

**Jocelyn Alcántara-García, Ph. D.**

University of Delaware – Department of Art Conservation (Main) – Department of Chemistry and Biochemistry (Joint)  
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**1. Education**

Escuela Nacional de Conservación, Restauración y Museografía “Manuel del Castillo Negrete”		1999-2001	Art Conservation
National Autonomous University of Mexico (UNAM)	BS	2004	Chemistry
National Autonomous University of Mexico (UNAM)	PhD	2009	Inorganic Chemistry
Museo Nacional Centro de Arte Reina Sofía (MNCARS)	Spanish Ministry of Culture Conservation Science Fellow	2011	Scientific Analysis of Modern and Contemporary Art
Johns Hopkins University	Andrew W. Mellon Postdoctoral Fellow	2012-2014	Conservation Science

**2. Research Experience**

2014-present (PI)	<b>University of Delaware – Department of Art Conservation. DE, USA.</b> <b>University of Delaware – Department of Chemistry and Biochemistry. DE, USA. (Joint Appointment)</b> Research of writing materials with emphasis on copper-rich inks on paper. Study of original and degraded natural dyes on historic and archaeological textiles. Development on a non-destructive analysis database for textiles. Elucidation of (mordanted) dyed textiles bonding.
2014 (PI)	<b>Coordinación Nacional de Conservación del Patrimonio Cultural – INAH. MEX.</b> Developed of conservation treatment for malachological materials.
2012-14 (Postdoctoral Fellowship)	<b>Sheridan Libraries and Museums. Department of Conservation and Preservation. Johns Hopkins University. Baltimore, MD. USA.</b> Studied of pyranose-containing compounds for conservation of historical iron gall inks with high copper to iron ratio.
2010-11 (PI)	<b>Coordinación Nacional de Conservación del Patrimonio Cultural – INAH. MEX.</b> Analyzed iron gall inks and other writing materials on Colonial Manuscripts using nondestructive technique. Developed an iron gall inks’ chemical profile map of Mexican inks using non-destructive analysis. Designed an interdisciplinary project for the conservation of the Archaeological Zone Cacaxtla, Tlaxcala, Mexico
2009-10 (PI)	Analyzed binding media of wall paintings from San Juan Ixcaquixtla, Puebla <b>Apoyo al Desarrollo de Archivos y Bibliotecas de México – Adabi. MEX.</b> Developed alternative methods for treatment of iron gall ink-corroded documents. Evaluated of commercially available antifungal <i>miconazole</i> in historical paper.

### 3. Honors and Awards

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2019	Sigma Xi Member	Sigma Xi, The Scientific Research Honors Society
2019	Camille Dreyfus Teacher-Scholar Award, <i>Nominee</i>	The Camille & Henry Dreyfus Foundation
2018	Eastern Analytical Symposium (EAS) Young Investigator Award, <i>Nominee</i>	Eastern Analytical Symposium (EAS)
2015	Vice Provost for Diversity Summer Research Mini-Grant	University of Delaware
2012	Andrew W. Mellon Postdoctoral Fellowship	Johns Hopkins University
2011	Spanish Ministry of Culture (Ministerio de Cultura de España)	Museo Nacional Centro de Arte Reina Sofia (MNCARS)
2009	Young Researcher Start-Up Grant	Instituto de Ciencia y Tecnología del Distrito Federal (ICyT-DF)
2008	Internship Award Consejo Nacional de Ciencia y Tecnología (CONACyT)	Brno University of Technology. Faculty of Chemistry. Institute of Materials Science. Brno, Czech Republic
2004-09	Consejo Nacional de Ciencia y Tecnología (CONACyT)	High-Achieving Undergraduate and Graduate scholars
2009	“Alfonso Caso” medal (best Doctoral Dissertation), <i>Nominee</i>	Universidad Nacional Autónoma de México (UNAM)
2004	Graduated top 15%, BS Chemistry “Gabino Barreda” medal (best Undergraduate Thesis), <i>Nominee</i>	Universidad Nacional Autónoma de México (UNAM)

### 4. Memberships

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- American Institute for Conservation of Historic and Artistic Works (AIC) – Professional Associate (since 2012)
- American Association of University Professors (AAUP) – Member (since 2014)
- International Council of Museums - Committee for Conservation (ICOM-CC), Scientific Research Working Group – Assistant Coordinator (since 2017)
- Materials Research Society (MRS) – Member (since 2011)
- Reef Environmental Education Foundation (REEF) – Volunteer Fish Surveyor and Member (since 2015)
- Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) – Member (since 2019)
- European Association of Archaeologists (EAA) – Member (since 2019)

## 5. Publications, divided by research topic

(**bold** denotes PI/primary author, underline denotes student, % denotes JAG contribution)

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### *Copper-rich writing materials*

- (1) Wiggins, Marcie, Emma Heath, Karl Booksh, and **J. Alcántara-García**. 2019. "Multi-Analytical Study of Copper-Based Historic Pigments and their Alteration Products." *Applied Spectroscopy* 73 (11) 1255-1264. doi: [10.1177/0003702819856606](https://doi.org/10.1177/0003702819856606). (50%)
- (2) Wiggins, Marcie, **Jocelyn Alcántara-García**, and Karl Booksh. 2018. "Characterization of Copper-Based Pigment Preparation and Alteration Products." *MRS Advances* 2 (63):3973-3981. doi: [10.1557/adv.2018.53](https://doi.org/10.1557/adv.2018.53). (50%)
- (3) **Alcántara-García, Jocelyn**, José Luis Ruvalcaba-Sil, and Marie Van der Meeren. 2014. "XRF Study of Mexican Iron Gall Inks. Historical and Geographical Overview of their Chemistry." *Materials Research Society Symposium Proceedings* 1618:31 - 41. doi: [10.1557/opl.2014.453](https://doi.org/10.1557/opl.2014.453). (80%)
- (4) **Alcántara-García, Jocelyn**. 2013. "Pyranose-based Ligands for Conservation of Historical Iron Gall Inks with High Copper to Iron Ratio." Final Paper Number 118 245th American Chemical Society Spring Meeting & Exposition, New Orleans, LA, 7-11 April. (100%)
- (5) **Alcántara García, Jocelyn**. 2013. "2013. "Uso de Monosacáridos para Conservación de Tintas Ferrogálicas con Altos Contenidos de Cobre." *Use of Monosaccharides for the Conservation of Iron Gall Inks with High Copper Content*. Mexico: Publicaciones digitales ENCRyM (Escuela Nacional de Conservación, Restauración y Museografía). <https://revistas.inah.gob.mx/index.php/digitales/article/view/4657> (accessed January 3, 2019). (100%)
- (6) **Alcántara-García, Jocelyn**, José Luis Ruvalcaba-Sil, and Marie Van der Meeren. 2012. "Study of Colonial Manuscripts from San Nicolás Coatepec, Mexico through UV&IR Imaging and XRF." *MRS Proceedings* 1374:17-25. doi: [10.1557/opl.2012.1375](https://doi.org/10.1557/opl.2012.1375). (75%)
- (7) **J. Alcántara-García**. 2011. "Investigaciones Documentales y Científicas en Conservación de Papel." (Documental and Scientific Research on Paper Conservation): Adabi de México. Fundación Harp-Helú. ISBN [978-607-416-233-2](https://doi.org/978-607-416-233-2). (100%)
- (8) **J. Alcántara-García**. 2010 "Conservación de Papel: Tratamiento de la Corrosión por Tintas Ferrogálicas." (Paper Conservation: Treatment of Iron Gall Ink Corroded Manuscripts). Abstracts Book "Science and Innovation Week" Mexico City, Mexico. (100%)

