

Dr. Richard R. Hark

CONTACT INFORMATION

Conservation Scientist
Institute for the Preservation
of Cultural Heritage
Yale University
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Permanent address:

EDUCATION

Ph.D.

Department of Chemistry, University of Pennsylvania, Philadelphia, Pennsylvania, 1996
Thesis: "Synthesis of ninhydrin analogues"

B.S. (*cum laude*)

Department of Chemistry, University of Rochester, Rochester, New York, 1984
Thesis: "Synthesis of acetohydroxamic acid derivatives of 3-nitropyrzole for use as sensitizers in anticancer radiation therapy"

PROFESSIONAL APPOINTMENTS

2017–2018	Yale University, Institute for the Preservation of Cultural Heritage, Visiting Scientist
2008–2017	Juniata College, Department of Chemistry, Chair
2008, 2011	Victoria and Albert Museum, Visiting Researcher
2007–2008	University College London, Department of Chemistry, Research Associate
2007–present	Juniata College, Department of Chemistry, Professor
2001–2007	Juniata College, Department of Chemistry, Associate Professor
2000	University of Pennsylvania, Department of Chemistry, Visiting Researcher
2000–2001	Marietta College, Department of Chemistry, Associate Professor
1999–2001	Marietta College, Honors Program Director
1993–2000	Marietta College, Department of Chemistry, Assistant Professor

PUBLICATIONS

Books

1. *The Art & Science of Portrait Miniatures*, Jennifer L. Streb and Richard R. Hark, Juniata College Press: Huntingdon, PA, 2015.

Refereed Journal Articles

1. Throckmorton, C.S., Hark, R.R., Harmon, R.S., Estright, C.A., Collins, L.M. "Practical approaches for ensuring and assessing the validity of classifier performance: Examples from laser-induced breakdown spectroscopy," *Spectrochim. Acta B* **2018**, under review.

2. Harmon, R.S., Hark, R.R., Throckmorton, C.S., Rankey, E.C., Wise, M.A., Somers, A.M., Collins, L.M. "Geochemical Fingerprinting by Handheld Laser-induced Breakdown Spectroscopy (LIBS)," *Geostand. Geoanal. Res.* **2017**, *41*, 563-584.
3. Kuck, D., Heitkamp, S., Sproß, J., Letzel, M.C., Ahmed, I., Krohn, K., Parker, R.G., Wang, Y., Robbins, V.J., Ames, W.A., Schettler, P.D., Hark, R.R. "Consecutive loss of two benzyl radicals from the $[M + Na]^+$ adduct ions of di- and tri(benzyloxy)benzenes under ESI/CID conditions," *Intl. J. Mass Spectr.* **2015**, *377*, 23-28.
4. Harmon, R.S., Russo, R.E., Hark, R.R., "Applications of laser-induced breakdown spectroscopy for geochemical and environmental analysis: A comprehensive review," *Spectrochim. Acta B* **2013**, *87*, 11-26.
5. Hark, R.R., Houston, K.R., Mass, J., Minardi, L., Durnbaugh, H.T., Mumford, J. "Investigating the Juniata College collection of Pennsylvania German *fraktur*: art historical perspectives and scientific analysis," *Juniata Voices* **2012**, 102-125.
6. Hark, R.R., Remus, J.J., East L.J., Harmon, R.S., Wise, M.A., Tansi, B.M., Shughrue, K.M., Dunsin, K.D., Liu, C. "Geographical analysis of 'conflict minerals' utilizing laser-induced breakdown spectroscopy," *Spectrochim. Acta B* **2012**, *74-75*, 131-136.
7. Remus, J.J., Harmon, R.S., Hark, R.R., Potter, I.K., Bristol, S.K., Baron, D., Haverstock, G. East, L.J. "Investigation of advanced signal processing analysis of laser-induced breakdown spectroscopy data for the discrimination of obsidian sources," *Appl. Optics*, **2012**, *51*, B65-B73.
8. Amick, A.W., Hoegg, E., Harrison, S., Houston, K.R., Hark, R.R., Reingold, I.D., Barth, D., Letzel, M.C., Kuck, D. "Site-specific hydrogen exchange and hydrogen transfer processes preceding the fragmentation of long-lived radical cations of ethyl dihydrocinnamate and related arylalkanoates", *Intl. J. Mass Spectr.*, **2012**, *316-318*, 206-215.
9. Harmon, R.S., Shughrue, K.M., Remus, J.J., Wise, M.A., East L.J., Hark, R.R. "Can the provenance of the conflict minerals columbite-tantalite be ascertained by laser-induced breakdown spectroscopy?," *Anal. Bioanal. Chem.*, **2011**, *400*, 3377-3382.
10. Clark, R. J. H., Hark, R.R., Salvadó, N., Butí, S., Pradell, T. "Spectroscopic study of mural paintings from the Church of Saint Eulàlia of Unha," *J. Raman Spectrosc.*, **2010**, *41*, 1128-1134.
11. Burgio, L., Clark, R. J. H., Hark, R.R. "Raman microscopy and x-ray fluorescence analysis of pigments on medieval and Renaissance Italian manuscript cuttings," *Proc. Natl Acad. Sci. USA*, **2010**, *107*, 5726-5731.
12. Burgio, L., Clark, R. J. H., Hark, R.R. "The Bourdichon Nativity: a masterpiece of light and colour," *V&A Conservation Journal*, **2010**, *58*, 36-38.
13. Burgio, L., Clark, R. J. H., Hark, R.R. "Spectroscopic investigations of modern pigments on purportedly medieval miniatures by the so-called 'Spanish Forger,'" *J. Raman Spectrosc.*, **2009**, *40*, 2031-2036.
14. Burgio, L., Clark, R. J. H., Hark, R.R., Rumsey, M. S., Zannini, C. "Spectroscopic investigations of Bourdichon miniatures: masterpieces of light and colour," *Appl. Spectrosc.*, **2009**, *63*, 611-620.
15. Tutar, A., Berkil, K., Hark, R. R., Çakmak, O., Balci, M. "Photobromination of 5-Methoxyindan and 5-Methoxyindanone: Preparation of Bromoindenones and Ready Access to 5-Bromo-3,10-dimethoxy-7H-benzo[c]fluoren-7-one," *Synthetic Commun.* **2008**, *38*, 1333-1345.
16. Hark, R. R.; Hauze, D. B.; Petrovskaja, O. G.; Joullié, M. M. "Synthesis of Novel Ninhydrin Analogs," *Can. J. Chem.* **2001**, *79*, 1632-1654.
17. Hark, R. R.; Hauze D. B.; Petrovskaja, O.; Joullié, M. M.; Jaouhari, R.; McComiskey, P. "Novel Approaches Toward the Synthesis of Ninhydrin Analogs," *Tetrahedron Lett.* **1994**, *35*, 7719-7722.
18. Cantu, A. A.; Leben, D. A.; Joullié, M. M.; Heffner, R. J.; Hark, R. R. "A Comparative Examination of Several Amino Acid Reagents for Visualizing Amino Acid (Glycine) on Paper," *J. Forensic Ident.* **1993**, *43*, 44-66.

19. Nicolaou, K. C.; McGarry, D. G.; Somers, P. K.; Kim, B. H.; Ogilvie, W. W.; Yiannikouros, G.; Prasad, C. V. C.; Veale, C. A.; Hark, R. R. "Synthesis of Medium-Sized Ring Ethers from Thionolactones. Applications to Polyether Synthesis," *J. Am. Chem. Soc.* **1990**, *112*, 6263.
20. Mulcahy, R. T.; Wustrow, D. J.; Hark, R. R.; Kende, A. S. "Enhancement of 1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosourea (CCNU) Toxicity by Acetohydroxamic Acid Analogs of 3-Nitropyrzole In Vitro," *Invest. New Drugs* **1987**, *5*, 281-287.
21. Mulcahy, R.T.; Wustrow, D.J.; Hark, R.R.; Kende, A.S. "Radiosensitization by Acetohydroxamic Acid Derivatives of 3-Nitropyrzole," *Radiat. Res.* **1986**, *105*, 296-306.

