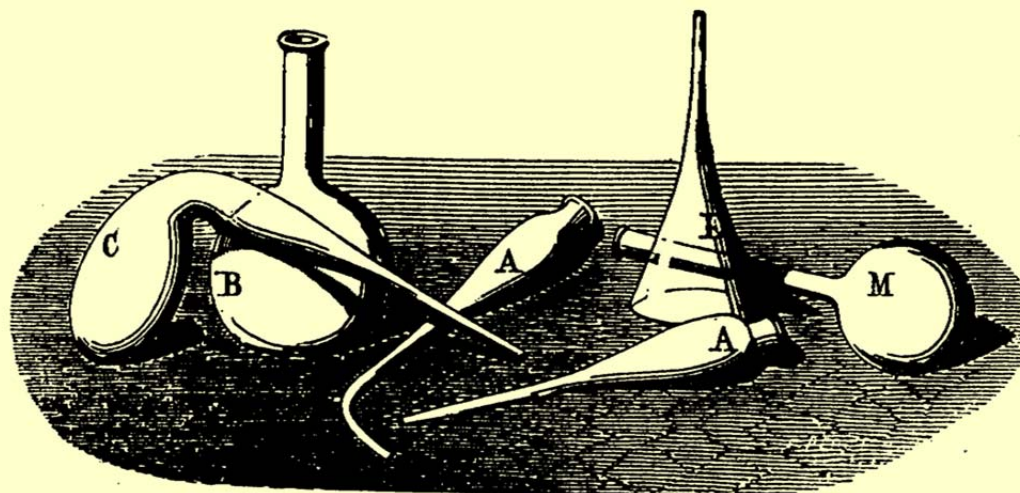




American Chemical Society
**DIVISION OF THE
HISTORY OF CHEMISTRY**



NEWSLETTER, PROGRAM AND ABSTRACTS

245th ACS National Meeting
New Orleans, LA
April 7-11, 2013

S. C. Rasmussen, Program Chair
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Mission Statement

The Division of the History of Chemistry (**HIST** - <http://www.scs.illinois.edu/~mainzv/HIST/index.php>) of the American Chemical Society (ACS) seeks to advance knowledge and appreciation of the history of the chemical sciences among chemists, students, historians of science, and the broader public by

- Encouraging research and scholarship in history of the chemical sciences;
- Providing a welcoming environment for the discussion of history of chemistry in a variety of venues, particularly in symposia at national ACS meetings;
- Serving as a resource for chemical scientists in general, and members of the ACS in particular, who seek to understand the roots of their discipline, sub-discipline, or interdisciplinary subject;
- Recognizing major achievements from the past in the chemical sciences and the individuals who made those achievements;
- Publishing a scholarly journal in history of chemistry;
- Interacting with other organizations interested in the history of science; and
- Adding value to the ACS by helping it achieve its vision and missions.

Message from Ned Heindel, HIST Division Chair

Just how far is the horizon? Well, according to ACS HQ the time horizon for chemistry programming is three years ahead. Plans are already underway for the traditional five-year gathering of the chemical societies of the Pacific Rim, commonly called "Pacifichem" or "PacChem." The meeting will be held 15-20 December 2015 in Honolulu, Hawaii. The informational website has just been opened, <http://www.pacifichem.org/general-information/>

Chemical Societies of the Pacific Rim are steadily registering their co-sponsorships and as of January 2013 the chemical societies of the following nations had signed up: Brunei, China, Indonesia, Japan, Malaysia, Papua New Guinea, Philippines, Sri-Lanka, Taiwan, Thailand and the United States. Pacifichem-2015 has requested that ACS Divisions submit plans for any internationally-based symposia they intend to develop for Honolulu before 1 April 2013. These early submissions have been promised financial help from ACS in implementing their programming.

The HIST Executive Committee has selected a provisional title of "*Evolution of the Chemical Community in the Countries of the Pacific Rim.*" An operational abstract to describe what the Division has in mind is:

The doctorate in chemistry is generally regarded to have come into existence in early 19th century Germany but the model soon spread around the world. In early years it was common for international chemistry scholars to train at the ranking German universities and then return to their home countries to seed a local version of the doctorate. The availability of higher education in chemistry in US, Canada, and Asia also stimulated national chemical industries and governmental research institutes in each nation which have advanced the health and comfort of their citizenry. Each country's story is unique. Different pioneering professors became local heroes to the chemists of today. This symposium brings forth the roots of the professional chemistry communities (academic, industrial, and governmental) in the countries of the Pacific Rim.

We have contacted HIST members located in the nations of the Pacific Rim and have begun assembling potential speakers and topics for "*Evolution of the Chemical Community in the Countries of the Pacific Rim.*" Suggestions by HIST members and readers of this Newsletter as to possible presenters would be most welcome. While this horizon seems far off, past experience has shown that it will soon be upon us.

Ned D. Heindel, HIST Chair



Report of Councilors, Division of the History of Chemistry ACS National Meeting, Philadelphia, PA; August 19 - 23, 2012

Election Results

- By electronic ballot, the Council elected to the Committee on Committees G. Bryan Balazs, Dawn A. Brooks, Michelle V. Buchanan, Alan B. Cooper, and Ingrid Montes for the 2013-2015 term; and Spiro D. Alexandratos and Judith Currano for the remainder of a two-year (2013-2014) term.
- By electronic ballot, the Council elected to the Council Policy Committee Frank D. Blum, Mary K. Carroll, Lee H. Latimer, and Carolyn Ribes for the 2013-2015 term.
- By electronic ballot, the Council elected to the Committee on Nominations and Elections Cherlynlavaughn Bradley, Milagros Delgado, Carol B. Libby, Les W. McQuire and Donivan R. Porterfield for the 2013-2015 term.

Candidates for President-Elect and Board of Directors

- The candidates for the fall 2012 ACS national election were announced as follows:

Candidates for President-Elect, 2013

Dr. Thomas J. Barton, Distinguished Professor, Iowa State University, Ames, IA

Dr. Luis A. Echegoyen, Robert A. Welch Professor, University of Texas at El Paso

Candidates for Directors-at-Large, 2013-2015

Ms. Carol A. Duane, President, D&D Consultants of Mentor, Mentor, OH

Ms. Valerie J. Kuck, Retired, Lucent Technologies (Bell Labs), Murray Hill, NJ

Ms. Helen (Bonnie) A. Lawlor, Executive Director, National Federation of Advanced Information Services (NFAIS), Philadelphia, PA

Dr. Ingrid Montes, Professor, University of Puerto Rico, Rio Piedras Campus, San Juan, PR

Candidates for District I Director, 2013-2015

Dr. Thomas R. Gilbert, Associate Professor, Northeastern University, Boston, MA

Dr. Neil D. Jespersen, Professor of Chemistry, St. John's University, Queens, NY

Candidates for District V Director, 2013-2015

Dr. John E. Adams, Curators' Teaching Professor of Chemistry, University of Missouri, Columbia, MO

Dr. Peter K. Dorhout, Dean, College of Arts & Sciences, Kansas State University, Manhattan, KS

Petitions

- The Council received two amendments (petitions) to the ACS Constitution and Bylaws for action: The Petition on Candidate Comment in C&EN and the Petition on International Chemical Sciences Chapters Funds. The Council VOTED not to approve the Petition on Candidate Comment in C&EN which sought to restrict candidates for election to the Board of Directors from publishing comments in C&EN from May through the balloting period. The Council also VOTED not to approve (64% to 36% via clicker vote) the Petition on International Chemical Sciences Chapters Funds. This petition sought to clarify that the Board of Directors may grant funds to international chapters for specific purposes.

New Committee Supported

- The Council VOTED to establish a Joint Board-Council Committee on Senior Chemists whose mission is to enrich the educational, technical, and cultural lives of the ACS Membership by ministering to and employing the talents of senior ACS members by: sharing with ACS members of all ages a rich variety of personal experiences and expertise gained over many years of professional service; fostering interest and participation in the science of chemistry through community outreach, especially in grades K-12; acting as science advisors/ambassadors for the purpose of cultural exchange at home and abroad; providing senior ACS members with challenging, diverse, and enjoyable professional experiences that

enable them to contribute to the cultural experiences of their communities; and recommending policies that address issues of interest to senior chemists. The committee is aimed primarily at members over 60 years of age. Next, the Board of Directors must vote on whether to establish the committee.

Meeting Registration Report

- As of close of business August 22, 2012, the ACS fall national meeting had attracted 13,320 registrants, including 7,817 regular attendees and 3,177 students.

Membership Activity

- One of the Society's long-time concerns has been the decline in the number of domestic Regular Members, that is, members paying full dues. The impact of this decline has been offset, as we have reached record membership levels, by increases in the number of international Regular Members, and the 2009 addition of Student Member Undergraduates. While the number of regular domestic members paying less than full dues has decreased from 33,000 to 29,000 in the last five years, this is still significantly more than the number of student members added.

Special Discussion Item

- A special discussion item was put on the Council agenda for this meeting. ACS President Bassam Shakhshiri presented and moderated a discussion on "What major efforts should ACS pursue to help alleviate water and other global challenges?" Members of the ACS feel a responsibility as scientists and citizens to help address global challenges facing society in the 21st Century to help sustain Earth and its people. These challenges include increasing population growth, limited natural resources, malnutrition, disease, climate change, violence and war, and the denial of basic human rights, including the right to benefit from scientific and technological progress. This discussion focused primarily on the crisis of available water suitable for drinking, agriculture and industry. Following the presentation, more than 30 Councilors engaged in a discussion of this global challenge and others and offered numerous suggestions. Councilors are invited to continue discussion of this topic within the ACS Network Councilor Group (<https://communities.acs.org/groups/councilor-group>) at <https://communities.acs.org/message/11677>.

Resolution to Honor the Memory of Glenn T. Seaborg in the Centennial Year of His Birth

- The Council passed a resolution to honor the 100th anniversary of the birth of Glenn T. Seaborg, Chemistry Nobel Laureate and past ACS President.

Activities of HIST Councilors

Mary Virginia Orna – continues in the second year of her second three-year term as a member of the Council Policy Committee (CPC). She is also a member of CPC's Long-Range Planning Subcommittee and CPC's Subcommittee on Constitution and Bylaws. She has also participated in the planning and implementation of the New Councilor Mentor Program and the New Councilor Orientation Program. As a member of the Long-Range Planning Subcommittee, she has also helped to design and implement a Strategy Café Toolkit for use by Local Sections and Regional Meetings personnel. She also helped to update the Handbook for Councilors.

Roger Egolf – continues as a member of the Divisional Activities Committee (DAC). He has recently moved from the Annual Reports subcommittee to the Constitution and Bylaws subcommittee of DAC. He also continues to serve as the liaison from DAC to the Membership Affairs Committee and to HIST. Roger also serves the division as its representative to the Heritage Council of the Chemical Heritage Foundation.