### *Historical Dyes*

- (1) **Alcántara-García, Jocelyn** and Michael Nix. 2019. "The Norwich Textile Reference Database: A Collections Care Project." *AIC Wooden Artifacts Working Group Postprints*, AIC's 46<sup>th</sup> Annual Meeting, Houston, TX: 153-157. (invited contribution, 70%).
- (2) **Alcántara-García, Jocelyn**, and Michael Nix. 2018. "Multi-Instrumental Approach with Archival Research to Study the Norwich Textile Industry in the Late Eighteenth and Early Nineteenth Centuries: the Example of a Norwich Pattern Book Dated c. 1790–1793." *Heritage Science* 6 (76). doi: [10.1186/s40494-018-0242-x](https://doi.org/10.1186/s40494-018-0242-x).
- (3) **Alcántara-García, Jocelyn**. 2018. "The 'Industrial Patent' of Norwich Dyers in the Late 18th Century Revealed through Science." *Miscellany, Costume and Textile Association* 5: 6. (invited contribution, 100%)
- (4) Thomas, Riley, **Jocelyn Alcántara-García**, and Jan Wouters. 2017. "A snapshot of Viennese Textile History Using Multi-Instrumental Analysis: Benedict Codecasa's swatchbook." *MRS Advances* 2 (63):3959-3971. doi: [10.1557/adv.2017.604](https://doi.org/10.1557/adv.2017.604). (60%)
- (5) **Alcántara-García, Jocelyn**, Michael Nix and Taylor Pearlstein. 2017. "Tracing the Trade: HPLC-PDA-MS study Norwich Wool Swatch Books Reveal the Secrets of Master Dyers." *International Council of Museums – Committee for Conservation (ICOM-CC) Triennial Conference Preprints*, Copenhagen, Denmark. (70%)

### Chemical Education

- (1) Wiggins, Marcie, Emma Heath, and **Jocelyn Alcántara-García**. 2018. "Multidisciplinary Learning: Redox Chemistry and Pigment History." *Journal of Chemical Education*. doi: [10.1021/acs.jchemed.8b00358](https://doi.org/10.1021/acs.jchemed.8b00358). (60%)
- (2) **Alcantara-Garcia, Jocelyn** and Rebecca Ploeger. 2018. "Teaching Polymer Chemistry through Cultural Heritage." *Journal of Chemical Education* 95 (7):1118-1124. doi: [10.1021/acs.jchemed.7b00975](https://doi.org/10.1021/acs.jchemed.7b00975). (60%)
- (3) **Alcantara-Garcia, Jocelyn** and Mike Szelewski. 2016. "Peak Race: an In-Class Game Introducing Chromatography Concepts and Terms in Art Conservation." *Journal of Chemical Education* 93 (1):154-157. doi: [10.1021/acs.jchemed.5b00326](https://doi.org/10.1021/acs.jchemed.5b00326). (90%)
- (4) Esquevelzeta Rabell, Mariana, Raúl Huerta Laviorie, **Jocelyn Alcántara García**, and Daniela Chávez Barajas. 2014. *Ciencias 3: Química*. Reprint 2015(2), 2016, 2017, 2018, *Aprendamos*. Mexico City, México: MacMillan. [ISBN 978-607-473-479-9](https://doi.org/10.1016/j.jorganchem.2005.03.042). (25%)

### Other scholarly contributions

- (1) Translator Abstracts **2018** Textile Specialty Group (TSG), Post Prints –American Institute for Conservation of Historic and Artistic Works.
- (2) Editor (since **2018**) Conservation and Art Materials Encyclopedia Online ([CAMEO](https://cameo.org/)).
- (3) Principal Editor Volume 2|IMRC **2016-2017** – International Materials Research Conference – Cultural Heritage and Archaeological Issues in Materials Science (CHARIMSc).
- (4) Shugar, Aaron, Jennifer Mass, Rebecca Ploeger, Marcie Wiggins, Thomas Beebe, Karl Booksh, Alyssa Hull, Robert Opila, Terje Syversen, Eva Storevik, Letizia Monaco, Constanza Miliani, Koen Janssens, and **Jocelyn Alcantara-García**. 2016. "Shades of Yellow: Investigation of late 19th - Early 20th Century Yellow Artists' Pigments from the studios of Henri Toulouse-Lautrec and Edvard Munch." MRS Fall Meeting and Exhibit. Materials Research Society Symposium. Material Issues in Art and Archaeology., Boston, MA, Nov 27 - Dec 2, 2016. (8%)
- (5) Casanova-González, Edgar, **Jocelyn Alcántara-García**, and N. Pérez-Castellanos. 2017. "Back to Natural Processes: Controlled Carbonation for Recalcifying Malachological Artifacts." 2015. American Institute for Conservation of Historic and Artistic Works. blog post: [goo.gl/Sy0UbM](https://goo.gl/Sy0UbM) (accessed January 3, 2019). (40%)
- (6) Arciniega, Armando, Nora Perez, Edgar Casanova, Yareli Jaidar, José Torres, and **Jocelyn Alcantara-Garcia**. 2015. "Degradation Analysis of Stone Reliefs at the Archaeological Site of Tula, Mexico." *TECHNART Book of Abstracts – Non-Destructive and Microanalytical Techniques in Art and Cultural Heritage*. Catania, Italy. (20%)
- (7) Alcántara-García, Jocelyn, Vojtech Jancik, Joaquín Barroso, Sandra Patricia Hidalgo-Bonilla, Raymundo Cea-Olivares, Rubén Toscano, and Monica Moya-Cabrera. 2009. "Coordination Diversity of Aluminum Centers Molded by Triazol-Based Chalcogen Ligands." *Inorganic Chemistry* 48 (13):5874-83. doi: [10.1021/ic900166u](https://doi.org/10.1021/ic900166u). (50%)
- (8) Moya-Cabrera, Mónica, Raymundo Cea-Olivares, Jocelyn Alcántara-García, Rubén A. Toscano, Vojtech Jancik, Verónica García-Montalvo, and Simón Hernández-Ortega. 2005. "Synthesis and Structural Characterization of Gallium and Indium Complexes Obtained from Redistribution Reactions of Mixed Chalcogen-Imidodiphosphinate Ligands." *Journal of Organometallic Chemistry* 690 (12):3054-3060. doi: [10.1016/j.jorganchem.2005.03.042](https://doi.org/10.1016/j.jorganchem.2005.03.042). (30%)

