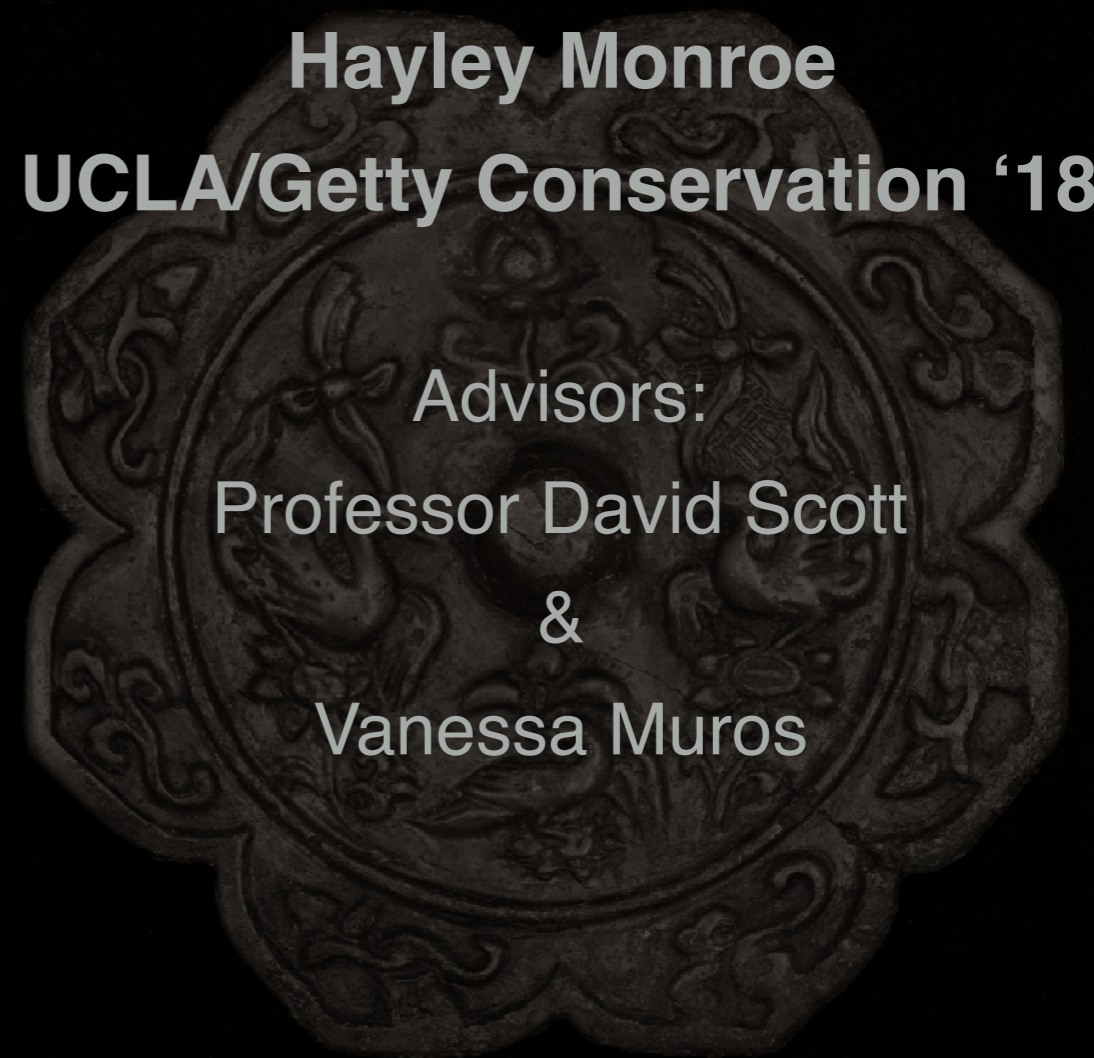




The Man in the Ancient Bronze Mirror

Hayley Monroe
UCLA/Getty Conservation '18

Advisors:
Professor David Scott
&
Vanessa Muros



Scripps College

Ruth Chandler Williamson
Gallery

Tang Dynasty (618-907 CE)