Mary Virginia Orna, Roger A. Egolf, Councilors

Message from Tom Strom, HIST Division Past Chair

Don't worry; I don't intend to keep bombarding you with messages the next two years from your Past Chair. However, I do have a little bit of past business to cover. HIST is very fortunate to have Ned Heindel as its new Chair, with Gary Patterson sitting in the wings as Chair-Elect. The HIST Executive Committee is strong at every position, so you members can look forward to outstanding leadership. However, you must do your part to support the division, especially by submitting papers that are not part of some symposium but are independently derived. The continued growth of contributed papers can only strengthen our division. Also, you need to urge your chemist friends to join our division.

Environmental activists are encouraged to "Think globally; act locally!" I hope we members of HIST will think globally about the need to archive historical materials of chemistry and will act locally to archive local ACS section newsletters and minutes.

In my message in the HIST newsletter during the fall of 2011, I listed the new ACS Fellows who were members of HIST, but I omitted one of our eight new Fellows. In my message during the fall of 2012, I again listed the new HIST ACS Fellows, but I again omitted one of the seven. If you believe in consistency, I was consistent, but if you believe in accuracy, I certainly missed the mark. Let me now give a shout-out to the seventh 2012 ACS Fellow, **Dr. Richard A. Hermens**, retired faculty member from Eastern Oregon University. Dr. Hermens had a long, successful career at that institution. One of his important accomplishments was in organizing the Eastern Oregon Science Journal, which opened to the door to students in any science having a venue for publication.

As I said in my message of last fall, I intend to remain active in HIST. I look forward to meeting many of you in future meetings.

E. Thomas (Tom) Strom, HIST Past Chair



Professor William R. Newman to Receive 2012 HIST Award

The recipient of the 2013 HIST Award of the Division of the History of Chemistry of the American Chemical Society is Professor William R. Newman, Distinguished Professor and Ruth Halls Professor of History and Philosophy of Science, Indiana University, Bloomington, IN. This award is the successor to the Dexter Award (1956-2001) and the Sydney M. Edelstein Award (2002-2009), also administered by the Division of the History of Chemistry.

William Newman was introduced to the history of chemistry by Otto T. Benfey in the 1970s as a student at the University of North Carolina-Greensboro. He did his graduate work at Harvard with the medievalist John Murdoch, also working with the classicist and historian Robert Halleux at the Université de Liège. Newman's doctoral dissertation, finished in 1986, was later published as *The Summa Perfectionis of Pseudo-Geber* (1991), which consisted of an edition, translation, and study of one of the most famous alchemical works of the Middle Ages. Newman demonstrated that this early 14th century Latin alchemical treatise, attributed to Pseudo-Geber, was not a translation of a work of the 8th century Arabic writer, Jabir ibn Hayyan, but an original work by Paul of Taranto. Thus in his doctoral dissertation, Newman laid to rest the Jabir-Geber problem.

Much of Newman's subsequent work has focused on the continuity between alchemy and chemistry in the seventeenth century. Two books, *Gehennical Fire* (1994) and *Alchemy Tried in the Fire* (2002, with L.M. Principe) deal with George Starkey. Newman identified the alchemical writer Eirenaeus Philalethes ("peaceful lover of truth") to be the Harvard-educated chemist George Starkey (1628-1665). Sometimes considered to be America's first scientist, Starkey became Robert Boyle's tutor, Isaac Newton's favorite



alchemical author, and a possible influence on the works of John Locke and Gottfried Wilhelm Leibniz. Newman and Principe have advocated the use of the terms “chymistry” and “chymist” to apply to the chemically related work of people such as Newton. Newman’s 2004 *Promethean Ambitions* deals with the division between natural and artificial products that has been a problem for chemistry since its origin. His most recent book, *Atoms and Alchemy* (2006), argues that the atomic theories of the nineteenth century were decisively prefigured by a form of chymical atomism that displaced the dominant early modern scholastic matter theory. Newman’s novel thesis is that later alchemists were concerned with chemical change in general, not just on the narrowly focused and futile searches for means to transform natural materials into gold. For the last seven years, Newman has devoted most of his time to the Chymistry of Isaac Newton Project (www.chymistry.org), an on-line edition of Newton’s alchemical writings hosted by Indiana University. In addition to his appointment in the Indiana University Department of History and Philosophy of Science, he is Director of the Catapult Center for Digital Humanities and Computational Analysis of Texts, also at Indiana University.

HIST Archives

As you may know, the archives of HIST are located at the Chemical Heritage Foundation in Philadelphia. The archives comprise 44 boxes containing 544 file folders of the division’s historical records. Until 1988, there was no formal archival record keeping on the part of the division. At that time James Traynham, chair of the Division, appointed James J. Bohning as division historian. As HIST historian, Bohning began to solicit past officers of the division, asking them to send material to him at CHF, where he was then working, as he began to assemble division records from diverse sources. The division in 2004 created a formal archivist position, also assumed by Bohning. In 2005, the HIST archives were formally deeded to CHF, and the long process of archiving the large amount of material began. Bohning continued as archivist until 2009, and the position was taken over by John B. Sharkey.

A finder’s guide is in the process of being completed, and this material will then be available to researchers. Although there is a wealth of material in the archives, there are also large gaps. For example the papers of Edgar Fahs Smith and Charles A. Browne, co-founders of our division, were donated to the University of Pennsylvania (The Smith Collection) and the Library of Congress respectively. If HIST members have anything in their files that you think may be of historical interest to the archives, and you are willing to donate this material, please contact John Sharkey at johnbsharkey@me.com, who can check to see if the material is needed for the archives. As our dear friend Jim Bohning used to say, “When in doubt, don’t throw it out”.

John B. Sharkey, HIST Archivist

History of Chemistry Resources Now Available at the UNT Digital Library

The UNT (University of North Texas, at Denton TX) Digital Library is an internationally known repository for materials from research, creative, and scholarly activities, concentrating on works from the faculty of UNT. Materials include many scholarly works, including scientific and historical articles, artwork, performances, musical scores, journals, government documents, rare books, and historical posters. These works are developed in conjunction with active and retired faculty of UNT. Dr. James (Jim) L. Marshall of the Chemistry Department of UNT has created sites for two items of interest to members of the History of Chemistry Division of the ACS: (1) SOUTHWEST RETORT ARCHIVES and (2) REDISCOVERY OF THE ELEMENTS collection. All articles in this collection are fully searchable and are a powerful resource for the historical scholar.

The SOUTHWEST RETORT ARCHIVES is being developed by Jim and his long-time colleague Dr. Tom Strom. The two have had a long association on many projects, including the Southwest Retort; Jim was formerly managing editor of the periodical when Tom was long-time editor-in-chief. Tom has furnished past issues of the Southwest Retort which are being scanned and are already accessible for study by chemical scholars. This collection contains the magazine published by the Dallas/Fort Worth Section of

the American Chemical Society since 1944. Included are *The Activator* (1944-1948) and the subsequent title, the *Southwest Retort* (1948-present). The magazines include division information, regional meetings, news about members, editorials, and other items of interest to members. This magazine, still active, became solely digital in 2011 and will be constantly being updated in the UNT digital library. So far issues have been scanned through the early 1970s and can be accessed at the following URL: <http://digital.library.unt.edu/explore/collections/DFWCS>.

The REDISCOVERY OF THE ELEMENTS collection has been contributed by Jim from the sesqui-decade project of him and his wife, Virginia (Jenny). This project will be concluded in about two years, when the entire Periodic Table will have been addressed. The collection is up-to-date in the Digital Library. In addition to the main articles, there are several other feature articles connected with the project as well as cover photographs taken by Virginia Marshall. Individual scholarly articles may be found at the following URL: <http://digital.library.unt.edu/explore/collections/UNTSW>. To access the material, click on the "Explore this Collection" tab at the top of the page. Then click on "Rediscovery of the Elements" on the left-hand banner under the category "Serial/Series Title". Alternatively, the entire address below will also take one to the individual scholarly articles:

http://digital.library.unt.edu/explore/collections/UNTSW/browse/?fq=str_title_serial%3ARediscovery+of+the+Elements

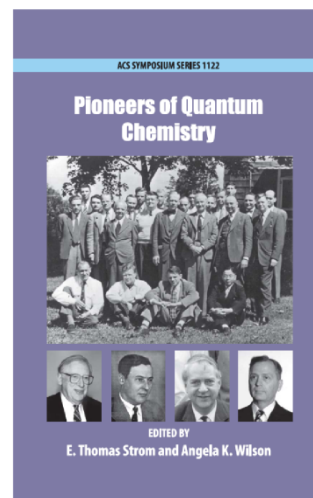
Already these two websites have been discovered by the webwide public, and the UNT Digital Library reports frequent and continuous hits.

Jim Marshall and Tom Strom

New HIST-Sponsored ACS Symposium Book: *Pioneers of Quantum Chemistry*

The ACS Symposium Book No. 1122 *Pioneers of Quantum Chemistry* will be available as an e-book by the time this newsletter reaches you. The hard copy will be available by the middle of summer. This book is based on the presentations given at the HIST Symposium of the same name held Mar. 28, 2011, at the Anaheim ACS meeting. The book's ten chapters cover the careers of noted quantum chemists John Pople, George Wheland, H. C. Longuet-Higgins, and Michael J. S. Dewar, Andrew Streitwieser's book on molecular orbital theory, both large and smaller scale surveys of quantum chemistry, the origins of free electron theory, pioneering quantum chemistry efforts at the University of Chicago and IBM, and a history of the Quantum Chemistry Program Exchange. The chapter authors are Janet Del Bene, E. Thomas Strom, Weston Thatcher Borden, Eamonn Healy, Andrew Streitwieser, Klaus Ruedenberg, W. H. Eugen Schwarz, István Hargittai, William Jensen, Paul Bagus, and Don Boyd. The editors are E. Thomas Strom and Angela K. Wilson.

Tom Strom



HIST Facebook Page Continues to Grow

In an effort to reach a wider audience, ACS HIST established a Facebook page in April 2011 to promote upcoming Division activities and to establish connections with those interested in the history of chemistry. While response to the page was initially slow, followers of the page and its visitors have continued to grow. To date, the community following the Facebook page has grown to 94 official 'likes', nearly double the number as of the previous HIST Newsletter. More impressively, according to Facebook statistics, **we are**

reaching up to an additional 36,920 Facebook users via our 98 official followers. The majority of those reached via Facebook are younger people in their 20s and 30s, most of which are not HIST or even ACS



Like



members. In addition, over two-third of the official 'likes' are coming from various international communities (**19 different countries**) without traditional access to activities of the division. The hope is to continue using this page to reach those outside of HIST, as well as allowing a venue for HIST members to share their views and discuss topics in the history of chemistry, without being limited by the timing and locations of national and local ACS conferences. The Facebook page can be found at <http://www.facebook.com/#!/pages/ACS-Division-of-the-History-of-Chemistry-HIST/152326921497559> or by searching 'HIST' in the Facebook search bar. If you are a Facebook user, please stop by, 'Like' the page, and post your thoughts on the Division or any aspect of the history of chemistry! Remember, every post on the page allows us to share what HIST is all about with nearly 40,000 people world-wide!

