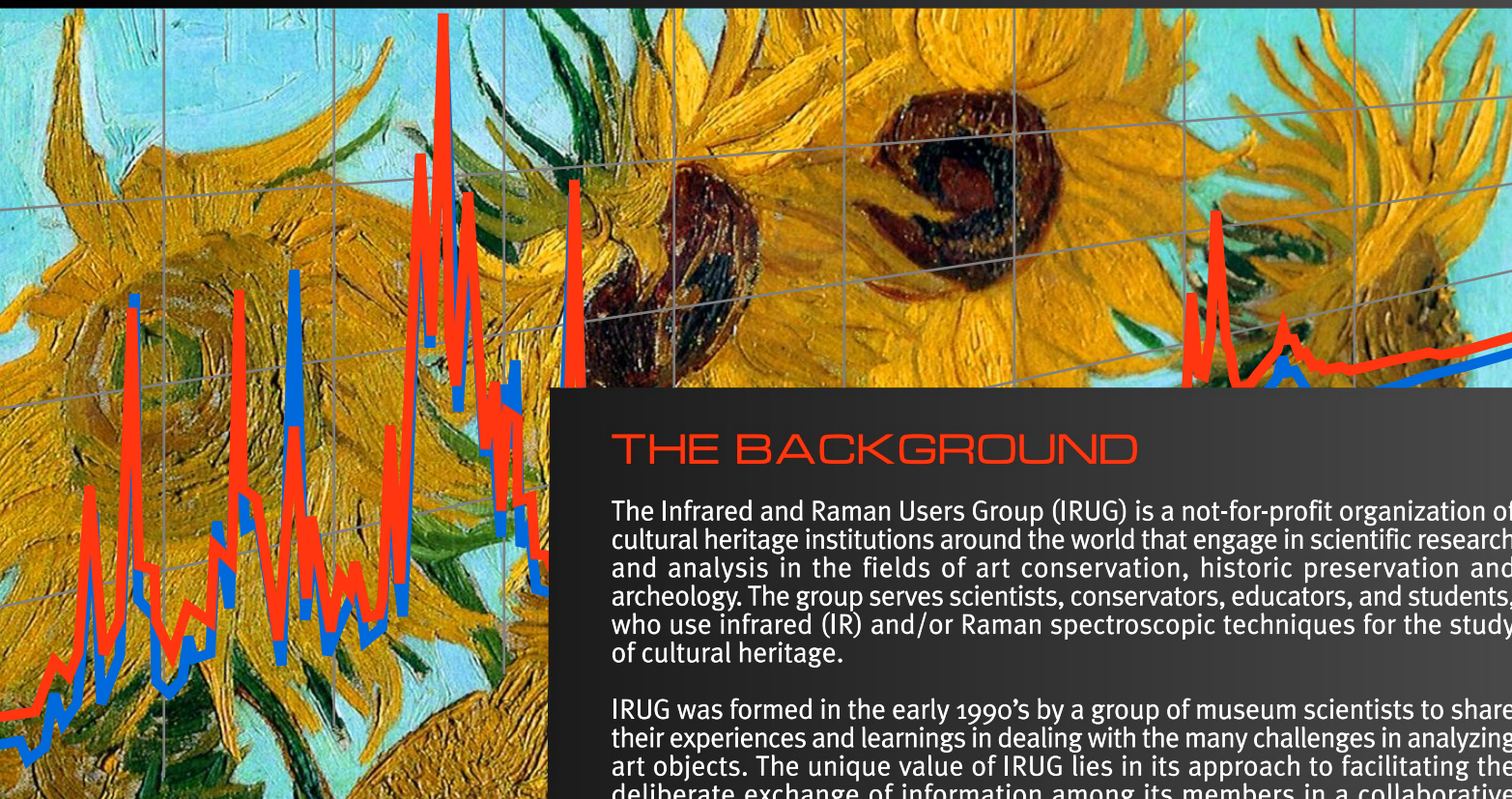


DLS OPENS THE DOOR TO IRUG COMMUNITY WITH SPECTRAL IDENTIFICATION TOOLS. IRUG DATABASE EXPECTED TO DOUBLE.



THE BACKGROUND

The Infrared and Raman Users Group (IRUG) is a not-for-profit organization of cultural heritage institutions around the world that engage in scientific research and analysis in the fields of art conservation, historic preservation and archeology. The group serves scientists, conservators, educators, and students, who use infrared (IR) and/or Raman spectroscopic techniques for the study of cultural heritage.