Book Chapters

1. Hark, R.R., Harmon, R.S. "Geochemical Fingerprinting Using LIBS," Chapter 12 in *Laser-induced Breakdown Spectroscopy: Fundamentals and Applications*, Musazzi, S., Perini, U. (Eds.), Springer-Verlag:Berlin, 2014.
2. Hark, R.R., East, L.J. "Forensic Applications of LIBS," Chapter 14 in *Laser-induced Breakdown Spectroscopy: Fundamentals and Applications*, Musazzi, S., Perini, U. (Eds.), Springer-Verlag:Berlin, 2014.

Conference Proceedings

1. Hark, R. R.; Hauze, D. B.; Petrovskaja, O.; Joullie, M. M. "Chemical Detection of Fingerprints. Synthesis of Arylated Ninhydrin Analogs," In: *Proceedings of the International Symposium on Fingerprint Detection and Identification*. Ne'urim, Israel: Hemed Press, 1995, 127-135.
2. Hauze, D. B.; Petrovskaja, O.; Joullie, M. M., Hark, R. R. "New Reagents for the Development of Fingerprints," In: *Proceedings of the International Symposium on Fingerprint Detection and Identification*. Ne'urim, Israel: Hemed Press, 1995, 119-123.

Related Publications

1. Lavelle, J "[Bodily Bookbinding, Chemistry for Mummies](#)," *Chemical & Engineering News*, October 26, 2015.
2. Meier, A. "[The Macabre Practice of Binding Books in Human Skin](#)," *Hyperallergic*, October 23, 2015.
3. Davis, S. "[The Quest to Discover the World's Books Bound in Human Skin](#)," *Mental Floss*, October 19, 2015.
4. Kim, M. "[At Death Salon, Real-World Forensic Investigations Trump TV's CSI](#)," *Philly Voice*, October 12, 2015.
5. L'Heureux, M. "[Analysis of the State of the Art: LIBS](#)," *Spectroscopy*, **2015**, *30* (6), 74-84.
6. "[Laser-Induced Breakdown Spectroscopy: A Closer Look at the Capabilities of LIBS, Part I](#)," *Spectroscopy*, **2014**, *29* (7), 34-37.
7. "[Laser-Induced Breakdown Spectroscopy: A Closer Look at the Capabilities of LIBS, Part II](#)," *Spectroscopy*, **2014**, *29* (11), 34-37.
8. Aurand, C.H. "[Fingerprinting Conflict Minerals](#)," *Chem. Eng. News*, **2012**, *90* (18), 36-37.
9. Biemiller, L. "[The Art of the Chemistry of Art](#)," *The Chronicle of Higher Education*, **2003**, *49* (33), A56.

HONORS AND AWARDS

2012 H. George Foster Endowed Chair in Chemistry

2010	Gamma Sigma Epsilon, national chemistry honorary
2007	Henry H. '57 and Joan R. Gibbel Award for Teaching Excellence
2004	Juniata College Outstanding Faculty Award,
2000	Marietta College Outstanding Faculty Award
2000	Omicron Delta Kappa, national leadership honorary
1998	Edward G. Harness Fellowship for Distinctive Teaching
1996	United States Secret Service, Forensic Services Division commendation

Grants and Fellowships

2017	South Mountain Partnership, research contract, \$6,608
2017	ChemImage, Inc., research contract, \$18,272
2017	SciAps, Inc., travel grants, \$2,208
2016	US Army Corps of Engineers, Cold Regions Research and Engineering Laboratory, research contract, \$3,503
2016	SciAps, Inc., travel grant, \$1,800
2016	JR Plumer Associates, LLC, consulting, \$1,500
2015	SciAps, Inc., travel grants, \$3,552
2015	JR Plumer Associates, LLC, research contract, \$1,758
2015	US Army Corps of Engineers, Cold Regions Research and Engineering Laboratory, research contract, \$2,400
2014	NSF Chemistry Collaborations, Workshops and Community of Scholars (cCWCS), support for 2 nd LIBS-URT workshop, \$3,221
2014	Quantel Laser North America, support for 2 nd LIBS-URT workshop, \$3,500
2014	Andor Technology, support for 2 nd LIBS-URT workshop, \$1,000
2013	Quantel Laser North America, support for 1 st LIBS-URT workshop, \$2,500
2013	Andor Technology, support for 1 st LIBS-URT workshop, \$1,000
2012	II-VI Foundation, equipment grant, \$10,000
2012	II-VI Foundation, research grant, \$19,690
2011–2014	"Methodologies and Protocols for Characterization of Geomaterials," research contract, Army Research Office, Terrestrial Research Program, \$30,000
2011	II-VI Foundation, research grant, \$35,521
2010	Spectroscopy Society of Pittsburgh College Equipment Grant, \$6,000
2010	II-VI Foundation, research grant, \$15,170
2010	Applied Spectra, Inc., RT100hp LIBS instrument grant, \$150,000
2008	Merck/AAAS Undergraduate Science Research Program Grant, \$7,500
2007–2010	A3 Technologies, LLC, research/consulting contract, \$323,994
2007	3M Corporation, consulting contract, \$1,500
2006	Stollberg Corporation, consulting contract, \$3,000
2004–2006	L'Oréal Corporation, research contract, \$142,500
2004	Merck/AAAS Undergraduate Science Research Program grant, \$7,500
2003	"Acquisition of an Analytical LV/HV Scanning Electron Microscope for Enhancement of Research and Training in the Geological, Environmental, Biological and Material Sciences," NSF MRI/RUI grant, \$300,000
2003	"Atomic Spectroscopy across the Chemistry Curriculum: Introduction of X-ray Fluorescence (XRF) and Laser-induced Breakdown Spectroscopy (LIBS) Instrumentation," Special Grant in the Chemical Sciences, Camille & Henry Dreyfus Foundation, \$30,000

- 1998 “Incorporating FT NMR into the Undergraduate Curriculum,” NSF CCLI grant, \$30,937
 1994 “Development of New Latent Fingerprint Reagents,” United States Secret Service research contract, \$20,000

Total Career External Funding: \$1,186,134

PRESENTATIONS (names of undergraduate coworkers underlined, presenting author starred)

2018

- *Hark, R.R. “Analysis of Art and Antiquities: Reflections of a Cultural Heritage Scientist,” Brigham Young University-Idaho, Rexburg, ID, January 9, 2018.

2017

- *Hark, R.R. “Geochemical Fingerprinting Using Laser-induced Breakdown Spectroscopy,” Department of Geology and Geophysics, Yale University, New Haven, CT, December 1, 2017.
 *Hark, R.R. “Science & Art Double Feature: Analysis of Cultural Heritage and Geochemical Fingerprinting Using Laser-induced Breakdown Spectroscopy,” Institute for the Preservation of Cultural Heritage, Yale University, New Haven, CT, September 20, 2017.
 Wise, M.A., *Hark, R.R., Harmon, R.S., Throckmorton, C.S., Collins, L.M., Somers, A.M. “Analysis of columbite-tantalite using handheld LIBS,” EMSLIBS 2017, 9th Euro-Mediterranean Symposium on LIBS, Pisa, Italy, June 11-16, 2017.
 Rankey, E.C., *Hark, R.R., Throckmorton, C.S., Harmon, R.S., Somers, A.M., Bompiani, K.E., Collins, L.M. “Analyzing carbonate muds by handheld LIBS,” EMSLIBS 2017, 9th Euro-Mediterranean Symposium on LIBS, Pisa, Italy, June 11-16, 2017.
 *Harmon, R.S., *Hark, R.R., Throckmorton, C.S., Gurney, J.J., Downey, A.H., Somers, A.M., Collins, L.M., “Handheld LIBS as a field tool for diamond exploration: Analysis of kimberlite minerals,” EMSLIBS 2017, 9th Euro-Mediterranean Symposium on LIBS, Pisa, Italy, June 11-16, 2017.