Seth C. Rasmussen, HIST Facebook Page Administrator

Message from the HIST Program Chair

"The more things change, the more they remain the same." I thought that this quote is a good way to start this most recent message. Yes, I am still here and doing what I can to advance the mission of HIST through our programming at National Meetings. However, at the same time HIST and the ACS has big changes coming. For those of you who have read these messages, you probably remember that in addition to my position as HIST Program Chair, I also represent HIST as a member of the ACS PACS Advisory Board, where I have continued to address difficulties with the PACS abstract submission process that acts as a barrier for some to contribute talks to HIST. Well, the good news is that PACS will soon no longer be a problem. The bad news, though, is that this is because the company that has recently acquired PACS has announced it will discontinue its support for PACS effective January 1, 2015. As such, the PACS Advisory Board has been officially disbanded and ACS is currently in the process of finding a replacement abstract system!! To assist in this decision, and to act as a voice for the ACS population, ACS has established the Abstract System Replacement Advisory Group and yours truly has once again agreed to serve as a member. Needless to say, I will be looking out for the needs and best interests of HIST members when evaluating potential replacement systems. The new system is supposed to be in place for the Denver (Spring 2015) call for papers.



The programming for New Orleans continues our recent trend in strong offerings and looks to be another great meeting for HIST. Much of this is due to the very strong *12th Archaeological Chemistry Symposium* organized by Ruth Ann Armitage and James Burton. Not only will the symposium cover a full two days of programming, but it also contributes an additional 12 posters to Monday evenings Sci-Mix. Thus, for the first time since I have been Program Chair, we will have filled all of our available Sci-Mix slots, with a total of **20 posters** representing HIST in Sci-Mix! Please take the time to attend Sci-Mix and visit with the presenters representing HIST in this important community-wide event. While I couldn't be more pleased with our representation in Sci-Mix, we still struggle to maintain our new *HIST Tutorial Series* due to a lack of willing speakers. For three meetings we have started our General Papers session with such a tutorial in order to provide an educational review to bring HIST members and the general ACS community up to speed on a historical topic of general interest. An additional aim is to tie these presentations into the ACS thematic programming if possible. Unfortunately, we were unable to find a speaker for Philadelphia and for New Orleans we will only have a Tutorial because I personally decided to step up and give my second such Tutorial on *Early history of alcohol - from food to energy* (thus aligning with the thematic programming of *Chemistry of Energy & Food*). I am still looking for Tutorial speakers for Indianapolis (*Chemistry in Motion*) and Dallas (*Chemistry of Energy: Advanced Materials for New Opportunities*). If you are willing to give a tutorial or if there is a topic you would like to see added to the series, please let me know (seth.rasmussen@ndsu.edu).

Seth C. Rasmussen, HIST Program Chair

HIST SYMPOSIA, 245th ACS Meeting in New Orleans, LA, April 7-11, 2013

Schedules and abstracts are listed at the end of this Newsletter.

Mary L. Good: Her Legacy in Science, Policy and Service.

Cosponsored by I&EC

In New Orleans, HIST will present the next symposium of its continuing series on the Science and Legacy of Past ACS Presidents. When you think of Mary Good, do you think of her as a chemist, educator, researcher, ACS leader, government official, entrepreneur, mentor or professional model? Come listen to and share in the stories from a collection of her friends and colleagues who will explore the many facets of Mary Good's career from Louisiana teacher, to Signal chemical researcher and leader, to ACS governance, to US government service, and back to academia with an industrial twist in Arkansas. Speakers will include: Elsa Reichmanis, Madeleine Jacobs, Erich Block, Halley Merrill, Margaret Cavanaugh, and Charles Hathaway. Mary will then get the chance at the end to share her "Remarks, Responses, and Memories". There just might be a chance for others of you to share your thoughts as well at the end. So join us Sunday afternoon to honor and celebrate our friend Mary Good. The symposium will be **Sunday afternoon**, April 7, at the New Orleans Downtown Marriott at the Convention Center - New Levee.

J. Hayes and M. Cavanaugh, Organizers

12th Archaeological Chemistry Symposium

Cosponsored by Society for Archaeological Sciences

Organized by James Burton, Director of the T. Douglas Price Laboratory for Archaeological Chemistry at the University of Wisconsin and Ruth Ann Armitage, Professor of Chemistry at Eastern Michigan University, the 12th symposium consists of both invited and contributed presentations from researchers in the fields of archaeological science, with emphasis on chemical analysis of cultural heritage materials. The presentations will range from a poster session during Monday evening's Sci-Mix event to a keynote talk from Dr. A. Mark Pollard, Director of the Research Laboratory for Archaeology and the History of Art at the University of Oxford. Talks will feature topics including identification of pigments in ancient manuscripts, analysis of archaeological organic residues, the capabilities and limitations of portable X-ray fluorescence in archaeological chemistry, and recent developments in isotopic analysis for understanding past human behavior. As with previous ACS Archaeological Chemistry Symposia, an ACS Symposium Series book based on papers from the meeting is planned. The symposium will be **all day Monday and all day Tuesday**, April 8-9, at the New Orleans Downtown Marriott at the Convention Center - New Levee.

R. Armitage and J. Burton, Organizers



UPCOMING NATIONAL MEETINGS AND HIST DEADLINES

Offerings are subject to change. Check the [HIST website](#) for updates.

Indianapolis, September 8-12, 2013

Submit your abstract via the online ACS Program and Abstract Creation System (PACS) by **April 1, 2013**. If you do not have access to a computer for use in the submission or are having difficulties in submitting your abstract, contact Seth Rasmussen (seth.rasmussen@ndsu.edu). Check the call for papers in *Chemical and Engineering News* or www.acs.org for changes in the abstract deadlines.

HIST Tutorial and General Papers. (**Seeking contributors**) Seth C. Rasmussen, Department of Chemistry and Biochemistry, North Dakota State University, NDSU Dept. 2735, P.O. Box 6050, Fargo, ND 58108-6050, Phone: (701) 231-8747, Email: seth.rasmussen@ndsu.edu

HIST Award Symposium Honoring William R. Newman. (Invited) Seymour Mauskopf, Department of History, Duke University, Box 90719, Durham, NC 27708-0719, Phone: (919) 684-2581, Email:

shmaus@duke.edu; Seth C. Rasmussen, Department of Chemistry and Biochemistry, North Dakota State University, NDSU Dept. 2735, P.O. Box 6050, Fargo, ND 58108-6050, Phone: (701) 231-8747, Email: seth.rasmussen@ndsu.edu

What's Your Number: A Centennial Remembrance of Henry Moseley (Invited and **Seeking contributors**) Gary D. Patterson, Department of Chemistry, Carnegie Mellon University, 4400 Fifth Avenue, Pittsburgh, PA 15213, Phone: 412-268-3324, Email: gp9a@andrew.cmu.edu

Historical Origins of Mass Spectrometry (Invited) Gary D. Patterson, Department of Chemistry, Carnegie Mellon University, 4400 Fifth Avenue, Pittsburgh, PA 15213, Phone: 412-268-3324, Email: gp9a@andrew.cmu.edu

Dallas, March 16-20, 2014

HIST Tutorial and General Papers. (**Seeking contributors**) Seth C. Rasmussen, Department of Chemistry and Biochemistry, North Dakota State University, NDSU Dept. 2735, P.O. Box 6050, Fargo, ND 58108-6050, Phone: (701) 231-8747, Email: seth.rasmussen@ndsu.edu

History of Chemistry in North Texas (Invited and **Seeking contributors**) E. Thomas Strom, Department of Chemistry and Biochemistry, University of Texas at Arlington, P. O. Box 19065, Arlington, TX 76019-0065, Phone: (817) 272-5441, Email: tomstrom@juno.com

A Century of Physical Organic Chemistry. A Celebration of the Discoverers of Organic Reaction Mechanisms (Invited and **Seeking contributors**) E. Thomas Strom, Department of Chemistry and Biochemistry, University of Texas at Arlington, P. O. Box 19065, Arlington, TX 76019-0065, Phone: (817) 272-5441, Email: tomstrom@juno.com; Jeffrey I. Seeman, SaddlePoint Frontiers, 12001 Bollingbrook Place, Richmond, VA 23236, Phone: (804) 794-1218, Email: jiseeman@yahoo.com

San Francisco, August 10-14, 2014

HIST Tutorial and General Papers. (**Seeking contributors**) Seth C. Rasmussen, Department of Chemistry and Biochemistry, North Dakota State University, NDSU Dept. 2735, P.O. Box 6050, Fargo, ND 58108-6050, Phone: (701) 231-8747, Email: seth.rasmussen@ndsu.edu

Found and Lost: Incredible Tales of Spurious, Erroneous and Rehabilitated Elements (Invited and **Seeking contributors**) Mary Virginia Orna, Department of Chemistry, College of New Rochelle, New Rochelle, NY 10805, Phone: (914) 654-5302, Email: maryvirginiaorna@gmail.com; Marco Fontani, Email: marco.fontani@unifi.it

Recent Studies in the History of Modern Organic Chemistry (Invited and **Seeking contributors**) Jeffrey I. Seeman, SaddlePoint Frontiers, 12001 Bollingbrook Place, Richmond, VA 23236, Phone: (804) 794-1218, Email: jiseeman@yahoo.com

HIST Past Presidents Symposium Series

The HIST Past Presidents Symposium series is designed to explore the professional and scientific legacy of some of our former ACS Presidents. Symposia are planned for National ACS meetings in the geographical area associated with the President to be honored. Past symposia have honored Henry Eyring (Salt Lake City, Spring 2009) and Anna Jane Harrison (Boston, Fall 2011). Beyond the Spring 2013 Mary Good symposium in New Orleans, future symposia are under development for Helen Free (Indianapolis, Fall 2013), William Carroll (Dallas, Spring 2014), Attila Pavalth (San Francisco, Fall 2014) and Henry Hill (Boston, Fall 2015). If you would like to be a part of any of these future symposia, please contact Jan Hayes at janan.hayes@yahoo.com for more information on plans and participation.

Springer Briefs in Molecular Science: History of Chemistry Seeks New Authors

Following the official launch of this new book series last year, the first five volumes have been published and are now available in softcover or ebook formats. This year we currently have at least three additional volumes in production and hope to add even more before the end of the year. As such, new authors are being sought for potential new volumes. Volumes are 50-125 pages in length, presenting concise summaries of historical topics covering all aspects of chemistry, alchemy, and chemical technology. Authors interested in discussing potential topics should feel free to contact the Series Editor, Seth Rasmussen (seth.rasmussen@ndsu.edu). For more detailed information on the new series and available volumes, please visit <http://www.springer.com/series/10127>.