### 6. Scholarship in Preparation

**(bold denotes PI/primary author, underline denotes student, % denotes JAG contribution)**

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- Wiggins, Marcie B. and **Jocelyn Alcantara-Garcia** "Verdigris through the eyes of science – A Review" – *Studies in Conservation* – 2020. (50%)
- Speed, Amelia M., Booksh, Karl S., and J. Alcantara-Garcia – "Multivariate Classification Methods Applied to the Nondestructive Analysis of Chromophores on Historical Textiles" – *Analytica Chimica Acta* – 2020. (60%)

## 7. Presentations Divided by Research Topic

(**bold** denotes PI/primary author, underline denotes student, % denotes JAG contribution)

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### *Copper-rich writing materials*

- **Alcantara-Garcia, Jocelyn**. Septiembre 2019. "Degradación de Verdigris en Sustratos Orgánicos e Implicaciones en Conservación." (Verdigris Degradation in Organic Substrates and Implications in Conservation). Universidad de Costa Rica, Costa Rica. *Invited*. (100%)
  - **Alcantara-Garcia, Jocelyn**. 2013. "Uso de Monosacáridos en Conservación de Papel Histórico" (The Use of Monosaccharides in Conservation of Historical Paper). Primer Congreso de Conservación del Patrimonio Documental (First Conference on Conservation of Cultural Heritage). Mexico City, Mexico. *Invited*. (100%)
- (1) Wiggins, Marcie B., Emma Heath, Karl S. Booksh, and **Jocelyn Alcantara-Garcia**. 2018. "Spectroscopic and Diffraction Analysis of Verdigris Pigment & Alteration Products on Organic Substrates (Paper and Gum Arabic)." Eastern Analytical Symposium. Plainsboro, NJ. (40%)
  - (2) Heath, Emma, Marcie Wiggins, Thomas Beebe, Jr., Karl Booksh, and **Jocelyn Alcántara-García**. 2018. "XPS of Cu-organic interactions related to Cultural Heritage Collections." Eastern Analytical Symposium. Princeton, NJ. DOI: 10.13140/RG.2.2.36120.44808
  - (3) Wiggins, Marcie, Karl Booksh, and **J. Alcántara-García**. 2017. "Alteration Products of Copper-Based Pigments in Organic Matrixes." XXVI International Materials Research Congress - Cultural Heritage and Archaeological Issues in Materials Science Symposium. Cancun, Mexico. (50%)
  - (4) **Alcantara-Garcia, Jocelyn**. 2016. "Studying the Study: Using Notebooks to Understand Education." 33rd International Paper Historians (IPH) Congress. Valencia, Spain (100%)
  - (5) **Alcantara-Garcia, Jocelyn**. 2014. "Pyranose-Based Ligands for Conservation of Historical Iron Gall Inks with High Copper to Iron Ratio." 245th American Chemical Society National Meeting and Exposition, New Orleans, LA. United States of America. (100%)
  - (6) **Alcantara-Garcia, Jocelyn**, Marie Vander Meeren, and José Luis Ruvalcaba-Sil. 2013. "XRF study of Mexican Iron Gall inks: Historical and Geographical Overview of their Chemistry (preliminary results)." American Institute of Conservation's Annual Meeting. Indianapolis, IN. United States of America. (80%)
  - (7) **Alcantara-Garcia, Jocelyn**, Marie Vander Meeren, and José Luis Ruvalcaba-Sil. 2013. "XRF study of Mexican Iron Gall inks: Historical and Geographical Overview of their Chemistry." XXII International Materials Research Congress. Cultural Heritage and Archaeological Issues in Materials Science Symposium. Cancun, Mexico. (80%)
  - (8) **Alcantara-Garcia, Jocelyn**, Marie Vander Meeren, and José Luis Ruvalcaba-Sil. 2011. "Study of Colonial Manuscripts from San Nicolás Coatepec, Mexico through UV&IR Imaging and XRF." XX International Materials Research Congress. Cultural Heritage and Archaeological Issues in Materials Science Symposium. Cancún, Mexico. (70%)

### *Historical Dyes*

- **Alcantara-Garcia, Jocelyn**. 2019. "Estudio Científico de Textiles Históricos y Arqueológicos: la Importancia de Colaboraciones Interdisciplinarias." (Scientific Study of Historical and Archaeological Textiles, and the Importance of Interdisciplinary Collaborations). Universidad de Costa Rica, Costa Rica. *Invited*. (100%)
- **Alcantara-Garcia, Jocelyn**. 2018. "Dressing in colour: analysis that tells stories." ISE Lab Speaking Series. University of Delaware, DE. *Invited*. (100%)

- (1) **J. Alcántara-García**, Amelia M. Speed, and Karl S. Booksh. "Using Norwich Patternbooks to Accomplish Non-Destructive Analysis of Textiles." DHA 38. Dyes in History and Archaeology. Amsterdam, The Netherlands. 6-9 November 2019. (60%)
- (2) **J. Alcántara-García**, Marianne Weldon, Amelia M. Speed, and Karl Booksh. 2019. "Addressing the Challenges of Disassociated Archaeological Textiles with Multivariate Classification of Spectroscopic and Chromatographic Data." *25<sup>th</sup> Annual Meeting of the European Association of Archaeologists*. University of Bern, Switzerland. 4-7 September, 2019. Abstract id 1245. (60%)
- (3) **Alcantara-Garcia, Jocelyn** and Michael Nix. 2018. "The Norwich textile reference database, a collections care project." American Institute for Conservation of Historic and Artistic Works. 46th Annual Meeting. Houston, TX. (95%)
- (4) **Alcantara-Garcia, Jocelyn**, and M. Nix. 2017. "Norwich textile database project, a non-destructive analysis perspective." SERMACS - Southeast American Chemical Society Annual Meeting. Charlotte, NC. (90%)
- (5) **Alcantara-Garcia, Jocelyn**, Michael Nix, Riley Thomas, Taylor Pearlstein and Jan Wouters. 2017. "Pattern Books to Assess Textile Collections: the Ultimate Reference Materials." XXVI International Materials Research Congress - Cultural Heritage and Archaeological Issues in Materials Science Symposium. Cancun, Mexico. (50%)
- (6) **Alcantara-Garcia, Jocelyn**, Michael Nix, and Taylor Pearlstein. 2017. "Tracing the Trade: PDA-LC-MS study Norwich Wool Swatch Books Reveal the Secrets of Master Dyers." International Council of Museums – Committee for Conservation (ICOM-CC) Triennial Conference. Copenhagen, Denmark. (75%)