MET 25.20.3



MFA Boston 50.2088



MFA Boston 50.2092



MFA Boston 08.462



MFA Boston 50.2089



Graham no. 96 (M63)



SC 295
After Treatment
Front



SC 295
After Treatment
Front



METRIC 1

Alloy

(pXRF)

Leaded tin bronze

No zinc or arsenic

Trace amounts of Fe, Ag and Sb

*Typical Tang bronze mirror alloy = 66-78% Cu,
18-26% Sn, and 1-9% Pb*

Casting

(X-radiography)

Uneven, vertical wax casting

*Good quality mirrors from early dynasties through at
least the Tang were horizontally cast and very uniform*



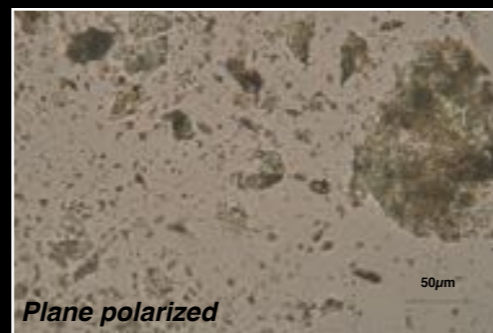
Spongy, dendritic shrinkage, cracks and hot tears

Corrosion

(PLM & ideally
metallographic x-section)



Malachite 'pit'