IRUG was formed in the early 1990's by a group of museum scientists to share their experiences and learnings in dealing with the many challenges in analyzing art objects. The unique value of IRUG lies in its approach to facilitating the deliberate exchange of information among its members in a collaborative manner over the web (www.irug.org). Members share their research, reference data and results, using a web-based database. In addition to the database, IRUG holds biennial conferences where research and papers involving IR and Raman studies are presented.

Beth Price is IRUG's Chair for the America's, as well as being a Senior Scientist at the Philadelphia Museum of Art (PMA). She says, "IR and Raman analyses can be performed non-invasively or on very small, microscopic samples from works of art. The data are collected as spectra. The best way to interpret a spectrum is to compare it to reference spectra of known substances." The IRUG Spectral Database is essentially a growing collection of IR and Raman spectra of reference materials. The database is the key component to analysis. It contains a range of relevant materials, including those that have aged. "Collecting, peer-reviewing, formatting, and sharing all this reliable, high-quality information to improve the accuracy of our analyses was a primary motivation behind starting IRUG."

SEARCHING THE IRUG DATABASE

Finding reference spectra in the online IRUG database currently is accomplished through a keyword search. A user puts in a keyword and the system returns a list of matching spectra that contain the keyword. Beth cites an example. "Let's say a user has a spectrum of a sample that might indicate one of several types of nylon. The user goes to the website and searches the word 'nylon.' All of the nylon spectra come up in a results list. The user then compares their spectrum with the reference spectra, evaluating them visually one-by-one noting similarities and dissimilarities to determine whether there's a match that might identify the particular type of nylon in the sample."

Continued on next page.