### **Chemical Education**

- **Alcantara-Garcia, Jocelyn**. 2020. "The Power of Connection: Cultural Heritage to Understand Polymer Chemistry." 48<sup>th</sup> World Polymer Congress. International Union of Pure and Applied Chemistry (IUPAC MACRO2020) – Polymer Education. Jeju, Korea. *Invited*. (100%).
  - **Alcantara-Garcia, Jocelyn**, and Marcie B. Wiggins. 2017. "Learning from the green: Verdigris from the classroom to the conservation lab." SERMACS - Southeast American Chemical Society Annual Meeting. Charlotte, NC. *Invited*. (60%)
  - **Alcantara-Garcia, Jocelyn**. 2014. "La Química como Base de la Conservación del Patrimonio Cultural e Histórico" (Chemistry is the Basis for Conservation of Cultural and Historic Heritage), Universidad Nacional Autónoma de México – UNAM. Mexico City, Mexico. *Invited*. (100%)
- (1) Ploeger, Rebecca and **Jocelyn Alcantara-Garcia**. 2019. "Strategies for teaching polymer chemistry in the cultural heritage field." [Plastics Heritage Congress: History, Limits and Possibilities](#). Museu da Farmácia, Lisbon, Portugal. 29-31 May, 2019. (50%)
  - (2) Faculty Advisor – Summer Service Scholars – "[Terrific Tuesdays](#)" and "Fantastic Fridays" Public outreach programs designed to spark interest in science and art (ages 3-10). Sponsored by the Delaware Division of the Arts in partnership with the National Endowment for the Arts. 2018-to present.

### **Other Scholarly Contributions**

- (1) Jiménez, Luis Armando, Armando Arciniega, **Nora Pérez**, Manuel Díaz de León, Yareli Jáidar, Edgar Casanova and Jocelyn Alcantara-Garcia. 2017. "Factors affecting the preservation of stone reliefs at the archaeological site of Tula: constituent materials, pollution and conservation materials." XXVI International Materials Research Congress - Cultural heritage and archaeological issues in materials science symposium. Cancun, Mexico.

- (2) **Alcantara-Garcia, Jocelyn**, Nora Pérez and Edgar Casanova. 2015. "Back to Natural Processes: Controlled Carbonation for Recalcifying Malacological Artifacts." American Institute of Conservation's Annual Meeting, Miami, FL.
- (3) **Arciniega, Armando, Nora Perez**, Edgar Casanova, Yareli Jaidar, Jose Torres and Jocelyn Alcantara-Garcia. 2015. "Degradation Analysis of Stone Reliefs at the Archaeological Site of Tula, Mexico." TECHNART, Catania, Italy.
- (4) **Ruvalcaba-Sil, José Luis**, and J. Alcantara-Garcia. 2011. <https://vimeo.com/24357339> – "ANDREAH - Análisis no destructivo para el estudio del arte, la arqueología y la historia" (Non-destructive analysis for studying art, archaeology and history). *Public outreach video*.

## 8. Teaching and Advising Experience

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### **Courses Taught**

Chemistry of Art	ARTC167	Spring 2015 and Spring 2016
Science of Color Phenomena	ARTC/CHEM210	Spring 2017, Fall 2017, 2018, 2019
Advanced Instrumental Techniques I	ARTC672	Fall 2014, 2015-19
Advanced Instrumental Techniques II	ARTC673	Spring 2015-18, 2020
General Chemistry with Lab	UNAM, Mexico (equivalent 400-level)	Spring and Fall 2011 and 2018

### **Invited Guest Lecturer**

Scientific Analysis of Textiles	Fashion Institute of Technology	February 3, 2020 (3 h)
Chemistry of Dyes	For ARTC615	April 21, 2020 (3 h) November 8, 2018 (3 h)
Chemical Analysis of Textiles	For Analysis of Art: Early Byzantine Textiles, Brynn Mawr College	September 21, 2018 (3 h) Fall 2019 (3h, date TBD)
Advanced Spectroscopic Techniques for Analysis of Cultural Heritage	For ARTC495	November 27, 2018 (3 h) November 29, 2017 (3 h) October 23, 2018 (3 h)
Iron Gall Inks	For Paper and Archives Block, WUDPAC	January 31, 2017 (3 h) February 1, 2016 (3 h) February 1, 2015 (3 h)

### **Workshops Led**

Lenape Dyes and Chemistry – Delaware Humanities grant "The First People of the First State: Restoring our Ancestral Knowledge"		January 31, 2020 (5 h)
Delaware Department of Education – Math and Science Partnership (DDO-MSP) DISCOVERY: The Discover Delaware Interdisciplinary STEM Citizen Science Project - <i>iSTEAM: Visual Analysis and Ethnobotany Workshop</i>		January 30-31, 2017 (8 h) With Dr. Zachary Voras, ISE lab preceptor.
Delaware Department of Education – Math and Science Partnership (DDO-MSP) DISCOVERY: The Discover Delaware Interdisciplinary STEM Citizen Science Project - <i>iSTEAM: Visual Analysis and Ethnobotany Workshop</i>		January 28-29, 2018 (8 h) With Jonathan Cox, NatGeo Explorer.

**Other**

Volunteer tutor for high school and undergraduate students (1 on 1 and small group advisement). UNAM, Mexico  
Algebra, Chemistry and English  
2001-2005 (total 37 students)

**Advising – Doctoral**

Amelia M. Speed (Chemistry and Biochemistry), second year, co-advising with Dr. Karl S. Booksh – **Application of Multivariate Analysis Classification Methods to Historical and Archaeological Artifacts.**

Marcie B. Wiggins (Chemistry and Biochemistry), doctoral defense 22 March 2019, co-advised with Dr. Karl S. Booksh – **Spectroscopic Studies of Copper-Based Pigments.** Significant accomplishments: Eastern Analytical Symposium Graduate Student Award; University of Delaware Dissertation Fellowship; Professional Development Award, University of Delaware; Elizabeth Dyer Teaching Award, University of Delaware ; NSF-IRES Fellowship at Rijksmuseum; NSF funding to attend Scientific Methods in Cultural Heritage Research Gordon Conference. Four co-authored publications and two co-authored presentations. Postdoctoral Associate Yale's Institute for the Preservation of Cultural Heritage.