Seth C. Rasmussen, Series Editor

News from the Chemical Heritage Foundation

The [Chemical Heritage Foundation](#) (CHF) fosters an understanding of chemistry's impact on society. An independent nonprofit organization, we strive to inspire a passion for chemistry, highlight chemistry's role in meeting current social challenges, and preserve the story of chemistry across centuries. CHF maintains major collections of instruments, fine art, photographs, papers, and books. We host conferences and lectures, support research, offer fellowships, and produce educational materials. Our museum and public programs explore subjects ranging from alchemy to nanotechnology.

Enhanced Presence of the Chemical Heritage Foundation at Pittcon 2013

For the first time, Pittcon, the world's largest annual conference and exposition for the laboratory sciences will be held in Philadelphia, March 17-21, 2013, at the Pennsylvania Convention Center. For the past 13 years, CHF has partnered with Pittcon to produce a historical depiction of the importance of scientific instrumentation to the chemical and molecular sciences. This joint effort is the renowned Pittcon Hall of Fame to which all Pittcon attendees have access. This year, as a salute to the 100th year anniversary of mass spectrometry, the CHF will have an enhanced presence at Pittcon 2013. An instrumentation museum, which will be located in the main registration area, will feature an original copy of J. J. Thomson's Monograph that initiated the birth of mass spectrometry. A complementary display will include a collection of mass spec components and instruments such as a miniature Nier mass spectrometer and vacuum tubes to the modern day hand held instruments that service a variety of applications from airport security to space exploration to the modern operating room.

In addition, the CHF will be presenting a symposium, Instrumentation Innovation: A Personal History of Instruments and Innovation, which will include presentations by David Brock (Instruments, Automation, Bits, and Palm Trees: Instrumentation Firms and the Early Computer Industry); Rosie Cook (More Than Black Boxes – Using Instruments to Tell the Personal Side of Chemistry); and Davis Baird (Engineering Realities: Ometric, the University of South Carolina and the Birth of a New Measurement Technology).

Pittcon attendees will be encouraged to visit the Chemical Heritage Foundation as part of CHF's extended hours during conference week.

Pittcon registration is only \$130 before February 18 (\$260 after 2/18) which includes unlimited access to the exposition floor, technical program, Conferee Networking, and all event amenities. For more information on Pittcon, please visit www.pittcon.org.

News from the Society for the History of Alchemy and Chemistry

Founded in 1935, the Society for the History of Alchemy and Chemistry (SHAC) has consistently maintained the highest standards of scholarship in all aspects of the history of alchemy and chemistry from early times to the present. The Society has a wide international membership of over 200 with members from 28 countries.

2012 Morris Award: awarded to Professor Mary Jo Nye

The Society for the History of Alchemy and Chemistry has awarded the second John and Martha Morris Award for the History of Modern Chemistry and the Chemical Industry to Professor Mary Jo Nye, Horning Professor in the Humanities and Professor of History Emeritus, History of Modern Physical Sciences, in the Department of History, Oregon State University, Corvallis, Oregon. Professor Nye has been given this award for her path-breaking work on the history of modern physical chemistry, most recently her acclaimed biography of Michael Polanyi. Professor Nye will give the Morris Lecture at the 9th International Conference for the History of Chemistry in Uppsala, Sweden, in August 2013, and the award then will be presented to her at a reception.

Professor Nye completed her undergraduate studies at Vanderbilt University and the University of Wisconsin, taking her Ph.D. in History of Science at the University of Wisconsin. From 1970 she taught at the University of Oklahoma, where she was named George Lynn Cross Research Professor in the History of Science in 1991. She was appointed a Thomas Hart and Mary Jones Horning Professor of the Humanities and Professor of History at OSU in 1994. Her research interests include the history of chemistry and physics since the eighteenth century in western Europe, the UK, and the United States; the social and cultural history of science, including laboratory science, university education, and the political activities of scientists; and the philosophy of science, especially relations between theory and evidence. Nye is currently working on further aspects of the work of Michael Polanyi, and on styles of research collaboration in the laboratories of Linus Pauling and other modern chemists.

2012 Rumford Scholarship in the History of Alchemy or Chemistry:

The Society is delighted to announce that Evan Hepler-Smith, a Ph.D. Candidate at Princeton University, is the second recipient of the Rumford Scholarship for his project 'Thinking Through Names: Nomenclature and the Culture of Organic Chemistry, 1889-1930.'

News from the History of Science Society

The History of Science Society is the world's largest society dedicated to understanding science, technology, medicine, and their interactions with society in historical context. It was founded in 1924 to foster interest in the history of science and its social and cultural relations.

Dissertations in the History of Science and Medicine

The most recent dissertations pertaining to the history of science and medicine from the August 2010 volumes of Dissertation Abstracts can be viewed online at the following URL: <http://www.hsls.pitt.edu/guides/histmed/researchresources/dissertations/index.html>. Repeat visitors will notice a change in formatting—this is the new ProQuest platform—so there are no more short versions but the abstracts do give you all the bibliographic information that you will need.

New Searching Capabilities for Online Oral Histories

Niels Bohr Library and Archives staff have just added an important new search feature to AIP's online oral histories. Users can now search for any word they wish to find across all of the online transcripts. This enables researchers to more easily locate interviews that pertain to their area of research. For example, someone researching the "atomic bomb" will find 158 interviews (out of about 770 online) that mention this term somewhere in the interview. Similarly, there are 37 hits for "star wars," and six for "Higgs." The search results are sorted by relevance, so interviews with more occurrences of the search term will appear at the top of the search results.

Staffs continue to add transcripts to the website on a regular basis and have added audio clips for Bryce S. DeWitt, John Bardeen, Richard Garwin, and others. Of note—the Richard Feynman interview, added to the online collection in March, has quickly become the most popular of all our online oral histories. For further information, visit <http://www.aip.org/history/ohilist/transcripts.html>.

Final Program

HIST

DIVISION OF THE HISTORY OF CHEMISTRY

S. C. Rasmussen, *Program Chair*

SUNDAY MORNING

Section A

New Orleans Downtown Marriott at the Convention Center - New Levee

HIST Tutorial and General Papers

S. C. Rasmussen, *Organizer, Presiding*

7:30 1. HIST Tutorial: Early history of alcohol - from food to energy. **S. C. Rasmussen**

8:10 2. Urey, Deuterium, and the Rosenbergs. **D. J. O'Leary**

8:40 3. Chairmen of HIST: 1927-1947. **G. D. Patterson**

9:10 4. Decorating with explosives: Böttger luster on early Meissen porcelain. **N. Zumbulyadis**

9:40 Intermission.

9:55 5. What starts in Texas changes the world. **D. Mason**

10:25 6. Edwin Fremont Ladd: Early research and the establishment of North Dakota Agricultural College. **M. Bains, D. J. Mueller, S. C. Rasmussen**

10:55 7. Early (pre-XIXth-century) treatises describing the qualitative and quantitative analysis of mineral water. **N. V. Tsarevsky**

11:25 8. A brief philatelic history of the periodic table. **D. Rabinovich**

SUNDAY AFTERNOON

Section A

New Orleans Downtown Marriott at the Convention Center - New Levee

Mary L. Good: Her Legacy in Science, Policy and Service

Cosponsored by I&EC

M. Cavanaugh, *Organizer*

J. Hayes, *Organizer, Presiding*

1:00 Introductory Remarks.

1:05 9. Mary Lowe Good: A Success across Sectors. **M. A. Cavanaugh**

1:25 10. From instructor to icon: Mary Good's academic career in Louisiana. **J. G. Traynham, A. F. Bopp**

1:50 11. Meeting Challenges for the NSF and National Science Board in the 1980's. **E. Bloch, M. Cavanaugh**

2:10 12. Mary Good in Industry - Skillful Leader for R&D. **I. Brubaker**

2:35 Intermission.

2:50 13. Service to ACS: Mary L. Good, a member of the ACS presidential succession. **E. Reichmanis**

3:10 14. A Legacy of Leadership and Some 'Good' Stories. **H. Merrell**

3:35 15. "There's Something About Mary.....". **M. Jacobs**

4:00 16. How to retire - not! **C. E. Hathaway**

4:20 17. Remarks, Responses, and Memories. **M. L. Good**

SUNDAY EVENING

New Orleans Downtown Marriott at the Convention Center - TBA

5:00 - 8:00 HIST Executive Committee Meeting

MONDAY MORNING

Section A

New Orleans Downtown Marriott at the Convention Center - New Levee

12th Archaeological Chemistry Symposium

Pigments

Financially supported by Society for Archaeological Sciences

J. Burton, *Organizer*

R. Armitage, *Organizer, Presiding*

9:00 Introductory Remarks.

9:15 18. HyLogger™ near-infrared spectral analysis: A non-destructive mineral analysis for Aboriginal Australian objects. **R. S. Popelka-Filcoff**, A. Mauger, C. E. Lenehan, K. Walshe, A. Pring

9:35 19. Source of red pigments in Lower Pecos pictographs. **K. Bu**, J. Cizdziel, J. Russ

9:55 20. Artists' pigments in illuminated medieval manuscripts: Tracing artistic influences and connections. **M. Orna**

10:15 Intermission.

10:30 21. Characterization of the ink on the Gospel of Judas: A collaborative approach. **J. G. Barabe**, K. A. Martin, E. F. Schumacher, J. R. Swider, A. S. Teetsov

10:50 22. Unprecedented archaeo-chemical discovery of the 2,000-year old "Biblical-Blue" Tekhelet at Masada. **Z. C. Koren**

11:10 23. Characterizing organic colorants in mock-ups of a 15th century Iranian Timurid Qur'an by direct analysis in real time time-of-flight mass spectrometry. **C. Varney**, C. Selvius DeRoo, R. Armitage

MONDAY AFTERNOON

Section A

New Orleans Downtown Marriott Convention Center - New Levee

12th Archaeological Chemistry Symposium

Organic Materials

Financially supported by Society for Archaeological Sciences

J. Burton, *Organizer*

R. Armitage, *Organizer, Presiding*

V. Steele, *Presiding*

1:00 Introductory Remarks.