2016

- *Hark, R.R., Harmon, R.S., Collins, L.M., Throckmorton, C.S., Rankey, E.C. “Toward real-time geochemical analysis in the field: Provenance determination and correlation studies of carbonates using handheld LIBS,” IGC 2016, 35th International Geological Congress, Cape Town, South Africa, August 27-September 4, 2016.
 *Harmon, R.S., Hark, R.R., Wise, M.A., Collins, L.M., McGettigan, J.E., Throckmorton, C.S. “Handheld LIBS for precious mineral exploration: Prospecting for gems, conflict minerals, and diamond kimberlites,” IGC 2016, 35th International Geological Congress, Cape Town, South Africa, August 27-September 4, 2016.
 *Downey, A., Hark, R.R., Miller, A. Plumer, J. “Analysis of counterfeit currency, ammunition components, and gunshot residue: Forensic applications of a handheld laser-induced breakdown spectroscopy (LIBS) instrument,” ANAL 63, Abstract of Papers, 252nd American Chemical Society National Meeting, Philadelphia, PA, August 21-25, 2016.
 *Hark, R.R., Downey, A., Miller, A. Plumer, J. “Forensic and First Responder applications of a handheld laser-induced breakdown spectroscopy (LIBS) instrument,” Army Research Laboratory, Aberdeen Proving Grounds, Aberdeen, MD, August 16, 2016.
 *Hark, R.R. “Non-destructive analysis of pigments on cultural heritage objects,” MARM 2016, Abstract of Papers, 44th Middle Atlantic Regional Meeting, American Chemical Society, Riverdale, New York, June 9-12, 2016.

*Passannante, K.M., Hark, R.R., Streb, J.L., Campbell, E.F. "Imaging and spectroscopic analysis of portrait miniatures," ANAL 38, Abstract of Papers, 251th American Chemical Society National Meeting, San Diego, CA, March 13-17, 2016.

*Hark, R.R. "Analysis of pigments and other materials found in cultural heritage objects," Albright College, Reading, PA, February 1, 2016.

2015

*Hark, R.R., Miller, A., Plumer, J., Day, D. "First Responder and forensic applications of a handheld laser-induced breakdown spectroscopy instrument," Pacifichem—The International Chemical Congress of Pacific Basin Societies 2015, Honolulu, HI, December 15-20, 2015.

*Hark, R.R., Whitehouse, A. "Laser-induced breakdown spectroscopy for undergraduate chemistry research and teaching," Pacifichem—The International Chemical Congress of Pacific Basin Societies 2015, Honolulu, HI, December 15-20, 2015.

*Dhody, A.N., *Kirby, D., *Hark, R.R., *Rosenbloom, M. "Skin Deeper: Identifying & Analyzing the World's Books Bound in Human Skin" panel presentation, Death Salon 2015, Philadelphia, PA, October 5-6, 2015.

*Clausen, J.L., R. Hark, R., Bol'shakov, A., Plumer, J. "Analyzing Ice with LIBS," SciX 2015, Providence, RI, September 27-October 1, 2015.

*Hark, R.R., Day, D., Downey, A.H., Miller, A., Plumer J. "Evaluation of a handheld LIBS instrument for First Responder and forensic applications," SciX 2015, Providence, RI, September 27-October 1, 2015.

*Hark, R.R., Defnet, P., Wise, M., Harmon, R. "Classification and Geographic Origin of Garnets Using Laser-Induced Breakdown Spectroscopy (LIBS)," SciX 2015, Providence, RI, September 27-October 1, 2015.

*Kirby, D., Dhody, A.N., Lander, B., Hark, R.R. "You can't tell a book by its cover: Analytical adventures in anthropodermic bibliopegy," SciX 2015, Providence, RI, September 27-October 1, 2015.

*Brumbaugh, R., Taylor, R., Hark, R.R., Kuck, D., Ames' W., Schettler, P. "Synthesis of tetra(benzyloxy)benzenes for mass spectrometry studies," ORGN 148, Abstract of Papers, 249th American Chemical Society National Meeting, Denver, CO, March 22-26, 2015.

*Cueto, C., Hark, R.R. "Neat boron trifluoride etherates as reagents for efficient esterification of carboxylic acids and derivatives," ORGN 593, Abstract of Papers, 249th American Chemical Society National Meeting, Denver, CO, March 22-26, 2015.

*Defnet, P., Hark, R.R., Wise, M., Harmon, R. "Garnet classification and provenance using laser-induced breakdown spectroscopy (LIBS)," CHED 276, Abstract of Papers, 249th American Chemical Society National Meeting, Denver, CO, March 22-26, 2015.

2014

*Clausen, J., Bol'shakov, A., Gonzalez, J., Hark, R., Russo, R., Courville, Z., Osterberg, E. "Comparison of LIBS to ICP-MS for analysis of ice," SciX 2014, Reno, NV, September 28-October 3, 2014.

*Hark, R.R. "Laser-induced breakdown spectroscopy in undergraduate research and teaching," SciX 2014, Reno, NV, September 28-October 3, 2014.

Richter, C., *Hark, R.R., Steigen, L.A. Gregory, B.D. "Provenance determination of cumin spice using laser-induced breakdown spectroscopy (LIBS)," SciX 2014, Reno, NV, September 28-October 3, 2014.

*Cueto, C.J., Hark, R.R. "Insights into the mechanism of the base-catalyzed condensation of *o*-phthalaldehyde and malonic acid," Undergraduate Research Poster Symposium, The Pennsylvania State University, State College, PA, September 9, 2014.

- *Defnet, P.A., Hark, R.R., Harmon, R.S., Wise, M. "Garnet classification and provenance using laser-induced breakdown spectroscopy (LIBS)," Undergraduate Research Poster Symposium, The Pennsylvania State University, State College, PA, September 9, 2014.
- Clausen, J., Bol'shakov, A., Gonzalez, J., *Hark, R., Russo, R., Courville, Z., "Ice Core Analysis using Laser-Induced Breakdown Spectroscopy (LIBS)," 8th International Conference on Laser Induced Breakdown Spectroscopy (LIBS 2014), Beijing, China, September 8-12, 2014.
- Richter, C., *Hark, R.R., Steigen, L.A., Gregory, B.D. "Provenance determination of cumin spice using laser-induced breakdown spectroscopy (LIBS)," 8th International Conference on Laser Induced Breakdown Spectroscopy (LIBS 2014), Beijing, China, September 8-12, 2014.
- Wise, M., Defnet, P.A., *Hark, R.R. Harmon, R.S. "Garnet classification and provenance using laser-induced breakdown spectroscopy (LIBS)," 8th International Conference on Laser Induced Breakdown Spectroscopy (LIBS 2014), Beijing, China, September 8-12, 2014.
- *Kuck, D., Heitkamp, S., Sproß, J., Letzel, M.C., Wang, Y., Hark, R.R. "Sequential loss of $C_7H_7^{\bullet}$ radicals from the $[M + Na]^+$ adduct ions of di- and tribenzyloxybenzenes," 32nd Informal Meeting on Mass Spectrometry (IMMS), Balatonszarszo, Hungary, May 11-14, 2014.
- *Dellamotta, R., Hark, R.R. "Reactions of 2,3,9,10-tetrahydroindeno[5,4-*b*:4',5'-*d'*]thiophen-1,11-dione," [ORGN 718](#), Abstract of Papers, 247th American Chemical Society National Meeting, Dallas, TX, March 16-20, 2014.
- *Mauger, G.D., Hark, R.R. "Factors affecting the cyclization of dicarboxylic acids to form hydrindacene diones," [CHED 1261](#), Abstract of Papers, 247th American Chemical Society National Meeting, Dallas, TX, March 16-20, 2014.
- *Wang, Y., Heitkamp, S., Sproß, J., Kuck, D., Hark, R.R. "Synthesis and mass spectrometric study of deuterium labeled 1,2,4-trihydroxybenzene tribenzyl ether," [ANYL 85](#), Abstract of Papers, 247th American Chemical Society National Meeting, Dallas, TX, March 16-20, 2014.

