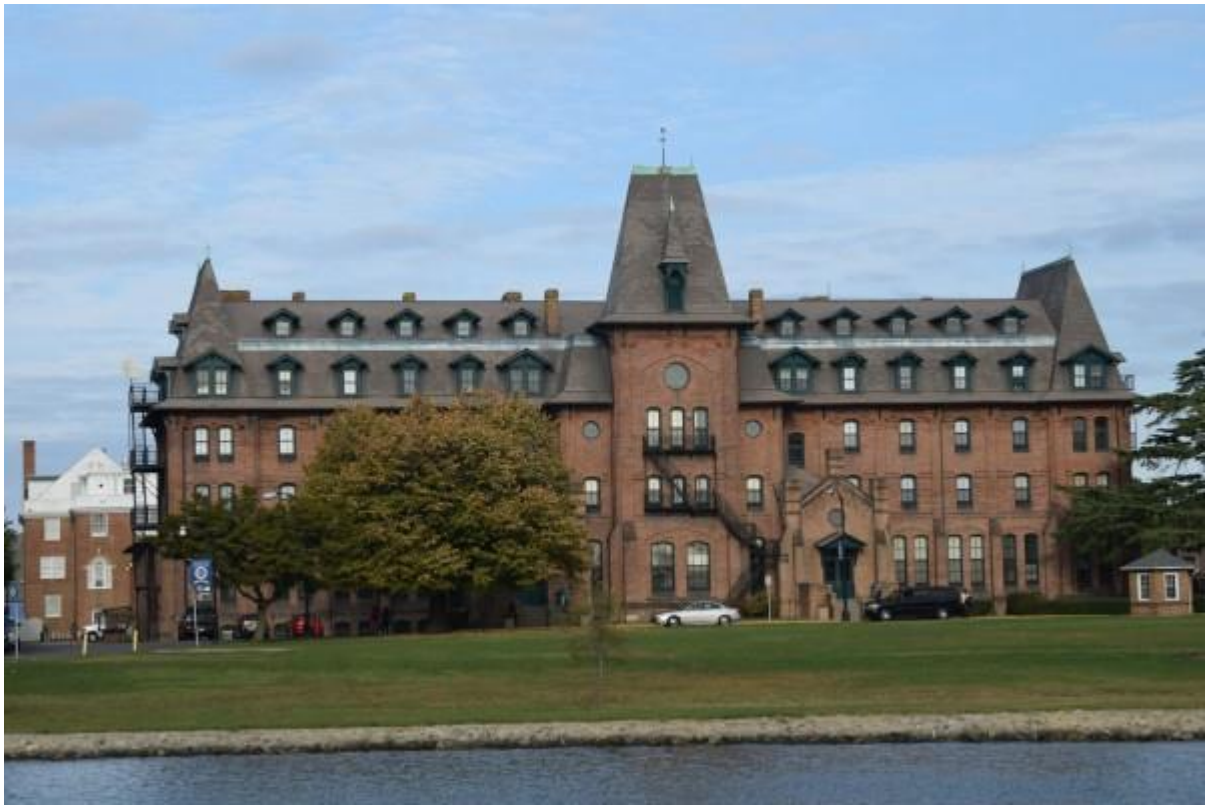


University archaeology departments can benefit from advanced spectrophotometry. Image credit: Flickr user Tony Alter (CC BY 2.0)

In 2004, Marco Leona, Francesca Casadio, Mauro Bacci, and Marcello Picollo successfully identified the chemical composition of the pre-Columbian Maya Blue pigment[1]—a combination of indigo and palygorskite—with the aid of Uv-Vis reflectance spectrophotometry. The detailed spectral profiling of the machine allowed them to discern distinct hydrogen bonding configurations for the indigo molecule.

The discovery might not have attracted widespread public notice, but it was remarkable nonetheless. With this knowledge, archaeological researchers are now able to use reflectance to positively identify Maya blue in field samples. University anthropology and archaeology departments hoping to attract high-caliber students and faculty may be able to strengthen their competitive advantage by providing access to spectrophotometers for these types of research purposes.

