NEWSGRAM
News in brief from the Conservation Center

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INSTITUTE of FINE ARTS
NEW YORK UNIVERSITY

# Reflectance Transformation Imaging Training at the Conservation Center

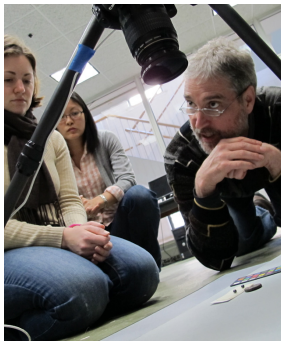
*The RTI workshop participants at the Conservation Center* © Cultural Heritage Imaging 2011

Imaging techniques are on the rise within the field of conservation. Now, conservators can see beyond what was visible only a few short years ago thanks to Reflectance Transformation Imaging.

From March 16–19, the Conservation Center hosted a four-day intensive workshop in Reflectance Transformation Imaging (RTI), led by Carla Schroer, Mark Mudge and Marlin Lum of the San Francisco-based non-profit Cultural Heritage Imaging (CHI). RTI is a non-invasive documentation tool developed by CHI and a team of international collaborators to aid conservators, art historians, archaeologists, epigraphers and other museum professionals in the examination of an object's 3D surface. It can be used safely on a wide range of materials and sizes of objects, it is portable and relatively inexpensive, it eliminates many of the limitations of traditional raking light photography, and the files and viewing software can be shared electronically to facilitate collaborative scholarship.

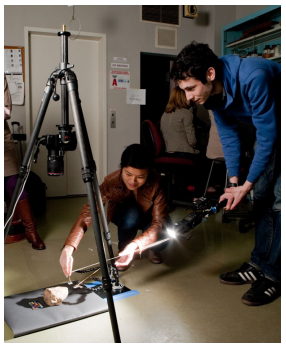
Using digital photography and open source software, RTI files are derived from a group of digital photographs of the same subject shot from a stationary, fixed camera position. During capture, 24 to 60 different shots may be taken, each lit from a slightly different angle and radial position so that every photo contains unique information about an object's surface texture. This sequence of images is then synthesized by the RTI software, which calculates surface normals – the vector that is perpendicular to the surface at any point, based on the direction of reflected light – within each pixel, and generates a single RTI file that is an accurate visual rendering of the subject's 3D surface at a per-pixel level. The RTI viewing software allows the user to interactively alter the direction and diffusion of the light, and contains a number of enhancement modes that apply algorithmic transformations to the RTI data, selected by the user to emphasize specific surface features under investigation.

In its most basic application, RTI has the potential to replace the "raking light" shots traditionally used in conservation to document an object's surface texture. Such documentation has historically been limited by the static nature of the light source so that only a fraction of the possible information about an object's surface is recorded. In RTI, the subjective choice of lighting position is eliminated; impasto, brushstrokes, paper grain, dents, tool marks, epigraphy, polishing scratches and other surface effects may be relit from any angle and algorithmically enhanced to reveal greater textural detail and information about a work of art's construction and condition.



*Mark discusses proper framing of objects for imaging* © Cultural Heritage Imaging 2011

Over the course of the four-day workshop, participants at the Conservation Center mastered the fundamentals of this technique and created images of a number of objects from the Center's study collection, as well as objects from current treatment classes. Students were trained in a modular method of RTI capture and processing known as "highlight RTI". Prior to the invention of highlight RTI, capture required the use



*Melissa Tan and Brian Castriota perform highlight RTI* © Cultural Heritage Imaging 2011

*Carla and conservation student Morgan Adams interpret an RTI image at the processing station*
*© Cultural Heritage Imaging 2011*

of expensive pre-fabricated light domes. The highlight method relies on the user to position a handheld light source and recovers the lighting direction from the specular highlights produced on a black sphere included in the field of view. This acquisition method is simple, relatively low-cost, highly portable, and produces a high quality, data-rich RTI. Students immediately recognized the utility of this method for their work at the archaeological excavations of Aphrodisias, Selinunte, Samothrace, Abydos, and Sardis, where economy, efficiency and versatility are prized attributes of any field equipment. Paintings and paper students were equally enthusiastic about the possibility to document surfaces in a way that could not be done before.