Mariana DiGiacomo Caporale (Preservation Studies, Art Conservation), doctoral defense 20 May 2019, co-advised with Dr. Vicki Cassman – **The Consequences of Methods of Fossil Preparation on the Preservation and Future Research Suitability of Fossil Remains.** Significant accomplishments: Robert Davis Fellowship Award; Associate Editor for the SPNHC Collection Forum; Coordinator of the Natural History Working Group of the International Council of Museums, Committee for Conservation (ICOM-CC); Co-chair of the Emerging Professionals Committee (EPC), EPC Liaison for the Conservation Committee, Conservation Committee Resources representative for South America; Peer Recognition Award at the Smithsonian National Museum of Natural History for her work as a Conservation Fellow, collaborating with the Department of Paleobiology; Smithsonian National Museum of Natural History fellowship; part of delegation from University of Delaware to Havana, Cuba, to establish relationships with Cuban conservation professionals; funded by the National Endowment of the Humanities; Mae and Bob Carter Professional Development Award for students in the Art Conservation Department at the University of Delaware (2017).

Melissa Barrantes (Chemistry, Universidad de Costa Rica), first year, committee member. Advisor Dr. Óscar Andrey Herrera Sancho – **Analysis and Conservation of Paintings of Carlo Ferrari at the National Theater of Costa Rica.**

Hannah Palmer (Chemistry, Drexel University), second year, committee member. Advisor Dr. Kevin Owens - **Investigation of Insoluble Organic Artist's Pigments using a Solvent-Free approach for MALDI TOF-MS Quantitation.**

**Advising – Undergraduate**

Carolyn D. Chen, University of North Carolina at Chapel Hill, class of 2020 Chemistry (BA) and Chinese (BA) – **Development of non-destructive methodology for analysis of dyes on textiles.** Significant accomplishments: 2019 University of Delaware REU recipient, 2018 Smithsonian Minority Awards Program intern, 2018 Alpha Kappa Delta Phi Foundation Scholarship recipient.

Olivia Jaeger, class of 2020 Chemistry (BS) and Art Conservation (BA) Major, Biochemistry Minor – **Development of non-destructive methodology for analysis of dyes on textiles.** Significant accomplishments: University of Delaware Trustee Scholarship, Ludlum W&H Billsborough Scholarship, 2018 Woman of Promise.



Emma K. Heath, class of 2019 Honors Art Conservation (BA) and Chemistry (BS) Major, senior – **Spectroscopic, Chromatographic and Surface-Analysis studies of dyes and copper-rich writing materials**. Significant accomplishments: University of Delaware Trustee Scholarship; Francis J. McConnell Presidential Achievement Award; Woman of Promise; Quaesita Drake Scholarship; American Chemical Society Analytical Division Undergraduate Award in Analytical Chemistry; Summer Scholars and Fellows (JAG as PI); Eastern Analytical Symposium Undergraduate Student Research Award; Archaeological Field School (Penycloddiau Hillfort, Northern Wales); Honors College and Phi Kappa Phi Honors Society. Two co-authored publications and two co-authored presentations. Pursuing MSc in Archeological Science (fall 2019) at University College London.

Rachel Dunscomb, class of 2019 Honors Art Conservation (BA) and Chemistry (BS) Major, senior – **Elucidation of mordant-dye structures**. Significant accomplishments: Plastino Scholar (JAG as PI); Woman of Promise, Honors College and Phi Kappa Phi Honors Society. Pursuing PhD in Chemistry (fall 2019) at the University of Minnesota.

AnnaLivia McCarthy, Art Conservation (BA) – **Summer service scholar. Leader of STEAM camp**. Woman of Promise; Summer Service Scholar (JAG as PI); University of Delaware Presidential Scholarship.

Carolanne Deal, Art History (BA) major – **Summer service scholar. Leader of STEAM camp**. Significant accomplishments: Woman of Promise, Summer Service Scholar (JAG as PI), accepted as 4+1 MA in Art History.

Vivien Barnett, class of 2019 Art Conservation (BA) and Art History (BA) Major, senior – **Accelerated ageing studies of quercitron-dyed textiles**. Accepted to 4+1 Program in Art History, University of Delaware.

Riley Thomas, class of 2018 Honors (BA) with Distinction, Art Conservation and Anthropology majors – **Dye analysis of a late 18<sup>th</sup> century Viennese swatch book**. Significant accomplishments: Julian Steward Award for Anthropology; Barbara Hughes Award for Anthropology; Woman of Promise; Eugene DuPont Memorial Scholarship Recipient; Library of Congress Junior Fellow; Smithsonian National Museum of Natural History intern, Summer Scholar (JAG as PI). Paid intern National Museum of the American Indian (2019).

Elizabeth Van Winkle, class of 2018 Honors (BA) with Distinction, Art Conservation and Chemistry (BA) majors – **Binding media degradation** (directed by Dr. K. Booksh). Significant accomplishments: Francis Allison Distinguished Scholar, William W&H Billsborough Scholarship, Hoffman Scholar, Woman of Promise. Senior Thesis (second reader) "Spectroscopic Analysis of Artificially Aged Paint Binders." Competitive paid internship with Northwestern University at the Rijksmuseum, Amsterdam, The Netherlands.

Taylor Pearlstein, class of 2018 Honors (BA) with Distinction, Art Conservation and Apparel Design, Global Studies, Fashion History & Culture minors – **Dye analysis of a late 18<sup>th</sup> century Norwich swatch book**. Significant accomplishments: Summer Scholars (JAG as PI), Phi Beta Kappa, Phi Kappa Phi Graduate Fellowship UD Chapter Nominee, AATCC Outstanding Graduate Award, UD Woman of Promise. Attending University College London to pursue an MA in Cultural Heritage Studies.

Laura Mosco, class of 2016 – Art Conservation and Art History majors (BA), minor in Criticism – **Analysis of aged films, independent study** (directed by D. Hess Norris). Project manager at Pearhead Inc, NY. Independent study: identification of degradation materials on plastic sleeves from the Henry Grossman collection.

Adrienne Gendron, class of 2015 Art Conservation and Art History majors (BA); Phi Kappa Phi; Weber Award for Excellence in Conservation Research. Senior thesis (director) – **Degradation of Copper Alloy Artifacts In Situ**. Woman of Promise; Fortner Endowment for Anthropological Research and Weil Anthropology Travel Award; funded internships at the Smithsonian Institution (NMNH and NMAI), American Museum of Natural History, and National Park Service; class of 2021 New York University Program in Art Conservation.

