See also www.iupac.org/publications/ci/indexes/stamps.html

Cultural Heritage Chemistry

The tools of analytical chemistry, and the expertise and enthusiasm of many of its practitioners, have had a profound influence in the field of cultural heritage [1,2]. Analytical techniques, especially those involving non-destructive methods of examination, have played a key role in the characterization, restoration, and preservation of an incredible range of works of art and cultural heritage, including ceramics, textiles, paintings, books, drawings, sculptures, jewelry, and a myriad of artifacts made of glass, wood, or metal. In addition, modern analytical instrumentation has been successfully applied to study the techniques used to produce heritage materials, to verify the authorship or estimate the date of pieces of art, and to detect reproductions and forgeries.

In 2010, a group of French scientists reported the use of X-ray fluorescence (XRF) spectroscopy to determine the composition and thickness of the paint layers in seven Leonardo da Vinci portraits in the collection of the Louvre Museum in Paris, including the famous *Mona Lisa* [3]. Significantly, new light was shed into the painting technique used by Leonardo to attain subtle optical effects that blur outlines and blend shadows like smoke, which is particularly evident in the facial flesh tones of the subjects he depicted.

Historical musical instruments, such as the violins and cellos made by the Stradivari family in Italy during the 17th and 18th centuries, have also been probed by a variety of analytical methods, including X-ray microtomography and reflection FT-IR spectroscopy [4,5]. Many scientists and musical instrument historians have attempted to elucidate the nature of the wood treatment, varnish, binder, glue, and decoration materials used in the manufacture of the most valuable string instruments, and whether there is a reliable correlation between the composition of the materials used to make them and the remarkable quality of their sound.

And a joint team of chemists in Argentina and Brazil recently reported the use of XRF spectroscopy to establish that lapis lazuli was the pigment used for the blue color in the oldest surviving Argentinean flag, dating back to 1814 [6].

In a similar vein, the March issue of *Pure and Applied Chemistry, Chemistry International*'s IUPAC big sister publication, is dedicated to chemistry and cultural heritage. The array of topics in the special issue is as diverse as the definition of cultural heritage itself, with articles ranging from an analysis of the color pigments used to print Portuguese stamps in the second half of the 19th century to the application of X-ray Absorption Near-Edge Structure (XANES) spectroscopy to study the pigment formulations of Cennino Cennini (1360-1427?), an Italian artist who wrote a seminal technical manual on late Medieval and early Renaissance art.

The stakes are high today for museums, auction houses, and private collectors vying for the world's art and cultural heritage treasures, which now fetch outrageous amounts of money when they go on sale. A few weeks ago, on 15 November 2017, Leonardo's "Saviour of the World" was sold at auction for a whopping $450.3 million, the highest price ever paid for a work of art. Analytical chemists used XRF spectroscopy and infrared reflectography to assess the authenticity of the painting, and a majority of art historians, critics, and dealers agreed with

their findings. These days, anyone with a few million dollars (or pounds, euros, riyals, yuan…) to spare, and the blessing of a couple of knowledgeable analytical chemists, could be the proud owner of the next bona fide masterpiece showing up in the open market!

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Mark Your Calendar

Upcoming IUPAC-endorsed events
See also www.iupac.org/events for links to specific event websites

2018 after July 1

1-5 July 2018 • MACRO2018 • Cairns, Australia
World Polymer Congress
Prof. Sébastien Perrier and Prof. Martina Stenzel (conference co-chairs); Conference Coordinator: Taylor Mills, Leishman Associates; E-mail: taylor@leishman-associates.com.au, www.macro18.org

1-6 July 2018 • Physical Organic Chemistry • Faro, Portugal
24th International Conference on Physical Organic Chemistry, ICPOC 24
Maria de Lurdes Cristiano, Department of Chemistry and Pharmacy, University of Algarve, 8005-199 Faro, Portugal, E-mail: mcristi@ualg.pt or icpoc24@ualg.pt, http://icpoc24.ualg.pt

2-6 July 2018 • High Temperature Materials • Ekaterinburg, Russian Federation
XVI International IUPAC Conference on High Temperature Materials Chemistry (HTMC-XVI)
Dr. Andrey S. Bykov, Institute of. Metallurgy, UB Rus. Acad. Sci, 101 Amundsena Str., Ekaterinburg 620016, Russia; E-mail: a.s.bykov54@mail.ru, http://htmc16.ru

7-14 July 2018 • Postgraduate Summer School on Green Chemistry • Venice, Italy
http://www.unive.it/greenss2018

8-13 July 2018 • Photochemistry • Dublin, Ireland
27th IUPAC International Symposium on Photochemistry
Dr. Miguel A. Garcia-Garibay (Conference co-chair), Los Angeles, E-mail: mgg@chem.ucla.edu, and Dr. Susan Quinn, University College Dublin, Ireland, E-mail: susan.quinn@ucd.ie, http://photoiupac2018.com

8–13 July 2018 • Phosphorus Chemistry • Budapest, Hungary
22nd International Conference on Phosphorus Chemistry (ICPC)
Prof. György Keglevich, Chair, Budapest University of Technology and Economics, E-mail: icpc22chairman@mail.bme.hu, www.icpc22.mke.org.hu

8-21 July 2018 • Summer School on Analytical Science, Metrology and Accreditation • Tallinn, Estonia
http://www.msc-euromaster.eu/

10-14 July 2018 • Chemistry Education • Sydney, Australia
International Conference on Chemistry Education (ICCE) 2018
Chair of the Program Committee: Prof Siegbert Schmid, University of Sydney, School of Chemistry, Siegbert. schmid@sydney.edu.au, www.icce2018.org

14-19 July 2018 • Carbohydrate • Lisboa, Portugal
29th International Carbohydrate Symposium
Amelia Pilar Rauter, DQB-FCUL, Campo Grande, 1749-016 Lisboa, Portugal, E-mail: aprauter@fc.ul.pt or ics2018@chemistry.pt, http://ics2018.eventos.chemistry.pt0