Portland State
Chemistry

**College of Liberal Arts and Sciences**
**Winter 2022 Chemistry Seminar Series**
**Friday, February 18th**

Dr. Jennifer Mass
Andrew W. Mellon Professor of Cultural Heritage Science, Bard Graduate Center
President of Scientific Analysis of Fine Art, LLC

## Things Fall Apart: The Surprising Photochemical Fragility of Paul Cézanne's and Edvard Munch's Masterpieces

**ABSTRACT:** The innovative painting materials used by the Impressionists, Fauvists, and Expressionists were critical components of their break with traditional modes of representation. These artists heavily exploited the synthetic organic and inorganic pigments that were newly available products of the industrial revolution. However, the bright and novel hues that made their way onto these artists' palettes (and in many cases defined the movements listed above) were not always synthesized properly. Pigments in some of the greatest masterpieces of these movements have been found to be highly fugitive or rapidly discoloring. These unstable materials can react with adjacent or admixed pigments, agents of degradation in the environment, and even the paint binding media surrounding them. The urgent need for preservation of these works calls for intensive materials chemistry approaches for identifying their mechanisms of degradation and ensuring their longevity for future generations. As complex multilayered inorganic-organic composites, these paintings present a wealth of analytical challenges.

Artists working in this period of the 1880s to the 1920s were aware of the limitations of the materials available to them, and they attempted to make choices based upon the most stable options at hand. Paint manufacturers were also aware that not all of their offerings were equally stable, and they would note the stability of the pigments offered for sale. Within this context, however, we still have monumental works from this period changing so substantially that they can no longer represent the artists' original vision. Pigments from this period that have been found to alter over time include chrome yellow ($PbCrO_4.PbSO_4$), zinc yellow ($4ZnO.4CrO_3,K_2O.3H_2O$), cadmium yellow (CdS), emerald green ($Cu(C_2H_3O_2)_2.3Cu(AsO_2)_2$, eosin red ($C_{20}H_8O_5Br_4$, germanium lake), and purpurin (1,2,4-trihydroxyanthraquinone).

Noninvasive methods for identifying these pigments (both before and after their alteration) include x-ray fluorescence, hyperspectral imaging, and ultraviolet-induced infrared fluorescence. To understand their mechanisms of degradation, however, requires microscale x-ray diffraction methods (XRD), x-ray absorption near edge spectroscopy (XANES), and scanning transmission electron microscopy (STEM)

based methodologies such as electron energy loss spectroscopy (EELS). Edvard Munch's four versions of *The Scream* (c. 1910) and Paul Cezanne's *Large Bathers* (c. 1895-1906) will be used as case studies to identify highly degraded pigments, their technologies of manufacture, and their mechanisms of degradation.

**BIO:** Jennifer L. Mass is the Andrew W. Mellon Professor of Cultural Heritage Science at Bard Graduate Center and the President of Scientific Analysis of Fine Art, LLC. Her research interests focus on the inorganic chemistry of cultural heritage objects – exploring technological innovations and mechanisms of degradation. Dr. Mass is the former Director of the Scientific Research Laboratory at The Winterthur Museum and held Conservation Science Professorships at the University of Delaware and SUNY College at Buffalo. Jennifer earned her Ph.D. in Inorganic Chemistry and Materials Engineering from Cornell University, and did her postdoctoral work at the Metropolitan Museum of Art. She has published numerous articles in the conservation and scientific literature, and her work has received worldwide media attention including NPR's Science Friday, MSNBC, *The New York Times*, *The Washington Post*, Artnet News, the BBC, the *L.A. Times*, *Hyperallergic*, and *The Guardian*. She formed Scientific Analysis, LLC (SAFA) because of the growing need for objective material assessment of objects in the art market to complement the expertise of the connoisseur and the conservator. SAFA assists art conservators, museums, auction houses, and art insurers in addressing questions of attribution, state of preservation, provenance, and mechanisms of degradation.