2013

- *Hark, R.R. "A Decade of Laser-induced Breakdown Spectroscopy with Undergraduates," Laser-induced Breakdown Spectroscopy for Undergraduate Research and Teaching (LIBS-URT 2013), Huntingdon, PA, November 15-16, 2013.
- *Hark, R.R. "Spectroscopic analysis of pigments on works of art," Society for Applied Spectroscopy tour speaker,
University of Wisconsin-Milwaukee Student Section, Milwaukee, WI, September 27, 2013
Truman State University Student Section, Kirksville, MO, April 30, 2013
St. Louis Local Section, St. Louis, MO, April 29, 2013
Detroit Local Section, Detroit, MI, March 25, 2013
- *Cueto, C.J., Hark, R.R., "New insights on the mechanism of the formation of 1-indanone via the base-catalyzed condensation reaction of *o*-phthalaldehyde with malonic acid," [ORGN 650](#), Abstract of Papers, 245th American Chemical Society National Meeting, New Orleans, LA, April 7-11, 2013.
- *Parker, R.G., Hark, R.R., "Relative reactivity of the 1- and 2-positions of pyrogallol with benzyl bromide: Synthesis of differentially deuterated derivatives for mass spectrometric study," [ORGN 651](#), Abstract of Papers, 245th American Chemical Society National Meeting, New Orleans, LA, April 7-11, 2013.
- *Leckemby, B.D., Hark, R.R., Pelkey, N.W., Harmon, R.S. "Provenance determination of obsidian artifacts using laser-induced breakdown spectroscopy (LIBS)," [ANYL 128](#), Abstract of Papers, 245th American Chemical Society National Meeting, New Orleans, LA, April 7-11, 2013.
- *Defnet, P.A., Hark, R.R., Pelkey, N.W., Harmon, R.S. "Analysis of cassiterite ore concentrate using laser-induced breakdown spectroscopy (LIBS)," [ANYL 124](#), Abstract of Papers, 245th American Chemical Society National Meeting, New Orleans, LA, April 7-11, 2013.

*Dellamotta, R., Hark, R.R., "Synthesis and characterization of novel helical, bent, and linear dibenzothiophene dione derivatives," [CHED 1212](#), Abstract of Papers, 245th American Chemical Society National Meeting, New Orleans, LA, April 7-11, 2013.

2012

- *Hark, R.R. "Geochemical fingerprinting of 'conflict minerals' and archeological artifacts using laser-induced breakdown spectroscopy (LIBS)," American Chemical Society Upper Ohio Valley Section meeting, Marietta, OH, October 22, 2012.
- *Hark, R.R. "Spectroscopic analysis of works of art," Department of Chemistry, Department of Chemistry, Marietta College, Marietta, OH, October 22, 2012.
- *Harmon, R., Hark, R.R. "A generation of 'GeoLIBS' - Where did we start and how far have we come?," LIBS 2012, 7th International Conference on Plasma Spectroscopy and Applications, Luxor, Egypt, September 29-October 4, 2012.
- *Hark, R.R., Harmon, R. "Recent developments in geoscience applications of LIBS: Geochemical fingerprinting of columbite-tantalite, cassiterite and obsidian", LIBS 2012, 7th International Conference on Plasma Spectroscopy and Applications, Luxor, Egypt, September 29-October 4, 2012.
- *Hark, R.R. "Experiences with an "Organic First" premedical chemistry curriculum," [CHED 408](#), Abstract of Papers, 244th American Chemical Society National Meeting, Philadelphia, PA, August 19-23, 2012.
- *Hark, R.R. "Geochemical fingerprinting of 'conflict minerals' and archeological artifacts using laser-induced breakdown spectroscopy (LIBS)," U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory (CRREL), Hanover, NH, August 10, 2012.
- *Hark, R.R. "Biologically flavored 'Organic First': a chemistry curriculum for the 21st century" 22nd Biennial Conference on Chemical Education, The Pennsylvania State University, State College, PA, July 29-August 2, 2012.
- *Hark, R.R. "Perspectives on two decades of the 'Organic First' chemistry curriculum at Juniata College" 22nd Biennial Conference on Chemical Education, The Pennsylvania State University, State College, PA, July 29-August 2, 2012.
- *Hark, R.R. "Spectroscopic Analysis of Pigments on Works of Art" American Chemical Society Central Pennsylvania Section meeting, State College, PA, April 26, 2012.
- *Kuck, D., Barth, D, Letzel, M.C., Amick, A.W., Hoegg, E., Harrison, S., Houston, K.R., Hark, R.R., Reingold, I.D. "Hydrogen exchange and hydrogen transfer reactions preceding the fragmentation of long-lived radical cations of ethyl dihydrocinnamate and related arylalkanoates," Joint Conference of German Mass Spectrometry Society and Polish Mass Spectrometry Society, Poznan, Poland, March 4-7, 2012.
- Hark, R.R., *Harmon, R., Remus, J.J., East, L.J., Wise, M.A., Tansi, B.M., Shughrue, K.M., Dunsin, K.S., Liu, C. "Application of laser-induced breakdown spectroscopy (LIBS) as a tool to determine the origin of 'conflict minerals'," [EGU2012-12105](#), European Geosciences Union General Assembly 2012, Vienna Austria, April 22-27, 2012.
- Potter, I.K.*, Hark, R.R., Tansi, B.M., Hilferding, K., East, L.J., Remus, J.J., Harmon, R., Wise, M.A. "Determination of the provenance of cassiterite ore concentrates using laser-induced breakdown spectroscopy (LIBS)," [ANYL 38](#), Abstract of Papers, 243st American Chemical Society National Meeting, San Diego, CA, March 25-29, 2012.
- Tansi, B.M.*, Potter, I.K., East, L.J., Remus, J.J., Harmon, R., Wise, M.A., Hark, R.R. "Laser-induced breakdown spectroscopy (LIBS) for geochemical fingerprinting of columbite-tantalite sources ," [ANYL 40](#), Abstract of Papers, 243st American Chemical Society National Meeting, San Diego, CA, March 25-29, 2012.