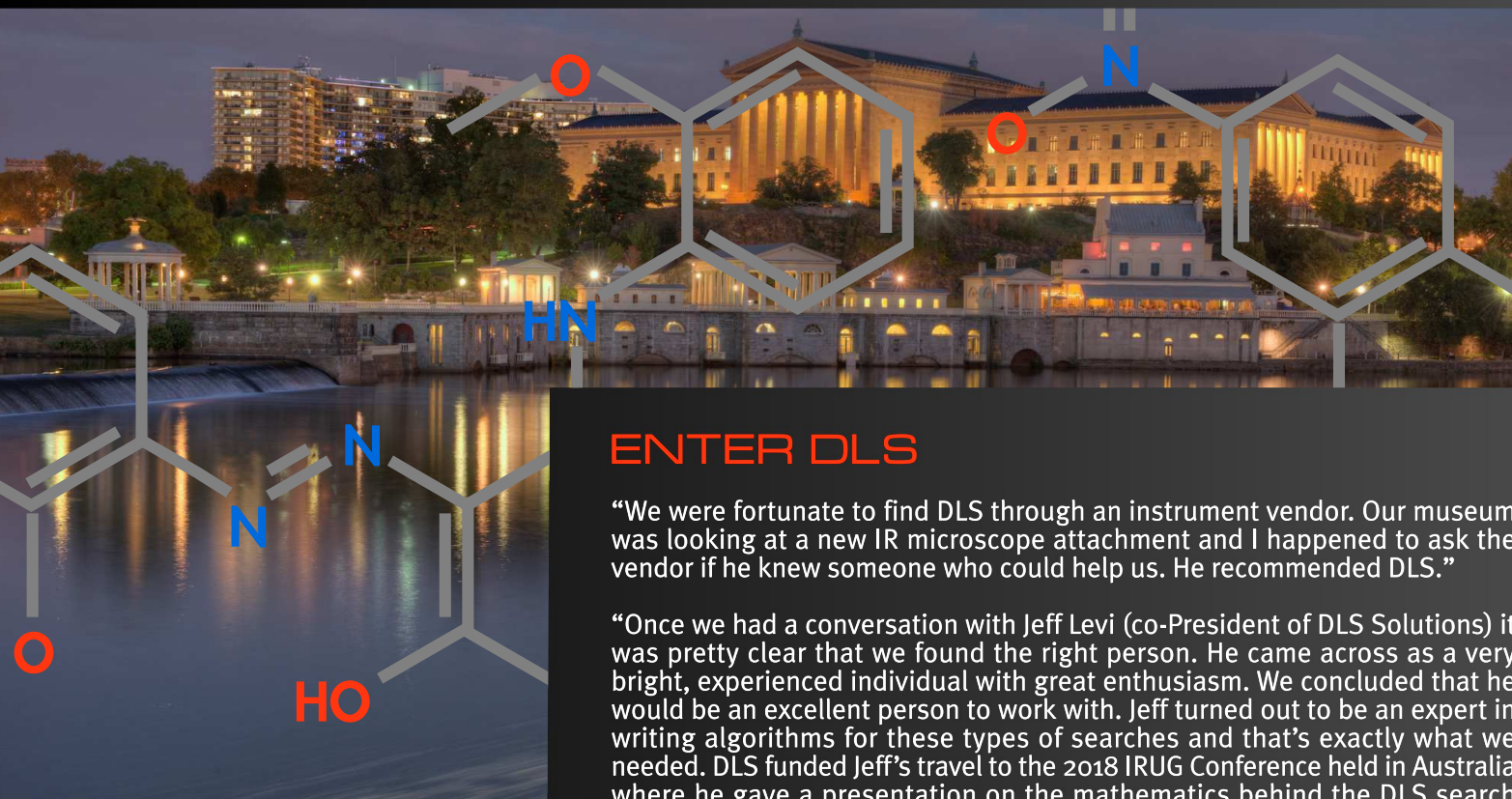


DLS Solutions has definitely provided us with a level of confidence on this project that we didn't have before they joined our team."

Beth Price

IRUG's Chair for the America's

DLS OPENS THE DOOR TO IRUG COMMUNITY WITH SPECTRAL IDENTIFICATION TOOLS. IRUG DATABASE EXPECTED TO DOUBLE.



ENTER DLS

“We were fortunate to find DLS through an instrument vendor. Our museum was looking at a new IR microscope attachment and I happened to ask the vendor if he knew someone who could help us. He recommended DLS.”

“Once we had a conversation with Jeff Levi (co-President of DLS Solutions) it was pretty clear that we found the right person. He came across as a very bright, experienced individual with great enthusiasm. We concluded that he would be an excellent person to work with. Jeff turned out to be an expert in writing algorithms for these types of searches and that’s exactly what we needed. DLS funded Jeff’s travel to the 2018 IRUG Conference held in Australia where he gave a presentation on the mathematics behind the DLS search algorithms. It was very valuable and we were so glad that he came. DLS Solutions has definitely provided us with a level of confidence on this project that we didn’t have before they joined our team.”

With the DLS search algorithms in place, users can search a spectrum for matching reference spectra, effectively doing their analysis online. This will mitigate the cumbersome step of having to visually assess spectra from a long list of keyword results and provide capability to users who lack the necessary instrument vendor software needed to analyze spectra on their local computers. Beth says, “That’s a big advantage for our not-for-profit community.”

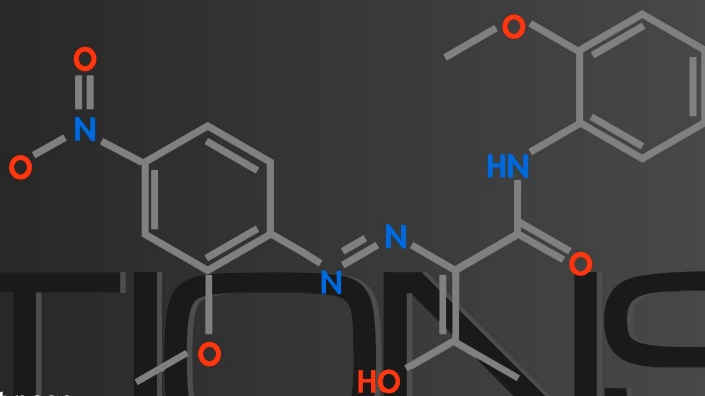
Jeff Levi added, “Over the years we developed flexible spectral search algorithms that allowed us to complete the IRUG implementation quickly. We adapted our existing components to IRUG’s server platform, connected to their JCAMP-DX data structure and added several new features that IRUG specified.”



“With (DLS’s) help, IRUG has taken a major step forward for the larger cultural heritage community.”

Beth Price

IRUG’s Chair for the America’s



Continued on next page.

DLS OPENS THE DOOR TO IRUG COMMUNITY WITH SPECTRAL IDENTIFICATION TOOLS. IRUG DATABASE EXPECTED TO DOUBLE.



Jeff Levi, Co-Founder and Co-President, DLS Solutions, Inc. (right) with Beth Price, Senior Scientist, Philadelphia Museum of Art (middle) and Professor Manfred Schreiner, Academy of Fine Arts, Vienna (left) at the IRUG13 Conference, Sydney, Australia, December, 2018.