Remy Kneski, class of 2015 (BA) with Distinction, Art Conservation and Anthropology majors. University of Delaware Honors Enrichment Award, Woman of Promise Award. Senior thesis (director Dr. V. Cassman) – **Polymeric Adhesives at an Archaeological Site**.

Emily Pazar, class of 2015 Winterthur Program in American Material Culture (WPAMC) – **Independent study: technical examination of 19<sup>th</sup> century hand-made marbled papers**.

Mariela Saraí Carrillo Díaz, class of 2014 Art Conservation major at Escuela Nacional de Conservación y Restauración de Occidente – ECRO (Guadalajara, Mexico). 3rd reader and science advisor Honors thesis: Identificación de componentes orgánicos como aglutinante de la decoración post-cocción al pseudo-cloisonné de cerámica arqueológica. Estudio de caso de objetos provenientes de los sitios La Higuera, Tala, Jal., Plan del Guaje, Tonalá, Jal. y Cerro del Teúl, Teúl de González Ortega, Zac. (**Identification of organic components of binding media in archeological pseudo-cloisonné post firing decoration ceramics**. Case study of artifacts from La Higuera, Tala, Jal., Plan del Guaje, Tonalá, Jal. and Cerro del Teúl, Teúl de González Ortega, Zac. sites)

## 9. Professional Consultations

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### 2018

Myriam de Arteni – New York Public Library, New York City, NY – Senior Exhibitions Conservator – assessment treatment options for 16<sup>th</sup> century Mexican documents (Nican Mopohua), in preparation for treatment (2 hours).

Dr. Sara Zaccaron – Johns Hopkins University, Baltimore, MD – Andrew W. Mellon Postdoctoral Fellow – potential use of glucose to extract copper ions from Cu-rich iron gall inks. “The disastrous copper. Comparing extraction and chelation treatments to face the threat of copper-containing inks on cellulose.” 2019. *Carbohydrate Polymers*, 2016, 198-2019.

### 2017

Alina Vazquez and Julio Llano Fariñas – Museo Nacional de la Música, Havana, Cuba – Analysis of Cuban National Anthem and Assessment on its delamination (4 months).

Dr. Robert Opila – Electrical and Computer Engineering, University of Delaware – Inks on Papyri and the use of Raman for their Characterization (2 hours).

Ana Gabriela Bautista – Radio Universidad de Guadalajara, Jalisco, Mexico – [Interview](#) about Heritage Science, for the radio show “[Seis Grados de Separación](#)” (1 hour).

### 2016

Erin Hammeke – Senior Conservator for Special Collections, Duke University Libraries – Oil residue analysis possibly affecting a book (2 hours).

*National Endowment for the Humanities (NEH) – Grant Award to Bring an Art Conservation Team to Cuba* (PI - D. Hess-Norris). Havana, Cuba. Cultural Exchange visit, representing the Art Conservation Department of the University of Delaware along with Debra Hess-Norris. <https://goo.gl/n6x3bR>; <https://goo.gl/WxaErJ>

*Queen Anne’s Revenge Project – North Carolina State Archives* – Consultation on research related to waterlogged paper fragments recovered from the Queen Anne’s Revenge shipwreck (2 years).

Selected notes from Internet and interviews:

- <https://www.delawareonline.com/story/news/education/2018/02/14/ud-conservators-analyze-paper-fragments-found-blackbeards-flagship/333864002/>
- [http://www.udel.edu/udaily/2018/january/blackbeard-pirates-shipwreck-paper/?utm\\_source=UDaily+Subscribers&utm\\_campaign=1d598dfbcc-UDaily+News+Email&utm\\_medium=email&utm\\_term=0\\_0b5034716d-1d598dfbcc-177567773](http://www.udel.edu/udaily/2018/january/blackbeard-pirates-shipwreck-paper/?utm_source=UDaily+Subscribers&utm_campaign=1d598dfbcc-UDaily+News+Email&utm_medium=email&utm_term=0_0b5034716d-1d598dfbcc-177567773)
- <https://www.ncdcr.gov/news/press-releases/2018/01/04%20/fragments-pirate-paper-discovered-and-conserved-queen-anne%E2%80%99s-0>
- <https://www.theguardian.com/books/2018/jan/11/fragments-of-book-recovered-from-wreck-of-blackbeards-ship>
- <https://news.nationalgeographic.com/2018/01/blackbeard-pirate-book-cannon-revenge/>
- <https://www.archaeology.org/news/6255-180105-books-paper-pirates>
- <http://www.foxnews.com/science/2018/01/08/incredible-blackbeard-discovery-stunning-find-on-buccaneers-ship-reveals-pirate-reading-habits.html>
- <https://www.aol.com/article/news/2018/01/09/papers-from-blackbeard-wreckage-lead-to-18th-century-voyage-thriller/23328966/>
- [https://www.huffingtonpost.com/entry/blackbeard-pirate-thrillers-reading\\_us\\_5a544156e4b01e1a4b18cf8a](https://www.huffingtonpost.com/entry/blackbeard-pirate-thrillers-reading_us_5a544156e4b01e1a4b18cf8a)
- <https://www.sciencealert.com/book-fragments-blackbeard-queen-anne-s-revenge-archaeology>
- <https://www.livescience.com/61351-blackbeard-pirate-book-fragments.html>
- <http://www.ancient-origins.net/news-history-archaeology/paper-fragment-shipwreck-reveals-blackbeard-s-crew-enjoyed-reading-pirate-021791>
- <http://bgr.com/2018/01/08/blackbeard-book-pirate-ship-queen-annes-revenge/>
- <https://gizmodo.com/paper-scrap-recovered-from-blackbeards-cannon-reveal-w-1821821451>
- Podcast: <http://www.udriseandscience.com/podcasts/2018/4/20/episode-98>

## 10. Research Grants

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### 10.1. Funded

- J. Alcántara-García** (PI) – Delaware Humanities – “The First People of the First State: Restoring our Ancestral Knowledge.” (\$13,161). July 2019.
- K. Booksh (PI), **J. Alcántara-García**, R. Lobo (Co-PI), J. Rabolt (Co-PI), and T. Hanson (Co-PI) – NSF-MRI “Acquisition of a AFM-Raman Microscope” (\$558,000). 2018.
- A. Alonso Olvera (PI), N. A. Pérez Castellanos (Co-PI) and **J. Alcántara-García** (Co-PI) – National Council of Science and Technology of Mexico (Consejo Nacional de Ciencia y Tecnología – CONACyT) – “Implementación de un laboratorio para la evaluación del deterioro y tratamientos de conservación del patrimonio cultural arqueológico mexicano” (Implementation of a laboratory for the evaluation of degradation and conservation treatments in Mexican archaeological cultural heritage). #INFR-2014-01 225845 (\$3,113,486.00MXP). 2014.