Plane polarized



Cross polarized

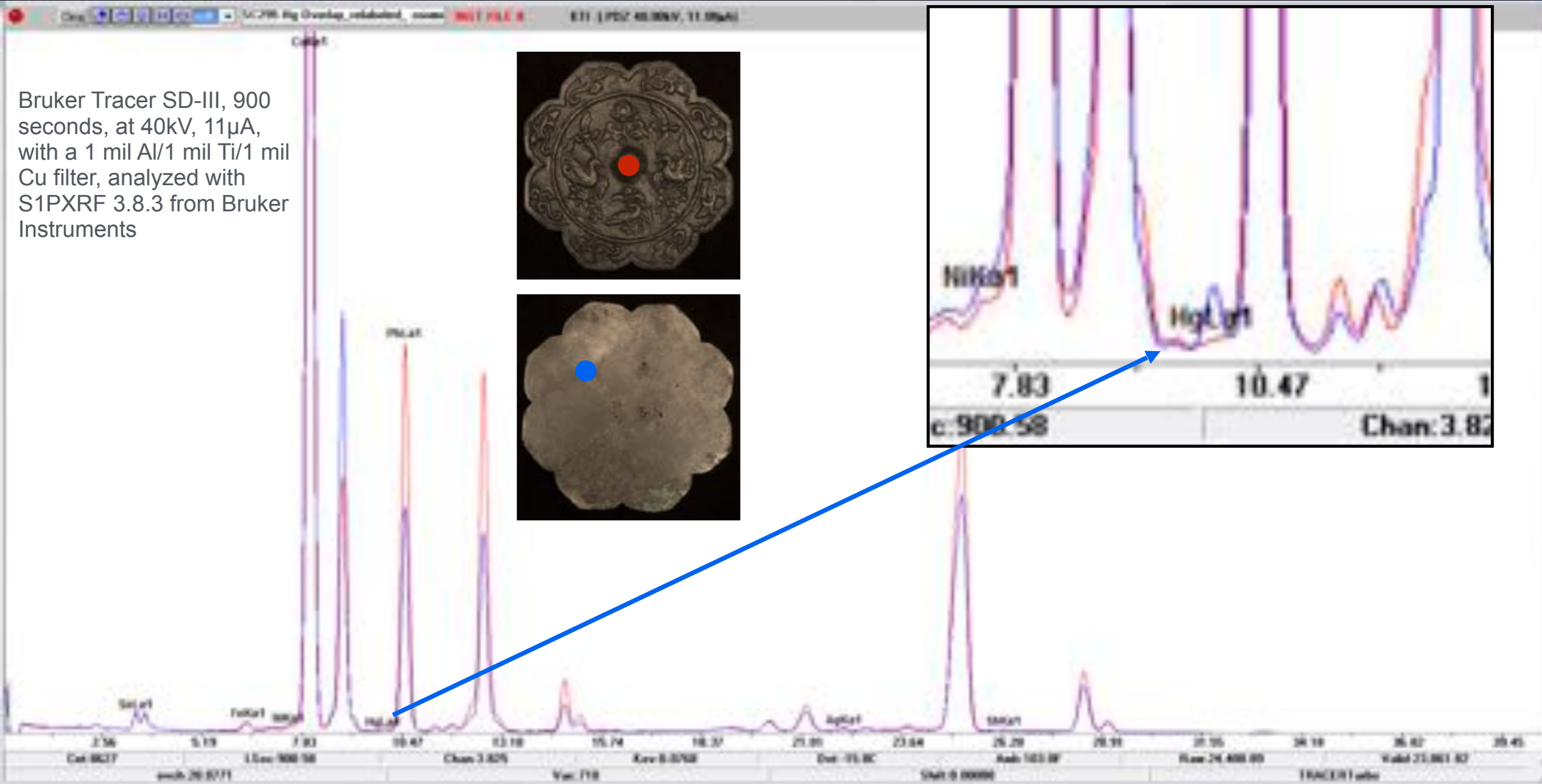
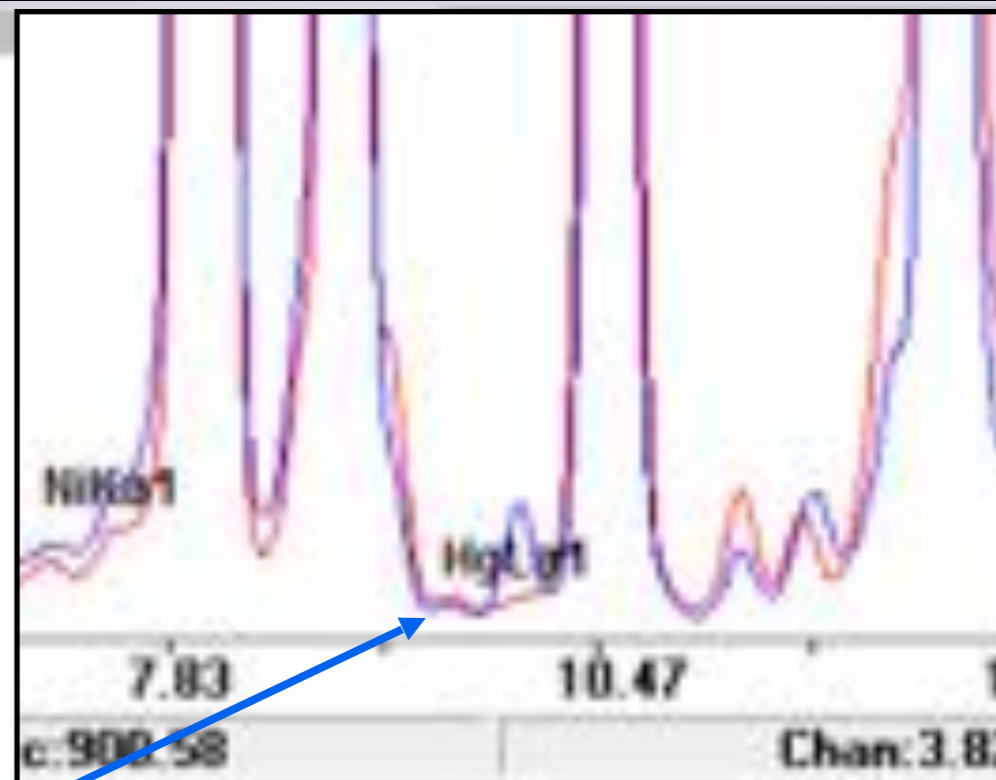
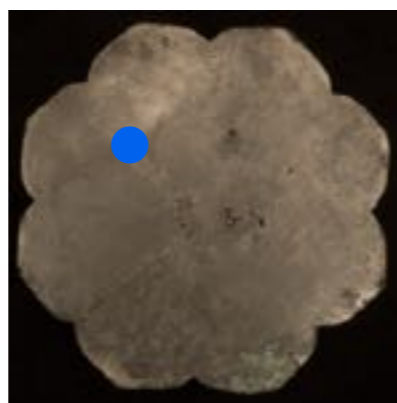
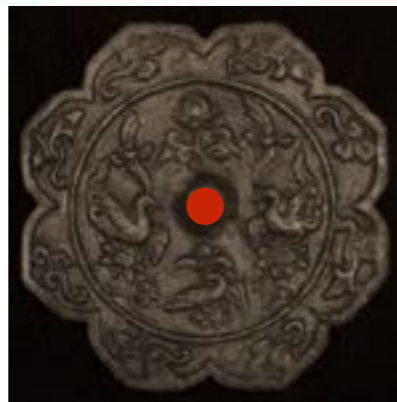
PLM microscopy,
Olympus BX51 at 50x

