

Spectral Matching of Pigments for Ancient Artifacts Using Hyperspectral Imaging & Analysis



**SPECTRAL MATCHING IS TRULY A SET OF PROCESSES TO DETERMINE
KNOWN FROM UNKNOWN & CORRELATION TO OTHER TECHNOLOGIES**

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DATA COLLECTED : NASA STENNIS SPACE CENTER, MS/USA & DAZU CHINA

DATA FROM A PAINTING THOUGHT TO BE THAT OF THE SPANISH PAINTER DIEGO VELAZQUEZ "PAINTER OF PAINTERS"

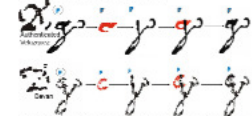
CONVENTIONAL TECHNIQUES HAVE BEEN USED IN THE PAST THAT CAN BE DESTRUCTIVE AND TIME CONSUMING. TECHNIQUES USING HYPERSPECTRAL IMAGING CAN BE USED TO DETERMINE THE BEST SUITED AREA FOR SAMPLING AND PARADIGMS FOR COMPARISON TO KNOWN BENCH MARK PROCEDURES.



**COMBINATION OF PRINCIPAL
COMPONENT ANALYSIS, &
SENSITIVITY ANALYSIS USING
NEAREST NEIGHBOR COMPARISON**

ONCE THE AREA OF INTEREST IS FOUND, THEN SPECTRAL MATCHING OF FEATURES BECOMES IMPORTANT IN DETERMINING LIKE FEATURES AND MINING THE IMPORTANT DATA THAT CAN PROVIDE TOOLS TO EXTRACT KEY FEATURES AND LATER MATCH LIKE FEATURES IN OTHER AREAS OF INTEREST AND ON OTHER LIKE OBJECTS/TARGETS.

The signatures below illustrate that the letter "t" which appears to be absent from both signatures is revealed to be a separate part of the letter "y" and is actually located just at the top of "y".

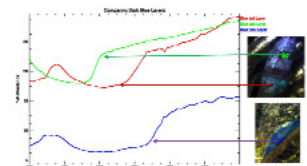
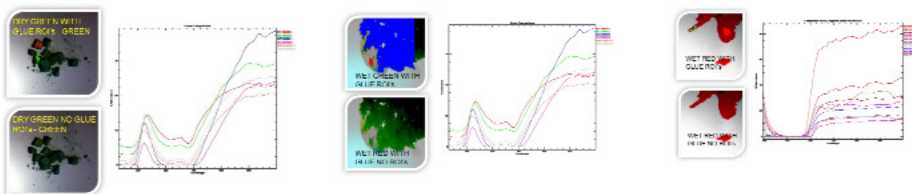


The letter "t" was not detected during this imaging session — only the dot located on top of the "t" was revealed, which has a similar spectral response to the "y" based on the analysis. Also located the dot above the top of the "y" was revealed to be the dot of the "t" based on the analysis.

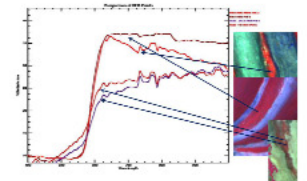
SUPPORTING DATA WAS USED FROM THE TIME PERIOD IN ORDER TO ALSO VERIFY PIGMENTS THAT MATCHED THE TIME PERIOD OF THE ARTIST & TO COMPARE TO KNOWN MATERIALS USED BY THE ARTIST.

DAZU CHINA DATA FROM THE STATUE OF GUANYIN (MERCY BUDDHA) : RESTORATION PROJECT - 2013/2014

DATA WAS TAKEN FOR SEVERAL STATES OF THE PIGMENTS. FROM THE LAST KNOWN RESTORATION, FROM THE SAMPLES OF DRY STATE PIGMENT (WITH AND WITHOUT GLUE COMPOUND), IN LIQUID STATE, AND APPLIED DRY. AFTER NORMALIZATION, DARKEST PIXEL STATISTICAL METHODS WERE USED TO DETERMINE THE DARKEST PIXELS; IN ORDER TO COLLECTED SPECTRA FROM THE MOST VIABLE PIXELS FOR THE TARGET SAMPLES. THEN THE DATA WAS PREPARED AND ARCHIVED IN ORDER TO THEN COMPARE TO KNOWN LIBRARIES AND TECHNIQUES.



THE SPECTRAL CHARACTERISTICS OF THESE PIGMENTS ARE COMPARED TO THAT OF THE PIGMENTS FROM THE LAST RESTORATION. THE MULTIPLE STAGES ARE TO BE FURTHER COMPARED, ONCE THE KNOWN SCIENTIFIC NAMES OF THE COMPOUNDS ARE PROVIDED. THIS WILL ALLOW FOR DIRECT COMPARISON TO KNOWN PROPERTIES OF THE PIGMENTS. THIS WILL MAKE FOR MORE ACURATE USE OF LIKE PIGMENTS IN FUTURE RESTORATIONS.



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& THE HYPERSPECTRAL IMAGING FOUNDATION**