1:05 24. Organic residues in archaeology - the highs and lows of recent research. **V. J. Steele**

1:35 25. Lipid analysis on Mapungubwe ceramics: Determining past function and foodstuffs. **Z. Collins**, C. Z. Ashley, A. Antonites, S. Bauermeister, Y. Naude

1:55 26. Chemical Evidence for the Archaeological Use of Pulque, a Pre-Columbian Fermented Beverage made from Agave. **K. L. Hamilton**, J. E. Bollinger, D. M. Healan, S. M. Grayson, R. Elupula

2:15 27. Identifying Glue Residues on 18th-Century Ceramics from Ferry Farm, George Washington's Boyhood Home. **D. Fraser**, M. Kaktins, R. Armitage

- 2:35 28.** Applications of Direct Analysis in Real Time Mass Spectrometry to Cultural Heritage Materials. **R. Armitage**
- 2:55** Intermission.
- 3:10 29.** Correlating paleoclimate and hominin activity: ESR dating at the Kharga Oasis, Egypt. **A. R. Skinner**, B. A. Blackwell, M. R. Kleindienst, K. V. Spiller, F. Mashriqi, J. I. Blickstein
- 3:30 30.** Preliminary results on biomimetic methods based on soluble ammonium phosphate precursors for the consolidation of archaeological wall paintings. **M. Balonis-Sant**, I. Kakoulli, X. Ma, Z. Yao, B. Wu, G. Sant
- 3:50 31.** Geochemical analysis of occupational surfaces at Augusta, an 18th century English/Miskitu settlement on Roatan Island, Honduras. **P. G. Phillips**, L. D. Mihok, E. C. Wells
- 4:10 32.** Analysis of samples excavated from a royal tomb in El Zotz: Application of materials science characterization techniques in archaeology. **K. A. Cheung**, N. Xie, Z. Yao, S. Newman, S. Houston, S. Prikhodko, I. Kakoulli
- 4:30 33.** Geochemical exploration of pottery and kiln fragments by ICP-OES at Aquabona (Northeast Italy). Identifying Late Republican and Early Imperial Roman amphora production. **D. Braekmans**, P. Monsieur, P. Degryse

MONDAY EVENING

Section A

Location - Hall D

Sci-Mix

S. C. Rasmussen, *Organizer*

8:00 - 10:00

1, 4, 6, 25, 26, 30. See previous listings.

- 34.** Developing direct analysis in real time-time of flight mass spectrometric methods for identification of organic dyes in historic textiles. **C. Day**, C. Selvius DeRoo, R. Armitage
- 35.** Rapid characterization of organic residues on ceramics using direct analysis in real time mass spectrometry. **J. Hopkins**, R. Armitage
- 36.** Biomolecular Evidence from Neanderthal Fireplaces. **A. Sistiaga**, C. Mallol, C. Hernández, B. Galván
- 37.** Laser Ablation – Inductively Coupled Plasma – Mass Spectrometry (LA-ICP-MS) analysis of re-melted glass pendants from the North American Upper Great Lakes. **H. Walder**
- 38.** Baghdad battery. **D. A. Habboush**, **E. J. Caliguri**, J. Audie
- 39.** Source analysis of prehistoric obsidian artifacts in Sicily (Italy) using pXRF. **R. H. Tykot**, K. P. Freund
- 40.** Advantages and disadvantages of pXRF for archaeological ceramic analysis: Prehistoric pottery distribution and trade in northwest Florida. **R. H. Tykot**, N. M. White, J. P. Du Vernay, J. Freeman, M. Koppe, C. N. Hunt, D. S. Woodward
- 41.** Roman rainbow: Investigation of ancient pigments by portable x-ray fluorescence spectroscopy and polarized light microscopy. **R. F. Beeston**, H. W. Becker
- 42.** Assessing pre-Inca subsistence patterns through elemental analysis of human bone using a non-destructive portable X-ray fluorescence spectrometer. **C. L. Bergmann**, R. H. Tykot
- 43.** Lipid residue analysis of pottery at Liangchengzhen, Shandong, China. **R. E. Lanehart**, R. H. Tykot, A. P. Underhill, L. Fengshi, F. Hui, W. Fen - *WITHDRAWN*
- 44.** Metal Plate Connectors of the Tripitaka Koreana Woodblocks. **C. Do**, C. Pyun, J. Bae
- 45.** Chemical analyses of black pigments from Olmec pictographs in southern Mexico. **J. McPeak**, J. Russ, M. D. Pohl, C. L. von Nagy, M. W. Rowe

TUESDAY MORNING

Section A

New Orleans Downtown Marriott Convention Center - New Levee

12th Archaeological Chemistry Symposium

X-ray Fluorescence Spectroscopy in Archaeology and Keynote Address

Financially supported by Society for Archaeological Sciences

R. Armitage, *Organizer*

J. Burton, *Organizer, Presiding*

8:55 Introductory Remarks.

9:00 46. Portable X-ray Fluorescence in Archaeology: Issues related to limitations of instrumentation and suggested methods to achieve desired results. **A. N. Shugar**

9:30 47. Interregional interaction and Dilmun Power in the Bronze Age: A Provenance Study of Ceramics from Bronze Age Sites in Kuwait, Bahrain and the Indus Valley Using non-destructive pXRF Analysis. **H. J. Ashkanani**, R. H. Tykot

9:50 48. Investigating human social dynamics and interaction in Ecuadorian prehistory through obsidian artifact provenience. **E. R. Dyrdaahl**, R. J. Speakman

10:10 49. Energy dispersive X-ray fluorescence analysis of sets of coins of the Kushan Empire, revolutionary France, and the state of Mysore: Three case studies throughout history. N. H. Stroeters, J. L. LaBond, S. D. Maurice, A. Schupbach, A. J. Diefenbach, **M. A. Benvenuto**

10:30 50. pXRF Analysis of Arsenic When Lead Is Present: A Cautionary Tale. **M. W. Rowe**, S. J. Cole, M. Yousuf

10:50 Intermission.

11:05 Introduction of keynote speaker.

11:10 51. Archaeological Chemistry: A Career in Ruins. **M. Pollard**

TUESDAY AFTERNOON

Section A

New Orleans Downtown Marriott Convention Center - New Levee

12th Archaeological Chemistry Symposium

Isotopes in Archaeological Chemistry

Financially supported by Society for Archaeological Sciences

R. Armitage, *Organizer*

J. Burton, *Organizer, Presiding*

A. Thibodeau, *Presiding*

1:30 Introductory Remarks.

1:35 52. Lead and strontium isotopes in archaeology. **A. Thibodeau**

2:05 53. The Use of Isotopes to Determine Geographic Origins of Humans: Cautionary Tales. **J. H. Burton**, T. D. Price

2:25 54. Seasonal reproduction patterns by isotopic signatures ($\delta^{18}\text{O}$) on Early Eneolithic sheep of Cheia (beginning of the 5th mil. cal BC, Romania). **C. Tornero**, A. Balasescu, V. Voinea, M. Balasse

2:45 Intermission.

3:00 55. Stone tools: Stable isotope analysis of organic residues. **K. L. Steelman**, H. Burger

3:20 56. Biogeochemical contributions to our understanding of hominin diet. **M. Sponheimer**

3:50 57. Identifying ancient population movement in Honduras using strontium and oxygen isotopes: New values and interpretations. **K. Miller**, C. Freiwald

4:10 Concluding Remarks.

HIST 1 - HIST tutorial: Early history of alcohol - from food to energy

Seth C. Rasmussen, seth.rasmussen@ndsu.edu. Department of Chemistry and Biochemistry, North Dakota State University, Fargo, ND 58103, United States

The production of alcohol via fermentation is one of the oldest forms of chemical technology and the production of beer predates the smelting of metals. By the 12th century, the ability to isolate alcohol from wine had moved this chemical species from a simple component of alcoholic beverages to both a new medicine and solvent. Of course, this also began the long tradition of production of liqueurs and strong spirits for consumption. The use of alcohol as a fuel, however, did not occur until significantly later periods. A general overview of the early history and chemistry of alcohol and its uses will be presented.

HIST 2 - Urey, deuterium, and the Rosenbergs

Daniel J. O'Leary, doleary@pomona.edu. Department of Chemistry, Pomona College, Claremont, CA 91711, United States

Harold C. Urey discovered the Nobel-worthy mass 2 hydrogen isotope in 1931 and is credited with naming it in June of 1933. Urey's correspondence reveals, however, that his team was struggling to find an acceptable name for 'the hydrogen' as late as May of that year. As documented elsewhere (O'Leary, Nat. Chem. 2012, 4, 236) but expanded upon in this presentation, it was Urey's doctoral advisor G.N. Lewis who decisively influenced him to settle on the name deuterium. Twenty years later, Urey became involved in a profoundly larger controversy when he offered the world a coolly logical and dissenting view of the government's decision to execute Ethel and Julius Rosenberg. The second part of this presentation will briefly discuss Urey's wearying efforts to convince government officials, citizens, and fellow scientists that the US justice system had failed in the Rosenberg case.

HIST 3 - Chairmen of HIST: 1927-1947

Gary D Patterson, gp9a@andrew.cmu.edu. Department of Chemistry, Carnegie Mellon University, Pittsburgh, PA 15213, United States.

The Division of the History of Chemistry achieved full status in 1927. Six people served as Chairman during the formative period from 1927-1947. Biographical material will be presented on Lyman Newell, F.B. Dains, Tenney L. Davis, James Couch, Harrison Hale and Henry M. Leicester. They will also be presented as historians of chemistry and as governors of the HIST Division. The present paper is the first in an annual series of lectures on the Chairmen and Secretaries of HIST.

HIST 4 - Decorating with explosives: Böttger luster on early Meissen porcelain

Nicholas Zumbulyadis, nickz@frontiernet.net. Unaffiliated, Rochester, NY 14613, United States.

During the early years of its existence, Europe's first porcelain manufactory met with little success in porcelain painting until the arrival of Johann Gregorius Höroldt in 1720. The only exception was a pink gold-based ground color that became known as Böttger luster. Unlike the traditional Purple of Cassius, Böttger luster did not use Sn to stabilize the gold nanoparticles (XRF). Höroldt describes its synthesis in his 1731 hand-written book of recipes as an explosive gold compound. We have recently completed the first transcription and English translation of the entire passage. In the modern context the procedure would not lead to an explosive compound. One must analyze the text in terms of an earlier recipe from "The Last Will and Testament of Basil Valentine." We will compare the synthetic procedures in the two recipes. It is anticipated that the archival documents analyzed in this work will guide future laboratory replication experiments.

HIST 5 - What starts in Texas changes the world

Diana Mason, drdiana@alumni.utexas.net. Chemistry, University of North Texas, Denton, Texas 76203, United States.

If Texas was designated today as its own country, it would be rank as the 40th richest country in the world. But why? This presentation will highlight how the history of Texas has affected the world's stage and how events that have occurred in Texas have made a difference. Discussed will be the advent of the addition of Mercaptans to natural gas, the fluoridation of municipal water supplies, a few special solutions native to Texas, and the birth of nanotechnology.