“DLS helped open the door for individuals all around the world to access IRUG’s database which has improved the quality of the information that’s used for conservation purposes.”

Beth Price

IRUG’s Chair for the America’s

DATABASE USAGE EXPECTED TO DOUBLE

Beth says, “With our new spectral search feature we expect the number of searches to double. We also expect that the average user will rely much more on the online database because the search options are broader and more robust. The new system has permitted the museum to fulfill the Bank of America grant, and that is gratifying. We wanted their generous grant to have a successful outcome.”

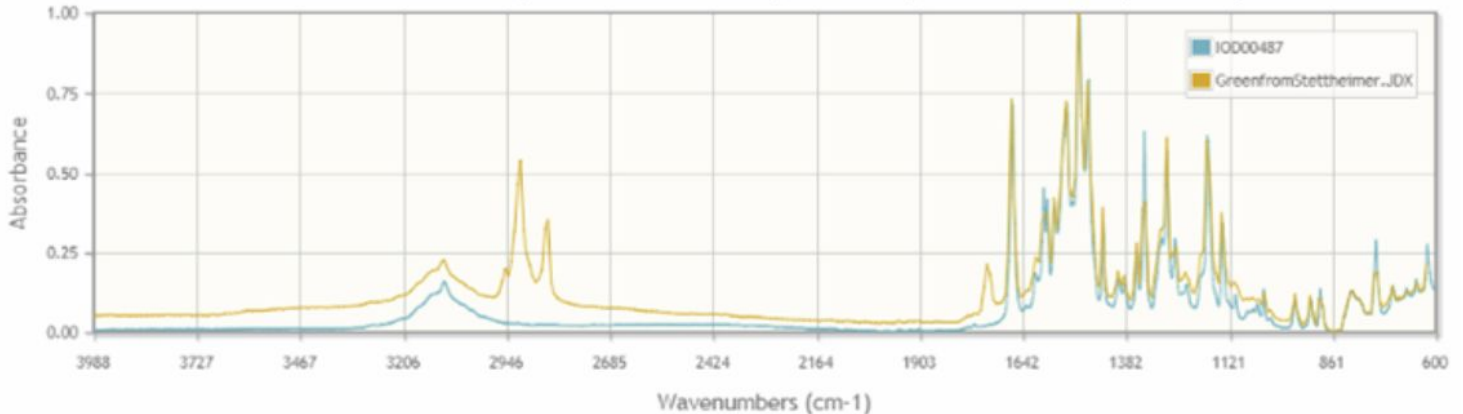
Beth concludes, “DLS helped open the door for individuals all around the world to access IRUG’s database which has improved the quality of the information that’s used for conservation purposes. With their help, IRUG has taken a major step forward for the larger cultural heritage community.”

SUCCESS STORY

DLS OPENS THE DOOR TO IRUG COMMUNITY WITH SPECTRAL IDENTIFICATION TOOLS. IRUG DATABASE EXPECTED TO DOUBLE.

Normalized Spectral Comparison

Unknown vs IOD00487 PY3, Monoazo Yellow, CI11710; Sun Chemical; ZVKDS; tran



Search Results

(Click ID number to overlay reference spectrum. Click on thumbnail to display Interactive Spectrum & Details Table.)

No.	ID	Quality	Overlap	Information	Thumbnail / Structure
1.	28	86	99%	<p>IRUG Filename: IOD00487</p> <p>Data Type: Infrared Spectrum</p> <p>Common Name(s): Pigment Yellow 3 (PY3) , Monoazo Yellow, Azo, CI11710</p> <p>Trade Name(s): Hansa Yellow 10G</p> <p>CAS Registry No: 6486-23-3</p> <p>Material Class: Organic dyes and pigments (OD)</p> <p>Institution: Institute for the Protection of Cultural Heritage of Slovenia (ZVKDS)</p>	 <p>[Chir]</p>

An example of a spectral comparison with search result listings from the current IRUG website, www.irug.org, which is showing the level of detail provided for cross referencing spectral data. With the help of DLS this database will be easier and much more widely accessible.

DLS
SOLUTIONS

DLSSolutions, Inc.
46 Gatehouse Road
Trumbull, CT, 06611
e-Mail: info@dlssolutions.com
www.dlssolutions.com

SOLUTIONS