2011

- *Hark, R.R., Shughrue, K.M., Tansi, B.M., Potter, I.K., Remus, J.J., Wise, M.A., East, L.J., Gonzalez, J., Liu, C., Harmon, R. “Geochemical fingerprinting of the conflict mineral columbite-tantalite using laser-induced breakdown spectroscopy (LIBS),” Invited talk at 38th Annual Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Reno, NV, October 2-7, 2011.
- Harmon, R., Remus, J.J., Bristol, S.K., Potter, I.K., *Hark, R.R., East, L.J. “Connecting obsidian artifacts with their sources using laser-induced breakdown spectroscopy (LIBS),” 38th Annual Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Reno, NV, October 2-7, 2011.
- *Hark, R.R. “Spectroscopic analysis of geomaterials and cultural heritage objects,” Department of Chemistry, University of Pennsylvania, Philadelphia, PA, September 26, 2011.
- *Harmon, R., Shughrue, K., Remus, J.J., Hark, R.R., Wise, M.A., East, L.J. “Laser-induced breakdown spectroscopy: a technique for the real-time analysis of conflict minerals in the field?,” 6th Euro-Mediterranean Symposium on Laser-induced Breakdown Spectroscopy (EMSLIBS), Izmir, Turkey, September 11-15, 2011.
- Shughrue, K., Dunsin, K.D., Wise, M.A., Remus, J.J., East, L.J., Gonzalez, J., Hark, R.R., *Harmon, R. “LIBS analysis of columbite-tantalite: a real-time technique for the analysis of conflict minerals in the field?,” 3rd North American Symposium on Laser-induced Breakdown Spectroscopy, Clearwater Beach, FL, July 18-20, 2011.
- *Harmon, R., Remus, J.J., Hark, R.R., East, L.J., Baron, D., Yohe, R. Haverstock, G. “Determining the source of obsidian artifact samples using laser-induced breakdown spectroscopy (LIBS),” 3rd North American Symposium on Laser-induced Breakdown Spectroscopy, Clearwater Beach, FL, July 18-20, 2011.
- *Shughrue, K., Hark, R.R. “Analysis of the 'conflict mineral' columbite-tantalite using laser-induced breakdown spectroscopy (LIBS),” Council of Undergraduate Research 15th Annual Posters on the Hill, Washington, DC, April 13, 2011.
- *Bristol, S.K., Hark, R.R., Harmon, R.S., Remus, J.J., East, L.J., “Analysis of historical rocks using laser-induced Breakdown Spectroscopy (LIBS),” [ANYL 249](#), Abstract of Papers, 241st American Chemical Society National Meeting, Anaheim, CA, March 27-31, 2011.
- *Kress, A.M., East, L.J., Hark, R.R., Gonzalez, J., “Analysis of silver coins by laser-induced breakdown spectroscopy (LIBS) and laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS),” [ANYL 238](#), Abstract of Papers, 241st American Chemical Society National Meeting, Anaheim, CA, March 27-31, 2011.
- *Shughrue, K., Hark, R.R., Remus, J.J., Harmon, R., Wise, M.A., East, L.J., Gonzalez, J., Oropeza, D.D. “Analysis of the 'conflict mineral' columbite-tantalite using laser-induced breakdown spectroscopy (LIBS) and laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS),” [ANYL 60](#), Abstract of Papers, 241st American Chemical Society National Meeting, Anaheim, CA, March 27-31, 2011.
- *Hoegg, E.D., Harrison, S.A., Amick, A.W., Houston, K.R., Hark, R.R., Kuck, D. “Unusual rearrangement of ethyl dihydrocinnamate in electron impact mass spectrometry,” [CHED 1029](#), Abstract of Papers, 241st American Chemical Society National Meeting, Anaheim, CA, March 27-31, 2011.
- *Bristol, S.K., Harmon, R.S., East, L.J., Hark, R.R., Baron, D. “Determining the origin of obsidian samples using laser-induced breakdown spectroscopy (LIBS),” [Paper No. 21-3](#), Geological Society of America, Northeastern (46th Annual) and North-Central (45th Annual) Joint Meeting, Pittsburgh, PA, March 20-22, 2011.

2010

- *Hark, R.R., *Miller, A.L., East, L.J. “Analysis of thermite mixtures using laser-induced breakdown spectroscopy,” Pacifichem 2010, Honolulu, HI, December 15-20, 2010.
- *Hark, R.R. “Laser-based analytical technologies for First Responders,” Invited speaker at *Lasers:*

Advancing Security, Health and Justice briefing co-sponsored by the Optical Society of America and American Chemical Society *Science and the Congress Project*, Washington, DC, November 30, 2010.

- Shughrue, K., Wise, M.A., Remus, J.J., *Harmon, R., Hark, R.R., “Provenance determination of conflict minerals by laser-induced breakdown spectroscopy: the example of columbite-tantalite,” GSA Annual Meeting, Denver, CO, October 31-November 3, 2010
- *Shughrue, K., Hilferding, K., Hark, R.R., Remus, J.J., Harmon, R., Wise, M.A., East, L.J., Oropeza, D.D., “LIBS analysis of conflict minerals: the example of columbite-tantalite,” LIBS 2010, 6th International Conference on Plasma Spectroscopy and Applications, Memphis, TN, September 13-17, 2010.
- *Kress, A.M., East, L.J., Hark, R.R., Gonzalez, J., “Analysis of silver coins by laser-induced breakdown spectroscopy (LIBS),” LIBS 2010, 6th International Conference on Plasma Spectroscopy and Applications, Memphis, TN, September 13-17, 2010.
- *East, L.J., Hark, R.R., Hilferding, K., Trejos, T., Almirall, J., “Analysis of paper samples by two identical-model commercial laser-induced breakdown spectroscopy (LIBS) instruments,” LIBS 2010, 6th International Conference on Plasma Spectroscopy and Applications, Memphis, TN, September 13-17, 2010.
- *Hark, R.R., Clark, R. J. H., “Raman microscopy of diverse samples of lapis lazuli at multiple excitation wavelengths,” 22nd International Conference on Raman Spectroscopy (ICORS XXII), Boston, MA, August 8-13, 2010.
- *Shughrue, K., Hilferding, K., Hark, R.R., Remus, J.J., Harmon, R., Wise, M.A., East, L.J., Gonzalez, J., Oropeza, D.D., “Analysis of coal and columbite-tantalite using laser-induced breakdown spectroscopy (LIBS),” 2nd Annual Landmark Conference Summer Research Symposium, Juniata College, Huntingdon, PA, July 21, 2010.
- *Hilferding, K., Hark, R.R., East, L.J., “LIBS Limit of Detection Analysis,” 2nd Annual Landmark Conference Summer Research Symposium, Juniata College, Huntingdon, PA, July 21, 2010.
- *Lagrange, B., Hark, R.R., “Synthesis and characterization of helical, bent and linear dibenzothiophene diones as precursors for a chiral ninhydrin analog,” 2nd Annual Landmark Conference Summer Research Symposium, Juniata College, Huntingdon, PA, July 21, 2010.
- *Milbrat, A., Hark, R.R., “Preparation of bis-diazomethylketones as chelate ligands,” 2nd Annual Landmark Conference Summer Research Symposium, Juniata College, Huntingdon, PA, July 21, 2010.
- *Kress, A. M., Hark, R. R., “Synthesis of 1-indanone via the base-catalyzed condensation reaction of *o*-phthalaldehyde with malonic acid,” [ORGN-1162](#), Abstract of Papers, 239th American Chemical Society National Meeting, San Francisco, CA, March 21-25, 2010.
- *Kress, A.M., Beiswenger, K.M., Hark, R.R., Miller, A.L., “Preliminary evaluation of portable and standoff laser-induced breakdown spectroscopy (LIBS) units for the identification of hazardous materials by first responders,” [ANYL-96](#), Abstract of Papers, 239th American Chemical Society National Meeting, San Francisco, CA, March 21-25, 2010.

2009

- East, L.J., *Wong, D.M., Beiswenger, K.M., Kress, A.M., Hark, R.R., Bolshakov, A.A., “Field and laboratory studies of CBRNE detection using standoff laser-induced breakdown spectroscopy,” Department of Homeland Security Explosives Detection Workshop, Kingston, RI, October 8-9, 2009.
- *Hark, R.R., Miller, A.L., Beiswenger, K.M., Kress, A.M., “Field and laboratory studies of Evaluation of Laser-induced Breakdown Spectroscopy (LIBS) Instruments for First Responder Applications,” 5th Euro-Mediterranean Symposium on Laser-induced Breakdown Spectroscopy (EMSLIBS), Tivoli Terme, Italy, September 28 – October 1, 2009.

