICOM-CC. Information on methods and materials, as well as mention of a product or company, are provided only to assist the reader, and do not in any way imply endorsement by the ICOM-CC.