Throughout the training, Mark and Marlin instructed small groups of students in this method of RTI capture, while Carla taught students how to use the RTI Builder and Viewer software. By the second day students had become comfortable enough with highlight RTI to begin experimenting with infrared RTI, using a "hacked" Cannon SLR with an infrared filter to image the underdrawing of *Adoration of the Shepherds* by Domenico Beccafumi, a mid-16th century panel painting from the Samuel H. Kress Collection, currently being treated by paintings conservation student Shauna Young. Traditional infrared reflectography has been extremely useful in recognizing and imaging underdrawing in paintings, but as paintings conservation student Sophie Scully commented, "the ability to make out the texture of the underdrawing using IR-RTI is completely new; it holds enormous potential for future research."

Julia Sybalsky, Jessica Pace, and Cybele Tom eagerly incorporated RTI into their own technical analysis of a 7th–9th century Central Asian saddle in the collection of the Metropolitan Museum of Art. Julia commented, "RTI was able to capture the reflective specular quality of a gold panel more successfully than digital photographs or photomicrographs. We were able to clearly see different levels of overlapping surface features, such as overlapping strikes from the same or different tools, and scratches from use or polishing in decorated areas." Using RTI, they were able to observe and capture important features between tool marks on different parts of the metal panels. Julia explained, "those differences included details in the handling of similar tools, allowing us to conclude that two people working in the same workshop are likely to have worked on the object."

CHI was founded in 2002 with the goal of advancing digital documentation methods for cultural heritage. The primary goal of the organization, in addition to research and development, is the dissemination of these tools and techniques through lectures and hands-on training. This workshop was the first of several training sessions Mark, Carla, and Marlin will be giving to each of the North American graduate programs in conservation, made possible by a generous grant from the Institute of Museum and Library Services.

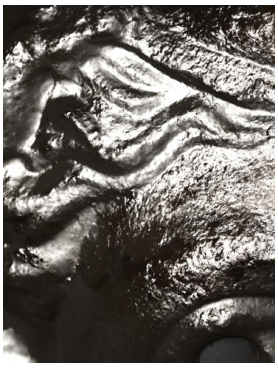
As new digital technologies like RTI are developed for application in the fields of art history, archaeology and conservation, we find our methods becoming increasingly more intuitive and efficacious and the divides between each field becoming increasingly narrowed. As both a documentary and investigative tool, RTI allows for simultaneous recording and analysis, integrating our research and documentation methods. RTI's interactive interface and open-source format improve our ability to work collaboratively, including with colleagues in other allied disciplines. We at the Conservation Center are happily adding RTI to our 21st-century tool kits, and are endlessly grateful to CHI for their commitment to developing practical and accessible tools that enhance our ability to see, understand, and preserve. •

*– Brian Castriota and Anna Serotta '09*

*Brian Castriota is a first-year student and new RTI user, and Anna Serotta is an objects conservator at the Metropolitan Museum of Art*

*A classical marble female head from the Center's study collection, CCS 92.15*

*Detail of the proper right forehead and hairline in the RTI default setting*



*The same view in the RTI "Specular Enhancement" mode where the topography of the surface is more clearly visible*

*photo credit: Marlin Lum © Cultural Heritage Imaging 2011, Brian Castriota, Melissa Tan*

## Upcoming Events

*AIC 39th Annual Meeting in Philadelphia, PA*
*May 31 – June 3, 2011*

*Conservation Center student and alumni speakers include:*

*Barbara Appelbaum '74, Rae Beaubien '86, Deborah Bede '82, Lynn Brostoff '87, Ellen Carrlee '00, Sue Ann Chui '99, Lisa Conte, Suzanne Davis '98, Margaret Holben Ellis '79, Jennifer Hickey, Stephanie Hornbeck '99, Kelly McHugh '00, Lisa Nelson, Eliza Spaulding '10 and Julia Sybalsky*