- Clark, R. J. H., Hark, R.R., *Salvadó, N., Butí, S., Pradell, T. "Spectroscopic study of mural paintings from the Church of Saint Eulàlia of Unha," 5th International Congress on the Application of Raman Spectroscopy in Art and Archaeology, Bilbao, Spain, September 14-18, 2009.
- *Burgio, L., Clark, R. J. H., Evans, M., Hark, R.R. "Identification of pigments in works by Gerolamo da Cremona, Franco de' Russi, and Bartolomeo Sanvito: a survey of medieval and Renaissance Italian manuscript cuttings by Raman spectroscopy," 5th International Congress on the Application of Raman Spectroscopy in Art and Archaeology, Bilbao, Spain, September 14-18, 2009.
- *Hark, R.R., Burgio, L., Clark, R. J. H. "Spectroscopic investigation of pigments on fake and authentic medieval miniatures," [ANYL-377](#), 238th American Chemical Society National Meeting, Washington, DC, August 16-20, 2009.
- *Connolly, K.M., Boyle, M.D., Hark, R.R. "Synthesis of IdeS Enzyme Inhibitor Z-LVG-CHN₂," 1st Annual Landmark Conference Summer Research Symposium, Susquehanna University, Selinsgrove, PA, July 22, 2009.
- *Kerlfeld, C., Hark, R.R. "Synthesis of Polymers containing Ninhydrin and 1,2-Indandione Groups," 1st Annual Landmark Conference Summer Research Symposium, Susquehanna University, Selinsgrove, PA, July 22, 2009.
- *Beiswenger, K.M., *Kress, A.M., Hark, R.R. "Application of a Laser-induced Breakdown Spectroscopy (LIBS) Standoff Unit for the Identification of Chemical, Biological, Radiological, Nuclear, or Explosive (CBRNE) Materials," 1st Annual Landmark Conference Summer Research Symposium, Susquehanna University, Selinsgrove, PA, July 22, 2009.
- *Kress, A.M., Hark, R.R. "A Study of the Base-catalyzed Condensation Reaction of *o*-Phthaldialdehyde with Malonic Acid," 1st Annual Landmark Conference Summer Research Symposium, Susquehanna University, Selinsgrove, PA, July 22, 2009.
- *Hark, R.R. "Archeological Puzzles and Miniature Treasures," American Chemical Society, Syracuse Section meeting, Syracuse University, Syracuse, NY, July 20, 2009.
- Gottfried, J.L., Harmon, R.S., *Hark, R.R., Wörner, G., Harpp, K. "Discrimination of Historical Volcanic Rocks Using Laser-induced Breakdown Spectroscopy (LIBS)," NASLIBS 2009, 2nd North American Symposium on Laser-induced Breakdown Spectroscopy, New Orleans, LA, July 13-15, 2009.
- *East, L.J., Hark, R.R., Liu, C. "Discrimination of Ink Samples Using Laser-induced Breakdown Spectroscopy (LIBS)," NASLIBS 2009, 2nd North American Symposium on Laser-induced Breakdown Spectroscopy, New Orleans, LA, July 13-15, 2009.
- *Hark, R.R. "Raman Microscopy of Pigments: Archeological Puzzles and Miniature Treasures," 2009 Tripartite Symposium, Chemistry in Art and Archeology, University of Pittsburgh, May 6, 2009.
- *Albaugh, D.M., *Machamer, N.K., Hark, R. R., "Analysis of ballpoint pen inks using laser-induced breakdown spectroscopy," [ANYL-047](#), Abstract of Papers, 237th American Chemical Society National Meeting, Salt Lake City, UT, March 22-26, 2009.
- *Oliveri, A.F., Hark, R. R., "SEM/EDX analysis of pigmentation found on Neolithic bone fragments," [ANYL-127](#), Abstract of Papers, 237th American Chemical Society National Meeting, Salt Lake City, UT, March 22-26, 2009.

2008

- Gottfried, J.L., *Harmon, R.S., Hark, R.R., DeLucia, F.C., Miziolek, A.W. "Analysis and Discrimination of Volcanic Rocks by Benchtop and Standoff LIBS," 2008 Joint Meeting of The Geological Society of America, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, Gulf Coast Association of Geological Societies with the Gulf Coast Section of SEPM, Houston, TX, October 5-9, 2008.
- Miller, A.L., *Hark, R.R. "Application of Laser-induced Breakdown Spectroscopy for the Effective Management of Hazardous Materials Incidents," LIBS 2008, 5th International Conference on Plasma Spectroscopy and Applications, Berlin, Germany, September 22-25, 2008.
- Gottfried, J.L., Harmon, R.S., *Hark, R.R., DeLucia, F.C., Miziolek, A.W.

“Classification and Discrimination of Volcanic Rocks by Benchtop and Standoff Laser-induced Breakdown Spectroscopy (LIBS),” LIBS 2008, 5th International Conference on Plasma Spectroscopy and Applications, Berlin, Germany, September 22-25, 2008.

*Machamer, N.K., Hark, R. R., “Study of the base-catalyzed condensation reaction of *o*-phthaldialdehyde with malonic acid,” [ORGN-105](#), Abstract of Papers, 235th American Chemical Society National Meeting, New Orleans, LA, April 6-10, 2008.

*Hark, R.R., “Adventures in Science & Art,” Leighton Buzzard and District Archaeological and Historical Society, Leighton Buzzard, Bedfordshire, England, April 9, 2008.

2007

*Hark, R.R., “Adventures in Chemistry & Art,” Fachhochschule Münster, University of Applied Sciences, Burgsteinfurt, Germany, May 30, 2007.

*Hark, R.R., “Forensic Research Part I: History and Chemistry of Fingerprint Visualization Reagents,” Fachhochschule Münster, University of Applied Sciences, Burgsteinfurt, Germany, May 29, 2007.

*Hark, R.R., “Forensic Research Part II: The Use of Laser-induced Breakdown Spectroscopy (LIBS) for Elemental Analysis of Evidence,” Fachhochschule Münster, University of Applied Sciences, Burgsteinfurt, Germany, May 29, 2007.

*Tutar, A., Ünlü, C. S., Erenler, R., Hark, R. R., Balci, M., “Bromination of Benz[f]indanone: The First and Quantitative Synthesis of 2,3-Dibromobenz[f]indenone,” International Conference on Organic Chemistry, Erzurum, Turkey, June 5-9, 2007.

*Hark, R.R., “Forensic Research: History and Chemistry of Fingerprint Visualization Reagents and The Use of Laser-induced Breakdown Spectroscopy (LIBS) for Elemental Analysis of Evidence,” Moravian College, Bethlehem, PA, April 4, 2007.

*Bogusz, B., Hark, R.R., “Synthesis and Reactions of Isomeric Diones Prepared from Dibenzothiophene,” [CHED-693](#), Abstract of Papers, 233rd American Chemical Society National Meeting, Chicago, IL, March 25-29, 2007.

*Weeden, J. A., Chisholm, J. D., Hark, R.R., “Phosphine-catalyzed Henry Reactions,” [CHED-637](#), Abstract of Papers, 233rd American Chemical Society National Meeting, Chicago, IL, March 25-29, 2007.

2006

*Hark, R. R., “Forensic Applications of LIBS: Challenges and Opportunities,” Workshop on Security Application of LIBS, LIBS 2006, 4th International Conference on Plasma Spectroscopy and Applications, Montréal, Canada, September 4, 2006.

*Hark, R.R., East, L.J., Eger, C.G., “Analysis of Ballpoint Pen Inks Using Laser-induced Breakdown Spectroscopy (LIBS),” LIBS 2006, 4th International Conference on Plasma Spectroscopy and Applications, Montréal, Canada, September 5-8, 2006.

*Hark, R. R., “History and Current Research on the Development of Fingerprint Visualization Reagents,” 235, Abstracts, 38th Middle Atlantic Regional Meeting of the American Chemical Society, Hershey, PA, June 4-7, 2006.

*Hark, R. R., “Laser-induced Breakdown Spectroscopy (LIBS) in the Undergraduate Curriculum,” 25, Abstracts, 38th Middle Atlantic Regional Meeting of the American Chemical Society, Hershey, PA, June 4-7, 2006.