Mercury (Xuan Xi)

Only the mirror side has a very small pXRF signal for mercury

This may be evidence of a non-plating mirror shining technique called Xuan Xi which deposited a minute amount of tin-mercury amalgam on the surface of the metal

Bruker Tracer SD-III, 900 seconds, at 40kV, 11 μ A, with a 1 mil Al/1 mil Ti/1 mil Cu filter, analyzed with S1PXRF 3.8.3 from Bruker Instruments



← Earliest bronze mirror dated to approx. 2000BCE

Zenith in Han-Tang Dynasties

Song style = more figurative & use of lines similar to SC295 →



Song Mirror
Freer Sackler F1917.229



Song Mirror
MFA Boston 2002.776

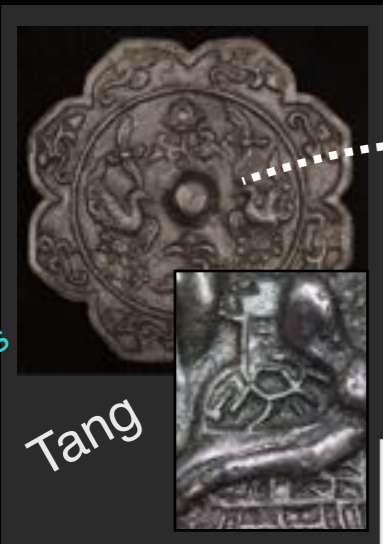


Song Mirror
Freer Sackler RLS1997.48.4195

Hight of interest in replicating earlier mirrors, especially Han-Tang periods

?

Earlier dynasties



Tang

Five Dynasties

Song

Yuan

Ming

Qing

Casting becomes less precise and often in vertical clay molds

Traditional mirrors replaced with glass

Standard alloy:
66-78% Cu
18-26% Sn
1-9% Pb

Horizontal molds

Alloy changes:
Sn ↓ Pb ↑

Brass (Cu and Zn) becomes common

Composition changes drastically (drop in Cu until mid Ming) - most in archaeological record heavily corroded

618_{CE}

907_{CE}

960_{CE}

c1279_{CE}

1368_{CE}

1644_{CE}

1911_{CE}

Acknowledgements

A special thank you to Professor David Scott for his metallurgic expertise and guidance throughout this project and Vanessa Muros for her tireless pXRF assistance.

Thank you also to the various experts who helped me with the iconography and history including Professor Lothar von Falkenhausen (UCLA) and Professor Bruce Rusk (UBC)

And finally thank you to all my professors and classmates as well as the organizers and hosts of the 2017 ANAGPIC conference.

Thank you!



(Admonitions Scroll, Tang Dynasty
British Museum 1903,04080,1)