Spectrophotometric Applications for Field Research

Determining the exact spectral profiles of pigments on pottery, painted objects, glass, textiles, and printed materials can help researchers identify the compound used to display the pigment. Pigment ingredients can then be traced back to their source, yielding information about the availability of materials and the interconnectedness of regions.

Students and faculty interested in ancient cultural capabilities, trade routes, fabrication processes, and a host of other topics would see clear benefits from access to this type of technology. Take the work of Ceglia and Muelebroeke, et al.[2] who used Uv-Vis reflectance spectrophotometry to date medieval stained glass windows. Such investigations can also reveal forgeries;[3] if a Cypriot potsherd is colored with a pigment unavailable on Cyprus in 700 BCE but commercially produced in Texas in the 1990s, the artifact is clearly a fake.

And since spectrophotometers represent a non-invasive measurement technique, they are preferable for the study of sensitive cultural artifacts, versus techniques such as dissolution in nitric acid.

What region produced this blue coloring? Was it the same which produced this mask? Image Credit: Flickr user Beesnest Mclain (**CC by 2.0**)

Versatility and Durability in Academic Spectrophotometric Usage

When selecting a spectrophotometer, you do have a range of options. Durable portable machines allow researchers to study objects that cannot be removed from their surroundings or to take measurements in situ during ongoing projects—avoiding unnecessary trips back to campus. These handheld scanners can also be used to measure portions of large objects that cannot fit into the measurement port of a benchtop machine—whether statues, armor, or large tapestries.

This isn't to say that benchtop machines aren't useful. In laboratory settings, these models are ideal for measuring larger sample areas. With up to 10nm resolution and 10nm reporting intervals on instruments like the HunterLab LabScan XE, benchtop spectrophotometers can report more precise results than handheld models. These instruments are also more stable than handheld options and, as a result, are able to generate more replicable results.

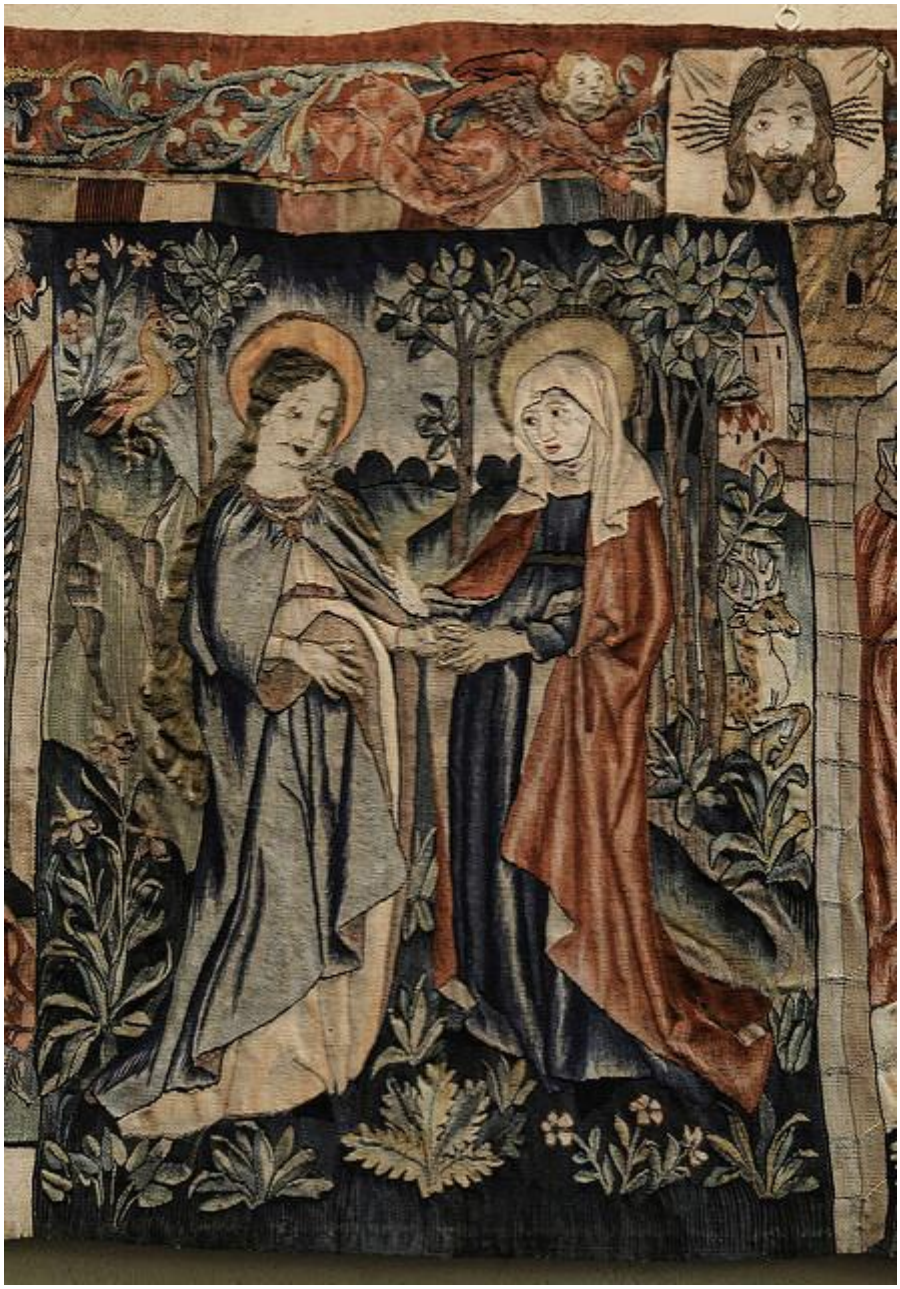
Both benchtop and handheld spectrophotometers are capable of lasting decades, adding long-term value (with little upkeep) to many research programs. Some universities continue to use