*Carroll, W. D., Shertz, C. A., Boyle, M. D., Hark, R. R., Reingold, I. D., Craddock, L., Geysen, H. M., Gineste, C., “Synthesis and Evaluation of Peptide Libraries for Inhibitory Activity Against the Streptococcal Enzyme IdeS,” [CHED-510](#), Abstract of Papers, 231th American Chemical Society National Meeting, Atlanta, GA, March 26-30, 2006.

*George, K., Schettler, P.D. Jr., Hark, R. R., “Development of Undergraduate Forensic Science Laboratory Experiments: Application of Gas Chromatography/Mass Spectrometry in Arson

- Investigation and Drug Identification,” [CHED-258](#), Abstract of Papers, 231th American Chemical Society National Meeting, Atlanta, GA, March 26-30, 2006.
- *[Houck, J.D.](#), [Hark, R.R.](#), “Synthesis of Triclosan Analogs,” [CHED-1028](#), Abstract of Papers, 231th American Chemical Society National Meeting, Atlanta, GA, March 26-30, 2006.
- *[Kauffman, M.C.](#), [Hark, R. R.](#), “Synthesis of Novel Helical Dibenzothiophene Derivatives,” [CHED-537](#), Abstract of Papers, 231th American Chemical Society National Meeting, Atlanta, GA, March 26-30, 2006.
- *[Santangelo, R. M.](#), [Hark, R.R.](#), “Synthesis of *as*-Indacene-1,2,7,8 (3*H*, 6*H*)-tetraone as a Potential Latent Fingerprint Visualization Reagent,” [CHED-521](#), Abstract of Papers, 231th American Chemical Society National Meeting, Atlanta, GA, March 26-30, 2006.
- *[Hark, R.R.](#), “Forensic Applications of Laser-induced Breakdown Spectroscopy (LIBS),” Invited speaker for 21st Century LIBS: Addressing Critical Applications in Analytical Science Symposium, 57th Annual Pittsburgh Conference, Orlando, FL, March 12-17, 2006.

Pre- 2006

- *[Shertz, C.A.](#), [Boyle, M.D.](#), [Carroll, W.D.](#), [Hark, R.R.](#), [Hess, J.L.](#), [Gineste, C.](#), [Geysen, H.M.](#), ” Investigation of inhibitory potential of peptides on the Streptococcal enzyme IdeS,” Annual Biomedical Research Conference for Minority Students (ABRCMS), Atlanta, GA, November 2-5, 2005.
- *[Wolbach, J. P.](#), [Hark, R. R.](#), [Longenecker, J. G.](#), [Schettler, P. D., Jr.](#), [Strobl, J.](#), “Modeling of enoyl reductase inhibition by triclosan analogs,” [COMP-287](#), Abstract of Papers, 230th American Chemical Society National Meeting, Washington D.C., August 28-September 1, 2005.
- *[Heckman, A. M.](#), [Zimmerman, E. A.](#), [Hark, R. R.](#), “Qualitative Comparison of Laser-induced Breakdown Spectroscopy (LIBS) and Scanning Electron Microscopy for the Analysis of Automobile Paint Samples,” Northeastern Association of Criminal Justice Sciences Annual Meeting, Bristol, RI, June 2-5, 2005.
- *[McMinn, S. E.](#), [Hark, R. R.](#), “Synthesis of Novel Helical Dibenzothiophene Derivatives,” 19th National Conference on Undergraduate Research (NCUR), Lexington, VA, April 21-23, 2005.
- *[Condon, L. J.](#), [Hark, R. R.](#), “Analysis of Inks and Pigments by Laser-induced Breakdown Spectroscopy (LIBS),” [CHED-282](#), Abstract of Papers, 229th American Chemical Society National Meeting, San Diego, CA, March 13-17, 2005.
- *[Longenecker, J. G.](#), [Schettler, P. D., Jr.](#), [Hark, R. R.](#), [Wolbach, J. P.](#), “Modeling of triclosan analogs for enoyl reductase inhibition,” [COMP-213](#), Abstract of Papers, 229th American Chemical Society National Meeting, San Diego, CA, March 13-17, 2005.
- *[Santangelo, R. M.](#), [Hark, R. R.](#), “Synthesis of 6-Aryl-1,2-indandiones as Potential Latent Fingerprint Visualization Reagents,” [CHED-522](#), Abstract of Papers, 229th American Chemical Society National Meeting, San Diego, CA, March 13-17, 2005.
- *[Hark, R. R.](#) “Laser-induced Breakdown Spectroscopy, a New Tool for Teaching and Research at Juniata College,” MAALACT 2004, 28th Middle Atlantic Associate of Liberal Arts Chemistry Teachers Meeting, Huntingdon, PA, October 22-23, 2004.
- *[Hark, R. R.](#), [Condon, L. J.](#), [Wilkins, J. R.](#) “Incorporating Laser-induced Breakdown Spectroscopy into the Undergraduate Curriculum,” LIBS 2004, 3rd International Conference on Plasma Spectroscopy and Applications, Torremolinos (Málaga), Spain, September 28–October 1, 2004.
- *[Hark, R. R.](#), [Wilkins, J. R.](#) “Analysis of Counterfeit Currency by Laser-induced Breakdown Spectroscopy (LIBS),” Workshop on Security Application of LIBS, LIBS 2004, 3rd International Conference on Plasma Spectroscopy and Applications, Torremolinos (Málaga), Spain, September 27–28, 2004.
- *[Hill, P.](#), *[Hark, R. R.](#), “Research Chemistry and Art Workshops: Designed to Energize Both Faculty and Students, Part 1,” [CHED-275](#), Abstract of Papers, 228th American Chemical Society National Meeting, Philadelphia, PA, August 22–26, 2004.