HIST 6 - Edwin Fremont Ladd: Early research and the establishment of North Dakota Agricultural College

Manpreet Bains, Manpreet.Bains@ndsu.edu, **Dustin J Mueller**, Dustin.J.Mueller@ndsu.edu, **Seth C. Rasmussen**. Department of Chemistry and Biochemistry, North Dakota State University, Fargo, ND 58108, United States.

Leaving the New York State Experiment Station in Geneva, Edwin Fremont Ladd came to the newly founded North Dakota Agricultural College (NDAC) in 1890 to become its second faculty member and the founding father of the chemical sciences in North Dakota. In his first ten years at NDAC, Ladd published papers on topics of soil chemistry, protein isolation, analysis of dairy and beef products, maize storage practices, and chemical composition of feed. This early work advanced the standards and practices that were used in this very agriculturally centered state and started Ladd on the path to become a major crusader of the pure-food movement. This presentation will present Ladd's early time at NDAC and demonstrate its impact had on the state of North Dakota and the shaping of the North Dakota Agricultural College.

HIST 7 - Early (pre-XIXth-century) treatises describing the qualitative and quantitative analysis of mineral water

Nicolay V. Tsarevsky, nvt@smu.edu. Department of Chemistry, Southern Methodist University, Dallas, TX 75275, United States.

The beneficial health effects of mineral springs were recognized at the dawn of human civilization. Although some ancient writers described reactions that can be viewed as “analytical tests”, it was not until the XVIIth century that technical chemists such as Johann Rudolf Glauber (1604-1670) isolated and identified salts present in natural waters. Robert Boyle (1627-1691) described qualitative color tests, and Friedrich Hoffmann (1660-1742) and particularly Torbern Bergman (1735-1784) developed methods for quantitative analysis of complex mixtures. It was their contributions that enabled the compilation of catalogues providing information about both medicinal uses and composition of numerous mineral waters, e.g., Elliot's “Account of the Nature and Medicinal Virtues of the Principal Mineral Waters of Great Britain and Ireland...” (1789). The major discoveries made in the XVIIth and XVIIIth centuries related to the analysis of mineral waters and some early attempts aimed at the preparation of artificial mineral waters will be described.

HIST 8 - Brief philatelic history of the periodic table

Daniel Rabinovich, drabinov@uncc.edu. Department of Chemistry, The University of North Carolina at Charlotte, Charlotte, North Carolina 28223, United States.

Milestones in the history of chemistry, from the notion of the four classical elements in pre-Socratic Greece to the development of the modern periodic table, are described in this presentation and illustrated with postage stamps and other philatelic materials. The discovery of new chemical elements and the contributions of Döbereiner, Gmelin, and Mendeleev to organize them in a rational way will be discussed.



HIST 9 - Mary Lowe Good: A success across sectors

Margaret A. Cavanaugh, mcavanau@nsf.gov. Directorate for Geosciences, National Science Foundation, Arlington, VA 22230, United States.

This overview of Dr. Mary L. Good's career serves as orientation for the symposium. Dr. Good's early years and education will be described and a timeline of her career will be presented. She quickly rose through the ranks in the Louisiana State University system, being named Boyd Professor in 1974. Her success in academia was matched by her prowess as vice president for research at a major oil company in the 1980's and later as Under Secretary of Commerce for Technology in the 1990's. She returned to academe at the University of Arkansas at Little Rock to become the founding dean of the College of Engineering and Information Technology. In 1980, she was appointed to the National Science Board, eventually becoming its chair. She has served as ACS President and been honored by the Priestley Medal. In many cases, Dr. Good has been the first woman to serve in a role or to be so honored.

HIST 10 - From instructor to icon: Mary Good's academic career in Louisiana

James G. Traynham¹, jmtraynham@msn.com, Alvin F. Bopp². (1) Department of Chemistry, Louisiana State University, Baton Rouge, LA 70810-5061, United States. (2) Department of Natural Sciences, Southern University, New Orleans, LA 70126-1009, United States.

Fresh out of graduate school, Mary Lowe Good began her faculty career at Louisiana State University as an instructor in 1954. She initiated a fruitful research career in inorganic chemistry and two years later, with her Ph.D. degree in hand, was promoted to Assistant Professor. In 1958, she and her husband, a physics Ph.D. recipient from LSU, moved to New Orleans, among the original faculty members of the newly-established Louisiana State University in New Orleans. LSUNO subsequently was renamed University of New Orleans but continued as part of the LSU System. Mary was rapidly promoted to professor, and in 1973 she became the first woman to be designated Boyd Professor (most distinguished rank) in the LSU System. In January 1979 she returned to LSU in Baton Rouge to be director of a new materials science program in the College of Engineering. Two years later she retired from LSU, after 26 years of service, to begin an industrial career.

HIST 11 - Meeting challenges for the NSF and National Science Board in the 1980's

Erich Bloch¹, ebloch.ag@huronconsultinggroup.com, Margaret Cavanaugh². (1) The Advisory Group at Huron, Washington, DC 20001, United States. (2) Directorate for Geosciences, National Science Foundation, Arlington, VA 22230, United States.

Concurrent with my term as Director of the National Science Foundation (NSF), Mary L. Good was a member, and later chair and co-chair, of the National Science Board (NSB). She was appointed to the NSB in 1980 by Jimmy Carter and reappointed by Ronald Reagan in 1986. In this presentation, I will describe some of the challenges facing NSF and the NSB during that period and our interaction in meeting them.

HIST 12 - Mary Good in industry: Skillful leader for R&D

Inara Brubaker, inarabrubaker@centurylink.net. UOP/AlliedSignal, United States.

In 1981 Mary Good was selected to be the Vice-President and Director of Research at the UOP Corporate Research Center. Her accomplishments in research and leadership were a good fit to lead the research department. During the 1980s, Mary led the Research Center through several changes in ownership, mergers, acquisitions and divestitures. She made certain that staff understood their role in new technology development, thus she could sell services to the business units.

After Signal merged with Wheelabrator-Frye, Mary convinced the analysts that the Research Center could provide research for the entire Signal conglomerate. When Signal merged with Allied, Mary became the President of Allied-Signal Engineered Materials Research and later the Senior Vice-President, Technology, for AlliedSignal. There she continued development of staffs at three company locations to provide the research support to all units.

Mary's contributions to the Research Centers (1981-1993) are in many expressions of appreciation and gratitude for her strategic and skillful leadership.

HIST 13 - Service to ACS: Mary L. Good, a member of the ACS presidential succession

Elsa Reichmanis, ereichmanis@chbe.gatech.edu. School of Chemical and Biomolecular Engineering, Georgia Institute of Technology, Atlanta, Georgia 30332, United States.

The November 18, 1985 issue of C&EN has as headline news, "Mary Good wins ACS presidential election." Mary Good became just the second woman to be elected as ACS President, winning the election by a little over half the votes cast in the three-way election. The focus of this presentation will be the initiatives, impact and ongoing legacy of 1987 ACS President, Mary L. Good.

HIST 14 - Legacy of leadership and some "Good" stories

Halley Merrell, normam8@yahoo.com. Secretary, Retired, American Chemical Society, United States.

For more than three decades Mary Good has been at the forefront in advancing the Society's policies and programs. Serving in several major leadership positions, Mary was critical to the Society's success at several levels. Her intelligence, critical judgment, and dedication to the Society's goals evidenced at the Board level, in the Council, and with the staff made her the go-to-person for articulation and resolution of numerous major issues. This former president and Board chair was always available with clear advice and counsel on any subject ranging from finance to international relations. Usually, she didn't wait to be asked.

HIST 15 - "There's Something About Mary....."

Madeleine Jacobs, Msj95@acs.org. American Chemical Society, Washington, DC 20036, United States.

"There's Something About Mary" was the title of a 1988 romantic comedy, but it's a fitting title for this talk, in which the presenter will shed some light on aspects of Mary Anne Good's career that may not be as obvious as her manifold contributions to industry, academia, government, and the non-profit world. "What's left?" you may ask. Attend this talk and you'll discover "There's Something About Mary" that you may not have known.

HIST 16 - How to retire - not!

Charles E. Hathaway, cehathaway@gmail.com. University of Arkansas at Little Rock, Little Rock, AK 72204, United States

This presentation will address what it is like to work FOR Mary Good as the founding Dean of the College of Engineering at UALR and as an economic driver in Arkansas.

HIST 17 - Remarks, responses, and memories

Mary L. Good, mlgood@ualr.edu. Donaghey College of Information Science, University of Arkansas at Little Rock, Little Rock, AR 72204, United States

Remarks, responses, and memories of the life and career of Mary L. Good.

HIST 18 - HyLogger™ near-infrared spectral analysis: A non-destructive mineral analysis for Aboriginal Australian objects

Rachel S Popelka-Filcoff¹: rachel.popelkafilcoff@flinders.edu.au, Alan Mauge², Claire E Lenehan¹, Keryn Walshe³, Allan Pring⁴. (1) School of Chemical and Physical Sciences, Flinders University, Adelaide, SA 5001, Australia (2) Department of Manufacturing Innovation Trade Resources and Energy (DMITRE), South Australian Government, Adelaide, SA 5000, Australia (3) Department of Anthropology, South Australian Museum, Adelaide, SA 5000, Australia (4) Department of Mineralogy, South Australian Museum, Adelaide, SA 5000, Australia

The CSIRO Australia HyLogger™ technology has been adapted from mineral exploration and mining applications to the high-resolution non-destructive infrared and visible light spectroscopic mineral analysis of Aboriginal Australian objects. Aboriginal Australian people primarily applied mineral pigments to wood, fiber, bark, resin or other organic substrates, making non-destructive in-situ scientific analyses of cultural objects challenging. This proof of concept study demonstrated the utility of the near-IR technology for the visual and

mineralogical analysis of Aboriginal Australian objects, as case studies for the development of methods to identify and differentiate types of mineral pigments regardless of substrate or binder. While many identified pigments such as hematite and goethite were expected for the red, orange and yellow pigments, Hylogger™ in combination with The Spectral Geologist™ software identified additional mixtures of previously unknown mineral components.

HIST 19 - Source of red pigments in Lower Pecos pictographs

Kaixuan Bu¹, kbu@go.olemiss.edu, James Cizdziel¹, Jon Russ². (1) Department of Chemistry and Biochemistry, University of Mississippi, University, MS 38677, United States (2) Department of Chemistry, Rhodes College, Memphis, TN 38112, United States

Laser ablation – inductively coupled plasma – mass spectrometry (LA-ICP-MS) was used to characterize the chemical composition of red pictograph pigments from the Lower Pecos Archaeological Region with the goal of identifying the source of the iron-based pigments. Thirteen paint specimen collected from two southwest Texas rock art sites were compared with three potential source materials (ochre, yellow siltstone and rhyolite), and two pigment cakes (crayons) that were excavated near the sampling sites. The chemical signature of the pictograph paints was strikingly similar to that of the yellow siltstone. If this material was the primary source for red pigments then we could conclude that the hunter-gatherers in the region 3000-4000 years ago had the technology to isolate the iron-oxide from the quartz matrix and convert the yellow goethite into red hematite.