### 10.2. Under revision

- C. Basak (PI), **J. Alcántara-García** (Co-PI), C. Chan (Co-PI), M. Li (Co-PI), and D. L. Sparks (Co-PI) – NSF “MRI: Acquisition of a Laser Ablation Multi-Collector Inductively Copupled Mass Spetrometer for Advancing Cross-Disciplinary Research.” (\$930,761). January 2020.
- K. S. Booksh (PI), **J. Alcántara-García** (Co-PI), and B. K. Lavine (Collaborative PI) – NSF – “Collaborative Research: Overcoming Challenges in Classification Near the Limit of Determination.” (\$754,063). October 2019.

### 10.3. Not Funded

- J. Alcántara-García** (PI) – NSF – “CAREER: Structural Elucidation of Dye Bonding in Historical Textiles and Implications for Stability and Clean Industrial Dyeing.” July 2019.

- Jocelyn Alcántara-García** (Co-PI), Jules Bruck (Co-PI), Chief Dennis Coker of the Lenape Indian Tribe of Delaware (Co-PI), Jonathan Cox (Co-PI), John Jungck (Co-PI) – CFP-Interdisciplinary Humanities Research Center (Humanities for STEM 21st Century Approaches) – “The First People of the First State: Restoring our Ancestral Knowledge.” (\$46,972). 2019.
- J. Alcántara-García** (PI) – NSF – “CAREER: Elucidation of metal (mordant)-dye interactions and development of database for non-destructive analysis of archaeological and historical textiles” (\$571,200). 2018.
- J. Alcántara-García** (PI) – “Studies of American and British textiles dyed with quercitron” (\$ 13,190). General University Research (GUR). 2017.
- J. Alcántara-García** (PI) – NSF – “CAREER: developing the methodology and database for non-destructive analysis of Western late 18th- early 19th- century textiles” (\$ 836,263). 2017.
- J. Alcántara-García** (PI) – The Mae and Robert Carter Endowment Women’s Studies Faculty Research Award Program. University of Delaware - “Study of constituent materials of notebooks related to female education between 18th and 19th centuries in the United States.” 2017.
- J. Alcántara-García** (PI) – “Study of ‘minor’ contemporary artists’ paper-supported work – sketches and notebooks.” The Metropolitan Museum of Art. New York, NY . United States of America. 2011.
- J. Alcántara-García** (PI) – “Scientific approach on the Turfan Collection: Identification of materials, degradation mechanisms and conservation plan.” Rathgen-Forschungslabor, Staatliche Museen zu Berlin. Stiftung Preußischer Kulturbesitz with Dr. Stefan Röhrs and Dr. Stefan Simon. Berlin, Germany. 2010, **accepted**, not funded.

## 11. Service

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### **Professional Service**

- Associate Editor – *Studies in Conservation* (2019 – present).
- Peer Reviewer – *Analytical Chemistry*, *Journal of Chemical Education*, *Studies in Conservation*, *MRS Advances and Heritage Science* (2015 – present).
- Translator Abstracts – *Textile Specialty Group (TSG)*, Post Prints – American Institute for Conservation of Historic and Artistic Works (2018).
- Editor – *Conservation and Art Materials Encyclopedia Online*, [CAMEO](#) (2018 – present).
- Assistant Coordinator – *International Council of Museums – Scientific Research Working Group* (2017 – to present).
- Co-Organizer and Co-Chair – *International Materials Research Conference – Cultural Heritage and Archaeological Issues in Materials Science (CHARIMSc) Symposium*. Cancun, Mexico (2017).
- Principal Editor – Special Issue *Cultural Heritage and Archaeological Issues in Materials Science (CHARIMSc) Symposium* in *MRS Advances* (2017).
- Moderator and Translator – *33<sup>rd</sup> International Paper Historians (IPH) Congress*. Valencia, Spain (2016).
- Search Committee Scientist/Senior Scientist search– *Winterthur Museum, Garden and Library*. Winterthur, DE. United States of America (2016).

### **Institutional Service**

- Curriculum Development for “Minerals and Society Program” – Unidel Grant – *University of Delaware*, Newark, DE (2018).
- Faculty Senator, Department of Art Conservation – College of Arts and Sciences – *University of Delaware*, Newark, DE (2015 – to present).
- Moderator – Summer Research and Service Symposium, *University of Delaware – Undergraduate Research Program*. Newark, DE. United States of America (2016 and 2019).
- Volunteer – kNOw More Campaign for Sexual Misconduct Awareness – *University of Delaware*, Newark, DE – <https://sites.udel.edu/sexualmisconduct/> (2015 – to present).

**Departmental Service**

Search Committee Applied Science Professor – *University of Delaware – Department of Art Conservation*. Newark, DE. United States of America (20).

Admissions Committee – *Winterthur/University Program in Art Conservation (WUDPAC)*. Winterthur, DE. United States of America (2015 – 2018).

Search Committee Technical Art History Professor, Business Administrator I, and Business Administrator II – *University of Delaware – Department of Art Conservation*. Newark, DE. United States of America (2016).

Advisory Committee Member of Winterthur/University of Delaware Program in Art Conservation (WUDPAC) students: 5 paper, 3 book and library, 4 paintings, 1 textiles, and 7 objects majors since 2014.

**Community Service**

Volunteer Fish Surveyor – Reef Environmental Education Foundation (REEF) – <http://www.reef.org/> (2015 to present).

Diver Volunteer – Coral Restoration Foundation – <https://www.coralrestoration.org/dive-programs> (2019 to present).

**12. Professional Development**

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**2020**

Winter Institute on Learning (WIL2020) – Refinement of Educational Goals for BA in Art Conservation and Winterthur/University of Delaware Program in Art Conservation – Newark, DE.

**2019**

Writing Winning Proposals – Research Office – University of Delaware – Newark, DE.

Engaging Students in the First Day of Class – Faculty Commons – University of Delaware – Newark, DE.

Questions, questions, and more questions: Using Just-in time teaching, Think-Pair-Share, and Peer Instruction to Leverage Student Learning – Faculty Commons – University of Delaware – Newark, DE.

Teaching with Primary Sources – Faculty Commons – University of Delaware – Newark, DE.

**2018**

Academic Writing Retreat – Easton’s Nook – Newark, NJ.

PKAL STEM Leadership Bootcamp – Association of American Colleges and Universities – AAC&U – Adamstown, MD

Stamped from the Beginning UD Book Club, organized by the Office of Equity and Inclusion – University of Delaware – Newark, DE.