- *Hark, R. R., *Hill, P. "Research Chemistry and Art Workshops: Designed to Energize Both Faculty and Students, Part 2," [CHED-276](#), Abstract of Papers, 228th American Chemical Society National Meeting, Philadelphia, PA, August 22–26, 2004.
- *Hill, P., *Hark, R. R., "Turning Them on to Chemistry and Art: Two Perspectives on a Successful Workshop," 18th Biennial Conference on Chemical Education, University of Iowa, Ames, IA, July 18–22, 2004.
- *Hark, R. R., *Hill, P. "Research Opportunities at the Interface of Science and Art," Council of Undergraduate Research 10th National Conference, University of Wisconsin-LaCrosse, LaCrosse, WI, June 23–26, 2004.
- *Hark, R. R., "Undergraduate Research Projects Utilizing Laser-induced Breakdown Spectroscopy (LIBS)," Council of Undergraduate Research 10th National Conference, University of Wisconsin-LaCrosse, LaCrosse, WI, June 23–26, 2004.
- *Spiese, C. E., *Loth, M. A., Fisher, T. L., Hark, R. R., Martin, P. J. S. "Detection of Heavy Metals in Acid Mine Drainage by Laser-induced Breakdown Spectroscopy," Council on Undergraduate Research, Undergraduate Research Posters on the Hill, Washington DC, April 20, 2004.
- *Allen, K., Hark, R. R., Reingold, I. D. "Synthesis of Cyclic Ketoesters Using Sequential Michael Addition," [CHED-971](#), Abstract of Papers, 227th American Chemical Society National Meeting, Anaheim, CA, March 28–April 1, 2004.
- *Gibney, H. M., Hark, R. R., "Isolation of Eucalyptol (1,8-Cineole) from Eucalyptus Leaves via Steam Distillation: An Undergraduate Organic Chemistry Experiment," [CHED-776](#), Abstract of Papers, 227th American Chemical Society National Meeting, Anaheim, CA, March 28–April 1, 2004.
- *Gibney, H. M., Hazard, M. A., Hark, R. R., "Synthesis of Peptidyl Diazomethyl Ketones as Antibacterial Peptide Inhibitors," [CHED-897](#), Abstract of Papers, 227th American Chemical Society National Meeting, Anaheim, CA, March 28–April 1, 2004.
- *McMinn, S. E., Hark, R. R., "Synthesis of Bis-diketones as Potential Latent Fingerprint Visualization Reagents," [CHED-890](#), Abstract of Papers, 227th American Chemical Society National Meeting, Anaheim, CA, March 28–April 1, 2004.
- *Skoda, E. M., Hark, R. R., "Synthesis and Evaluation of Triclosan Analogs as Antibacterial Agents," [MEDI-79](#), Abstract of Papers, 227th American Chemical Society National Meeting, Anaheim, CA, March 28–April 1, 2004.
- *Spiese, C. E., Loth, M. A., Fisher, T. L., Hark, R. R., "Detection of Heavy Metals by Laser-Induced Breakdown Spectroscopy after Deposition onto Silica," [ANYL-45](#), Abstract of Papers, 227th American Chemical Society National Meeting, Anaheim, CA, March 28–April 1, 2004.
- *Spiese, C. E., Loth, M. A., Martin, P. J. S., Hark, R. R. "Characterization of Heavy Metal Content in Acid Mine Drainage Using Laser-induced Breakdown Spectroscopy," 7th Annual Environmental Chemistry Student Symposium, Pennsylvania State University, March 19–20, 2004.
- *Spiese, C. E., Fisher, T. L., Hark, R. R., "Detection of Heavy Metals by Laser-induced Breakdown Spectroscopy After Deposition onto Silica," Laser Applications for Chemical and Environmental Analysis, Annapolis, MD February 9–11, 2004.
- *Hill, P., *Hark, R. R., "Turning Them On to Art and Chemistry: Two Perspectives on a Successful Workshop," 265, Abstracts, 55th Southeast Regional Meeting of the American Chemical Society, Atlanta, GA, November 16–19, 2003.
- *McMinn, S. E., Hark, R. R., "Synthesis of Novel Helical Dibenzothiophene Derivatives," Southeastern Regional Meeting of the American Chemical Society, Atlanta, GA, November 17–20, 2003.
- *Hark, R. R., "The Chemistry of Art," American Chemical Society, Mid-Hudson Section meeting, Bard College, Annandale-on-Hudson, NY, November 12, 2003.
- *Spiese, C. E., Fisher, T. L., Hark, R. R., "Use of Sol-gels as Solid Matrices for the Analysis of Heavy Metal Content in Aqueous Solutions by Laser-induced Breakdown Spectroscopy," 288, Abstracts, 35th Central Regional Meeting of the American Chemical Society, Pittsburgh, PA, October 19–22, 2003.

- *Hark, R. R., "The Chemistry of Art: Teaching Science in a Liberal Arts Context," 12, Abstracts, 35th Central Regional Meeting of the American Chemical Society, Pittsburgh, PA, October 19-22, 2003.
- *Hark, R. R., "Advances in Fingerprint Development Technology," St. Francis University, Loretto, PA, February 10, 2003.
- *Hark, R. R., "Innovative Chemistry Curricula that Support Undergraduate Research," Council of Undergraduate Research 9th National Conference, Connecticut College, New London, CT June 19-22, 2002.
- Amick, A. A., Boyer, J. F., Saylor, S. C., Vrabel, M. A., Youngster, S. B., Kuck, D. *Hark, R. R., "The Unusual Rearrangement of Ethyl Dihydrocinnamate in Electron Mass Spectrometry," Council of Undergraduate Research 9th National Conference, Connecticut College, New London, CT June 19-22, 2002.
- Amick, A. A., Boyer, J. F., Saylor, S. C., Vrabel, M. A., Youngster, S. B., Kuck, D. *Hark, R. R., "The Unusual Rearrangement of Ethyl Dihydrocinnamate in Electron Mass Spectrometry," National Conference on Undergraduate Research (NCUR), University of Wisconsin- Whitewater, Whitewater, WI, April 25-27, 2002.
- *Gibney, H. G. Hark, R. R., "Isolation of Eucalyptol (1,8-Cineole) from Eucalyptus Leaves via Steam Distillation," National Conference on Undergraduate Research (NCUR), University of Wisconsin- Whitewater, Whitewater, WI, April 25-27, 2002.
- *Sauers, A. L. Hark, R. R., "Synthesis of 6-Aryl-1,2-indanediones and Their Evaluation as Latent Fingerprint Reagents," National Conference on Undergraduate Research (NCUR), University of Wisconsin- Whitewater, Whitewater, WI, April 25-27, 2002.
- *Vrabel, M. A. Hark, R. R., "Synthesis of Spiroaziridines: Investigation of the Fluorophore Derived from the Reaction of 1,2-Indanedione and Amino Acids," National Conference on Undergraduate Research (NCUR), University of Wisconsin- Whitewater, Whitewater, WI, April 25-27, 2002.
- *Hark, R. R. "The Chemistry of Art" American Chemical Society, Upper Ohio Valley Section meeting, Marietta College, Marietta, OH, April 2001.
- *Hark, R. R. "Chemistry and Art" School of Science and Health, Philadelphia University, Philadelphia, PA, November 28, 2000.
- *Cunningham, G. Hark, R. R. "Synthesis of Triclosan Analogs and Evaluation of Their Antibacterial Properties," National Conference on Undergraduate Research (NCUR), University of Montana, Missoula, MT, April 27-29, 2000.
- *Nalepka, J. Hark, R. R. "Modeling Studies, Synthesis and Forensic Applications of Substituted 1,2-Indandiones," National Conference on Undergraduate Research (NCUR), Salisbury State University, Salisbury, MD, April 22-24, 1998.
- *Egolf, D. S.; Hark, R. R.; Walker, R. G.; Freeman, D. C.; Tschunko, A. H. "GC-MS in Undergraduate Laboratories and Student Research," 15th Biennial Conference on Chemical Education, University of Waterloo, Waterloo, Ontario, Canada, August 9-13, 1998.
- *Hark, R. R. "Forensic Applications of Ninhydrin Analogs" American Chemical Society Upper Ohio Valley Section meeting, Marietta, OH, May 1995.
- *Hark, R. R. "Ninhydrins: Synthesis and Applications in Fingerprint Identification," Philadelphia College of Textiles and Science, Philadelphia, PA, March 1995.
- Joullié, M. M.; *Hark, R. R.; Hauze, D. B. "New Reagents for the Development of Fingerprints," National Institute of Justice Program Meeting, National Meeting of the American Academy of Forensic Science, Seattle, WA, February 1995.
- *Hark, R. R.; Joullié, M. M. "A New Type of Latent Fingerprint Reagent: 5-Arylninhydrin Analogs," National Institute of Justice Program Meeting, National Meeting of the American Academy of Forensic Science, San Antonio, TX, February 1994.
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PROFESSIONAL AFFILIATIONS

American Academy of Forensic Science
American Chemical Society, Organic and Analytical Chemistry Divisions
Council on Undergraduate Research
Huntingdon County (Pennsylvania) Emergency Management Agency, Hazardous Materials Specialist
International Association for Identification
North American Society for Laser Induced Breakdown Spectroscopy (Treasurer, 2018-2010)
Optical Society of America
Society for Applied Spectroscopy

TEACHING EXPERIENCE

Advanced Organic Chemistry
Analytical Chemistry
Chemical Synthesis
Chemistry of Art
Forensic Science
Integrated Chemistry: Organic
Integrated Chemistry: Organic Laboratory

Integrated Chemistry: Principles
Integrated Chemistry: Principles Laboratory
Organic Chemical Concepts
Organic Chemistry Laboratory
Organic Reactions
Synthesis & Spectroscopy
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