HIST 20 - Artists' pigments in illuminated medieval manuscripts: Tracing artistic influences and connections

Mary Virginia Orna, mvorna@cnr.edu. Department of Chemistry, The College of New Rochelle, New Rochelle, NY 10805, United States

For the art historian, chemical analysis of pigments serves two main purposes. It can confirm or deny the alleged attribution or dating of a painting based on comparison with the known painting practices of the artist or period. In addition, the analysis of pigments can have a broader, and perhaps a more profound, importance to the historian as a tool for understanding more about the artistic process itself. Thus, in collaboration with several art historians and chemists, a lengthy project studying medieval illuminated manuscripts through the application of small particle analysis techniques was undertaken. Several dozen manuscripts from various museums and centers have been sampled and analyzed. Results to be discussed are the building of a pigment database, tracing lines of influence and interconnection between medieval centers of manuscript production, clarifying periods of known usage of several important artists' pigments, the difference in pigment usage between Armenian and Byzantine artists, the problems involved with handling manuscripts directly, and anachronistic pigment usage.

HIST 21 - Characterization of the ink on the Gospel of Judas: A collaborative approach

Joseph G. Barabe, jbarabe@mccrone.com, Kathleen A. Martin, Elaine F. Schumacher, Joseph R. Swider, Anna S. Teetsov. McCrone Associates, Inc., Westmont, Illinois 60559, United States

In 2006, the National Geographic Society (NGS) contracted with McCrone Associates to characterize the ink in a purportedly 3rd century document, the Gospel of Judas, in order to determine whether the ink was consistent with materials and manufacturing methods of 3rd century Egypt. McCrone's approach was to assemble a group of scientists with expertise in different aspects of microanalysis: The project required taking the initial ink samples in Geneva, Switzerland, specimen preparation for each of the instruments, and analysis by polarized light microscopy, scanning electron microscopy with high-resolution imaging and energy dispersive X-ray spectrometry (EDS), X-ray diffraction, transmission microscopy with EDS, and infrared and Raman spectroscopy. The ink turned out to be an unexpected mix of a traditional carbon black ink in a gum binder with an iron gall component which lacked the expected sulfur. Altogether, our findings are not inconsistent with 3rd century Egyptian ink.

HIST 22 - Unprecedented archaeo-chemical discovery of the 2,000-year old “Biblical-Blue” Tekhelet at Masada

Zvi C. Koren, zvi@shenkar.ac.il, *The Edelstein Center for the Analysis of Ancient Artifacts, Department of Chemical Engineering, Shenkar College of Engineering and Design, Ramat-Gan, Israel 52526, Israel*

There has been much confusion as to the malacological provenance, color, and chemical constitution of Tekhelet – the most sacred of the three Biblical dyes. For the first time, a two-millennia archaeological dyeing from the famous Judean palatial fortress of King Herod at Masada has been unambiguously identified as Biblical Tekhelet based on archaeo-chemical and physical evidence. Multicomponent HPLC analyses on purple archaeological dyeings and pigments produced from the most important Muricidae mollusk, Hexaplex (= Murex) trunculus, have shown that they consist mostly of three indigoidal colorants: red-purple 6,6'-dibromoindigo (“DBI”), violet 6-monobromoindigo (“MBI”), and dark-blue indigo (“IND”) [Koren ZC, *Microchim. acta* 2008, 162, 381-392]. Two chromatic sub-species of *H. trunculus* were used in antiquity, one that produced reddish-purple dyeings and hence richer in DBI, while the other produced bluish-purple dyeings richer in IND. This talk will discuss this unprecedented find, which may alter many people's perception of the color of “Biblical-Blue”.

HIST 23 - Characterizing organic colorants in mock-ups of a 15th century Iranian Timurid Qur'an by direct analysis in real time time-of-flight mass spectrometry

Christina Varney¹, rarmitage@emich.edu, *Cathy Selvius DeRoo*², *Ruth Ann Armitage*¹. (1) *Department of Chemistry, Eastern Michigan University, Ypsilanti, MI 48197, United States* (2) *Department of Conservation, Detroit Institute of Arts, Detroit, MI 48202, United States*

The Detroit Institute of Arts has in its Islamic collection a unique 15th century Timurid Qur'an. The Qur'an contains brilliantly-colored painted and polished paper with the calligraphy text inked onto the pages. The Qur'an is currently undergoing a multidisciplinary study to identify the inks, pigments, binders, dyes, gold alloys, and fibers used to construct the manuscript. X-ray fluorescence has shown that the colored pages contain primarily lead, suggesting that most of the colors are due to organic colorants. Raman microscopy indicated the presence of indigo in the blue pages, but fluorescence from organics, thought to be binder, was significant. We report here results from direct analysis in real time mass spectrometry (DART-MS) identifying organic dyes in mock-ups with a matrix that mimics that of the DIA Qur'an. These results will provide optimized methods for future work with authentic microsamples.

HIST 24 - Organic residues in archaeology: The highs and lows of recent research

Valerie J Steele, vsteele@thebritishmuseum.ac.uk, *Department of Conservation and Scientific Research, The British Museum, London, United Kingdom*

The analysis of organic residues from archaeological materials has become increasingly important to our understanding of ancient diet, trade and technology. Residues from many diverse contexts have been retrieved and analysed from the remains of food, medicine and cosmetics to hafting material on stone arrow heads, pitch and tar from shipwrecks, even ancient manure from soils. There have been many advances in our understanding of this kind of research over the past two decades. Some have led to the ability to give very specific and detailed interpretations of the materials preserved in the archaeological record. However there are still areas where we know very little, like the mechanisms at work during the formation and preservation of residues, and areas where each advance produces more questions rather than answers, as in the identification of degraded fats. This talk will discuss some of the most significant achievements in the field to date and the ongoing challenges for research in this area.

HIST 25 - Lipid analysis on Mapungubwe ceramics: Determining past function and foodstuffs

Zurethe Collins¹, zcollins9@gmail.com, *Ceri Z Ashley*¹, *Alexander Antonites*¹, *Sieglinde Bauermeister*², *Yvette Naude*². (1) *Department of Archaeology and Anthropology, University of Pretoria, Pretoria, Gauteng 0014, South Africa* (2) *Department of Chemistry, University of Pretoria, Hatfield, Gauteng 0028, South Africa*

Lipid analysis has been used in archaeology to analyse the residues left in ceramics, ranging from ancient Rome amphorae to the ceramics used during ancient Greek times. The use of lipids in other areas of the world

has shown the potential of this method to explore the actual use of ceramics. A single study using lipid analysis through GC/MS on Iron Age ceramics in southern Africa showed that lipids were present in a sample of ceramics, due to lipids seeping into the ceramics as a result of cooking activities. The present study will elaborate on this previous research through the examination of ceramics from the archaeological settlement of Mapungubwe. Previous ceramic studies have focused mainly on the stylistic characteristics instead of their function. This study will aim to determine the past use of ceramics and whether this is linked to form/decoration.

HIST 26 - Chemical evidence for the archaeological use of pulque, a pre-Columbian fermented beverage made from agave

Kasey L Hamilton¹, khamilto@tulane.edu, **James E Bollinger¹**, **Dan M Healan²**, **Scott M Grayson¹**, **Ravinder Elupula¹**. (1) Department of Chemistry, Tulane University, New Orleans, LA 70118, United States (2) Department of Anthropology, Tulane University, New Orleans, LA 70118, United States

Despite ethnographic, visual artistic, and early historical evidence for the consumption of pulque in Mesoamerica, no direct chemical evidence for the fermented agave beverage pulque has been reported within these archeological contexts. An organic residue study was conducted on ancient ceramic samples from the site of Tula, Hidalgo, Mexico. These samples associated with the Toltec site (c. 900 CE) were compared to lipid extracts from modern samples of pulque in order to establish the possibility of determining a chemical biomarker for its pre-historic consumption. Gas chromatography-mass spectrometry (GC-MS) analysis was used to identify surviving lipid contents embedded within thirteen different sherds, as well as to analyze the components of five different modern pulque samples. A terpenoid compound was found in each of the modern pulque samples, as well as many of the ancient ceramic sherds analyzed. The correlation of this compound, combined with characteristic fatty acids, provide strong evidence for the storage of this fermented beverage within the archaeological ceramics tested. The identification of these compounds as biomarkers for pulque consumption offers a valuable tool for identifying the use and trade of this important resource throughout prehistoric Mesoamerica.

HIST 27 - Identifying glue residues on 18th-century ceramics from Ferry Farm, George Washington's boyhood home

Daniel Fraser¹, dfraser@lourdes.edu, **Mara Kaktins³**, **Ruth Ann Armitage²**. (1) Department of Chemistry and Physical Science, Lourdes University, Sylvania, OH 43560, United States (2) Department of Chemistry, Eastern Michigan University, Ypsilanti, MI 48197, United States (3) The George Washington Foundation, Fredericksburg, VA 22405, United States

Archaeological investigations at Ferry Farm, home to the Washington family from 1738-1772, have yielded numerous ceramic artifacts associated with Mary Washington, George Washington's mother. Several of these bear residues of historic mending. The nature of the glues, and the relationship between these various artifacts, remains poorly understood. We are using direct analysis in real time mass spectrometry to investigate the composition of replica glues made from historic recipes. The adhesives fall into three classes: hide glues, resin glues, and casein-based "cheese" glues. While there is some overlap in recipes, marker compounds like abietic acid derivatives from pine resins and hydroxyproline from hide can help to rule determine which, if any, class was used on the excavated ceramics. Understanding the composition of the glues provides insight into Mary Washington's relationship to her ceramics and their uses, as well as information about the practice of china mending in the 18th century.

HIST 28 - Applications of direct analysis in real time mass spectrometry to cultural heritage materials

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Direct analysis in real time (DART) is an ambient ionization method for mass spectrometric identification of small molecules (less than 1000 Daltons) that requires little or no sample preparation. This nondestructive technique has been widely used for forensic science and pharmaceutical applications since its introduction in 2005. We are developing methods for characterizing art and archaeological materials by use of DART with high resolution mass spectrometry. Ongoing projects involve identification of organic colorants in textiles and painted

surfaces with complex matrices, screening ceramic artifacts for the presence of biomarker compounds characteristic of various organic residues, and differentiation of proteinaceous binders in glues and paints. Simple in-source derivatization or adduct formation, with or without additional sample preparation, can provide information about a wide range of materials of interest in cultural heritage studies without the need for chromatographic separation.