**2017**

Winter Faculty Institute, organized by the Center for Teaching and Assessment of Learning (CTAL) – University of Delaware – Newark, DE.

How Learning Works, Center for Teaching and Assessment of Learning (CTAL) Book Club – University of Delaware – Newark, DE.

Keys to Intercultural Communication, organized by the Office of Equity and Inclusion – University of Delaware – Newark, DE.

Discover Delaware – Organized by the University of Delaware in partnership with associations in the Delaware Valley Blue Hen Success collaborative workshop – University of Delaware – Newark, DE.

Qualtrics: simple surveys, big impact workshop – University of Delaware – Newark, DE.

Summer Institute on Teaching University of Delaware, organized by the Center for Teaching and Assessment of Learning (CTAL) – University of Delaware – Newark, DE.

**2016**

Winter Faculty Institute organized by the Center for Teaching and Assessment of Learning (CTAL) – University of Delaware – Newark, DE.

**2015**

Faculty Success Program – Writing Boot camp – National Center for Faculty Development and Diversity (Funded by the of the Vice Provost for Diversity).

Winter Faculty Institute organized by the Center for Teaching and Assessment of Learning (CTAL) – University of Delaware – Newark, DE.

Summer Faculty Institute organized by the Center for Teaching and Assessment of Learning (CTAL) – University of Delaware – Newark, DE.

Training on Surface Enhanced Raman Spectroscopy (SERS) – Preparation of nanoparticles and analysis protocol – Jointly funded by a grant from the Office of the Vice Provost for Diversity and the Department of Art Conservation – Metropolitan Museum of Art, New York (Dr. Anna Cesaratto).

Training on Liquid Chromatography – Protocols for Natural Dyes' Analysis – Funded by the Andrew W. Mellon Foundation – Scientific Research and Analysis Laboratory (SRAL), Winterthur Museum (Dr. Jan Wouters).

## 2012

Especialización en Patrimonio Cultural Metálico (*Metallic Cultural Heritage Workshop*) – Escuela Nacional de Conservación, Restauración y Museografía (ENCRyM) “Manuel del Castillo Negrete” – Universidad Autónoma de Madrid. Mexico City, Mexico.

## 2011

Materiales cristalinos y amorfos (*Amorphous and microcrystalline materials*) – Universidad Nacional Autónoma de México – Mexico City, Mexico (Dr. Laura Gasque).

La enseñanza del enlace químico en Química General (*Teaching chemical bonding for General Chemistry*)– Universidad Nacional Autónoma de México – Mexico City, Mexico (Dr. Laura Gasque).

## 2010

1er Coloquio sobre líneas de trabajo en materia de Conservación y Restauración en Archivos y Bibliotecas México – Eslovaquia (*1st Colloquium in research lines towards Conservation and Restoration of Archives and Libraries Mexico - Slovakia*) – Biblioteca Nacional. Universidad Nacional Autónoma de México. Mexico.

Taller de encuadernación básica (*Basic book binding workshop*) – Centro de Conservación, Restauración y Encuadernación. Adabi de México, A. C. Mexico City, Mexico (Gustavo Franco Palma).

Taller de restauración de papel (*Paper conservation workshop*) – Museo Franz Mayer - Centro Cultural de España. Mexico City, Mexico (Isabel Gil-Robles, conservator Biblioteca Nacional, Patrimonio Nacional y El Instituto del Patrimonio Cultural Español).

Jornadas sobre Conservación y Restauración de Piedra (*Conservation and Restoration of Stone Conference*) – Escuela Nacional de Conservación, Restauración y Museografía (ENCRyM) “Manuel del Castillo Negrete” – Mexico City, Mexico.

Las tintas ferrogálicas: su historia, deterioro y estabilización (*Iron gall inks: history, degradation and stabilization*) – Archivo General de la Nación – Mexico City, Mexico (Alejandra Odor Chávez).

## 2009

Nanotecnología aplicada a la conservación del patrimonio cultural (*Nanotechnology applied to cultural heritage*) – Escuela Nacional de Conservación, Restauración y Museografía (ENCRyM) “Manuel del Castillo Negrete” – Mexico City, Mexico (Prof. Piero Baglioni and Rodorico Giorgi, CGSI-University of Florence)

## 13. Languages

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Spanish:	Native language.
English:	ILR Level 5 proficiency.
German:	ILR Level 2 proficiency.
Swedish and Italian:	ILR Level 1 proficiency.

## 14. Instrumentation

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- FieldSpec 4 High Resolution Spectroradiometer with ViewSpec Pro software.
- Renishaw Invia Raman spectrometer (785nm diode laser or 514nm argon ion laser) with WiRE 3.4 software.
- ArtTAX  $\mu$ XRF spectrometer for ED-XRF (energy-dispersive X-ray fluorescence) spectroscopy using a rhodium tube with the Intax software version 4.5.18.1.
- SANDRA (Sistema de Análisis No Destructivo por RAYos X) spectrometer using molybdenum and rhodium X-ray tubes and Amptek Si-PIN and Cd-Te detectors with SANDRA software.
- Bruker Tracer III-SD XRF spectrometer with a rhodium tube using the PXRf1 software.
- Thermo Scientific Nicolet 6700 Fourier Transform-Infrared (FTIR) spectrometer using the Omnic 8.0 software.
- Zeiss Axio Imager M2m binocular microscope equipped with a Kübler Codix HXP 120C mercury lamp for reflected visible and ultraviolet light.
- Zeiss EVO MA15 scanning electron microscope with LaB6 source with Electron Dispersive Spectroscopy (EDS) using the Bruker Nano X-flash® detector 6 | 30 and analyzed with Quantax 200/Esprit 1.9 software.
- Rigaku D/Max RAPID II X-ray diffractometer using PDXL 2 Version 2.3.1.0 software.
- Varian 460-LC – Varian 500-MS High Pressure Liquid Chromatography – Mass Spectrometry (HPLC-MS) instrument with Prostar 335 Photodiode array (PDA) detector. Interpretation using Star Chromatography Workstation and Poliview 2000 software.
- Shimadzu Prominence Gel Permeation Chromatography (GPC) with UV detector.
- Konica Minolta CM-700d Spectrophotometer.
- Manipulation of Schlenk Techniques.
- Preparation and manipulation of air and moisture sensitive samples for Fourier Transform Infrared Spectroscopy (FTIR, transmission and total attenuated ATR), and Nuclear Magnetic Resonance (NMR).
- Preparation and manipulation of samples for viscometry. Interpretation.
- Conservation training in mural painting, ceramic and paper.