spectrophotometers put in service prior to the turn of the century, but while these machines may still be reliable, a number of advances in accuracy, resolution, software,[4] and sample preparation have occurred over the last thirty years. Double-beam machines can measure faster and more simply than older single-beam models. Operating ranges have also increased in both directions of the spectrum, and spectrophotometers have grown more compact. These improvements all argue in favor of upgrading legacy systems.

Spectrophotometers Increase Departmental Capability

Developing up-to-date research capabilities can ultimately give departments a competitive edge when it comes to attracting talented students. With over 500 schools in the U.S. and Canada offering graduate programs in anthropology or archaeology,[5] it can be a struggle to draw in candidates that will bring value to your program. But departments that offer better research equipment, and better access to it, are more likely to attract notice.

Spectrophotometers also add value by increasing the interconnectedness between programs and departments in the same university. Research conducted by archaeologists can fill in blanks for historians, classics students, and linguists—and in cases where a program's budget is constricted, department heads may be able to pool resources.



Each dye in this tapestry contains varied pigments, some far more rare and expensive than others. Image Credit: Flickr user Lawrence OP (**CC by 2.0**)

Advanced Spectrophotometric Technology for Universities

Archaeology programs can ultimately improve their research capabilities and gain a competitive advantage by investing in spectrophotometers for field and laboratory studies. Schools providing modern color measurement tools will be better able to attract driven students and researchers, improving their bottom line while sharing new knowledge with the world. HunterLab is a leading producer of spectrophotometers for a wide variety of applications. To learn more about which of our options is most suited to your needs, get in touch with us today.

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2. "Using optical spectroscopy to characterize the material of a 16th c. stained glass window," 2012, https://www.researchgate.net/publication/236216376
3. "Spectroscopy," 2017, http://www.webexhibits.org/pigments/intro/spectroscopy.html
4. "Evolution of UV-Vis Spectrophotometers," 2011, http://www.labmanager.com/lab-product/2011/07/evolution-of-uv-vis-spectrophotometers?fw1pk=2#.WJPQi_krK01
5. "Archaeology as Career or Avocation," 2017, http://saa.org/AbouttheSociety/Publications/ArchaeologyandYou/Chapter3ArchaeologyasCareerorAvocation/tabid/1009/Default.aspx