HIST 29 - Correlating paleoclimate and hominin activity: ESR dating at the Kharga Oasis, Egypt

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At Kharga Oasis in Egypt's hyperarid Western Desert, carbonate spring deposits and lacustrine sediment record several humid intervals during the Pleistocene, when wetlands, ponds, and small freshwater lakes provided water, thus permitting herbivore and human habitation. Finds include artifacts from Early Stone Age, Middle Stone Age, and later cultures. Standard ESR analysis was used to date freshwater mollusc shells (*Melanoides tuberculata*) found in tufas and lake silts at Wadi Miduawara. Dates suggest that freshwater existed at Miduawara at least during four different periods: at 13-20 ka, 31-40 ka, and 50-51 ka in Oxygen Isotope Stage (OIS) 2, 72-86 ka and 105 ka in OIS 5, 152-177 ka and 187 ka in OIS 6, and 198-208 ka and 229 ka in OIS 7. Moreover, snails and freshwater existed during the earliest Pleistocene, at ~ 2 Ma, which could have enabled the first hominin migration out of Africa via the Western Desert.

HIST 30 - Preliminary results on biomimetic methods based on soluble ammonium phosphate precursors for the consolidation of archaeological wall paintings

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This research develops hydroxyapatite (HAP)-based, inorganic mineral systems with improved properties for the consolidation of powdery wall paintings of archaeological significance. The scientific approach exploits biomimetic (biologically inspired design) principles to induce the formation of protective HAP crystals by triggering reactions between the calcium carbonate-rich layers in wall paintings and ammonium phosphate precursors. The high solubility and absence of toxicity of ammonium phosphates (precursors) and the stability of the calcium hydroxyapatite (reaction product) at varying pH, renders this treatment extremely promising for consolidation and protection of weathered wall paintings. Tests were carried out on experimental wall painting panels (representing the most common typologies across space and time) applying cellulose compresses of 1M and 2M solutions of diammonium hydrogen phosphate for 3 to 6 hours contact time. The consolidating effect, influence of the solution and conditions (composition, pH, contact time, application method) on hydroxyapatite formation (rate, extent) was evaluated through a series of structurally and compositionally sensitive analytics including: VPSEM-EDS, 3D-microstructure reconstructions, optical and mechanical analyses. Preliminary results indicated the formation of a porous hydroxyapatite network at the subsurface of the wall painting test panels, reduction of water absorption and dissolution at low pH and insignificant color change. These data show the potential of this treatment for the consolidation of powdery multi-layered wall paintings and their protection from weathering and deterioration induced by passage-of-time and environmental action linked effects.

HIST 31 - Geochemical analysis of occupational surfaces at Augusta, an 18th century English/Miskitu settlement on Roatan Island, Honduras

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Geochemical analyses of archaeological soils have been used in a variety of contexts to prospect for activity loci, with the greater goal of identifying the nature and extent of past human behaviors. However, much of this work has focused on prehistoric settlements, leaving gaps in our understanding about the fate and transport of chemical residues in historical settings. This paper reports the results of our ICP and colorimetric analyses of a range of earthen substances—soil, sediment, clay, plaster, and daub—from Augusta, Honduras. Now a major heritage site, Augusta was founded as an English stronghold on Roatan Island from 1742-1748 and hosted a mix of English militia and indigenous Miskitu. While historical documents provide details on the intentions of English settlers, we know very little about how English and Miskitu interacted on a daily basis. Here we discuss our research that integrates the geochemical and archaeological records to better understand the community.

HIST 32 - Analysis of samples excavated from a royal tomb in El Zotz: Application of materials science characterization techniques in archaeology

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This project focuses on the characterization of materials from burial offerings and painted decoration in a royal Maya tomb at El Zotz, Guatemala and their association to mortuary rituals. Archaeological findings included vessels, jade masks, organic materials (wood, cord, and textiles), specular hematite cubes, shells with powdered cinnabar, green (malachite) painted stucco assumed to have decorated the wooden bier where the king was resting, and caches of lip-to-lip orange bowls containing human phalanges. This paper describes preliminary findings from non-invasive and non-destructive analysis techniques including XRF, VPSEM-EDS, XRD, and Raman spectroscopy, emphasizing the potential of these combined technologies in the identification of organic and inorganic markers to infer burial customs. The nature and location of the findings, the evidence of pigment coloration on the bones employing hematite and cinnabar, and the indication of exposure of the bones to high temperatures suggest highly complex mortuary practices of Maya elite.

HIST 33 - Geochemical exploration of pottery and kiln fragments by ICP-OES at Aquabona (northeast Italy): Identifying late Republican and early Imperial Roman amphora production

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Major and trace-element concentrations determined by inductively coupled plasma-optical emission spectrometry (ICP-OES) show that three pottery groups can be distinguished involving the characterization of new amphora production sites at the Adriatic coast. This paper focuses on three different research questions: (1) characterize the amphora production at Acquabona, (2) identify possible chronological differences in raw material use, (3) define the relation of the ceramics with the excavated kilns and samples clay and soil material. The selection of raw materials is chronologically diversified and corresponds with the local production of amphora (175-25 BC). Groups are distinguished using SiO₂, CaO, Sr and Zr data combined with statistical factor and cluster analysis. Using geochemical analysis in determining pottery production proved to be successful in determining local signatures of ceramics and clays. In this study alkaline earth minerals (e.g. Ba and Sr) and high field strength elements (e.g. Zr) are considered useful for provenance studies taking into account the variety of clays and non-plastic materials used in manufacturing ceramics.

HIST 34 - Developing direct analysis in real time-time of flight mass spectrometric methods for identification of organic dyes in historic textiles

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Identifying organic dye compounds in textiles is a significant challenge in conservation science. Existing methods, such as liquid chromatography, require lengthy sample preparation procedures or relatively large amounts of sample. Direct analysis in real time mass spectrometry is a simple method for identifying a number of classes of dye compounds in single fibers. Blue and red fibers from historic tapestries from the Detroit Institute of Arts collections yielded clear spectra for indigotin and several anthraquinones including alizarin and purpurin, indicating the use of indigo and madder or Lady's bedstraw as sources of the colors. Yellows and greens have many possible botanical sources, and many of the colorant compounds are structural isomers. Flavones like luteolin and apigenin were readily observed in wool, silk, and cotton dyed with the most common natural yellow dyes. Ionization conditions that induce fragmentation may prove useful in differentiating some isomeric colorants.

HIST 35 - Rapid characterization of organic residues on ceramics using direct analysis in real time mass spectrometry

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Chemical analysis of adsorbed organic residues on ceramics is an established method for identifying food and trade items from the ancient world. Such characterization involves a variety of methods often requiring lengthy preparation steps. A large proportion of samples chosen for residue characterization yield no identifiable compounds of interest. DART-MS has potential for use as a high throughput method for screening samples for further study, as it requires little sample preparation and short run times. Our research is aimed at evaluating DART-MS as a biomarker screening tool prior to use on genuine archeological samples. Simulated archeological ceramics were prepared in the laboratory and evaluated using DART-MS. Mass spectra for wine residues showed significant quantities of tartaric acid even lengthy burial and intensive cleaning. Fatty acids in olive oil and dairy residues are not qualitatively diagnostic, but in-source doping to enhance triglyceride signals may differentiate these two materials.

HIST 36 - Biomolecular evidence from Neanderthal fireplaces

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The biomarker approach has been shown to be a powerful tool in archaeological research. Nevertheless, its application in prehistoric contexts is practically unknown. Here, we present results from a microstratigraphic study of three Neanderthal fireplaces from the Middle Paleolithic site of El Salt (Alicante, Spain) from this perspective. In this study, we identified the nature and preservation state of organic substances present in archaeological combusted sediment through coupled GC/MS and soil micromorphology. We found that the black layers of the fireplaces comprise a suit of organic substances possibly representative of a pre-combustion, pre-human occupation soil substrate, while human occupation and burning is associated with the white layers, which comprise pine wood ash, and in one case with a greenish layer beneath the ash containing coprostanol, a human faecal biomarker. Our study shows the potential of the biomarker approach in archaeological microstratigraphy, in this case, to identify periods of site abandonment.

HIST 37 - Laser ablation: Inductively coupled plasma, mass spectrometry (LA-ICP-MS) analysis of re-melted glass pendants from the North American upper Great Lakes

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In the Upper Great Lakes region of North America, Indigenous people crushed and re-melted glass trade beads to produce new adornment forms during the late 17th and 18th centuries. Laser Ablation – Inductively Coupled Plasma – Mass Spectrometry (LA-ICP-MS) was used to assess the chemical composition of re-melted glass pendants and re-melted fragments from four archaeological sites, as well as glass beads from these and other sites in the region, in order to investigate pendant production and trade. The data reflect both glass recipes used in Old World glass manufacturing processes and Indigenous raw material choices for re-melted glass pendant production. Glass of similar chemical composition recovered from different places may demonstrate trading relationships among archaeological sites. Chemical matches between beads and pendants from the same archaeological site may indicate that people were producing pendants on-site using available beads as raw material, rather than receiving beads and pendants from separate trade sources.

HIST 38 - Baghdad battery

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Beth Nahrain, Aramaic for the land of two rivers (Mesopotamia) is credited as the cradle of western civilization with history going back over 7000 years. This is the site of the first cities, first written letters, and earliest works and developments of arts, literature, libraries, laws, philosophy, mathematics, medicine, astronomy, and time.

In technology and science, this was the site of the invention of the wheel, glass, work with copper, iron and glass and chemistry. A less known discovery is believed to be a Galvanic cell, a clay jar housing an iron rod surrounded by a copper cylinder. The original, over 2000 years old, was discovered near Baghdad (ca 1936) and today is in the Berlin Museum, Germany. A replica of the device made at General Electric (ca 1939) is in the Berkshire Museum, Massachusetts. An updated review of the history of the Baghdad battery is presented here as part of the human chemical heritage.

HIST 39 - Source analysis of prehistoric obsidian artifacts in Sicily (Italy) using pXRF

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While obsidian artifacts have been found at many prehistoric archaeological sites in Sicily, only a few studies have been done to determine the specific geological sources used. In 2012, nearly 600 artifacts from 25 archaeological sites dating from the Neolithic, Copper, and Bronze Ages were analyzed non-destructively using a portable X-ray fluorescence spectrometer. A Bruker III-SD was equipped with a special filter (76 µm Cu, 25 µm Ti, 305 µm Al) to maximize trace element analysis. The resulting data for rubidium, strontium, yttrium, zirconium, and niobium were calibrated against international obsidian standards, and compared with results obtained with the same instrument on geological sources and subsources in the Mediterranean region. All artifacts tested came either from Lipari or Pantelleria, confirming visually-based predictions but also demonstrating that multiple subsources were used on each island. These results are used to assess variation based on site location, time period, and lithic typology.

HIST 40 - Advantages and disadvantages of pXRF for archaeological ceramic analysis: Prehistoric pottery distribution and trade in northwest Florida

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Ceramic artifacts from northwest Florida were tested non-destructively with a portable X-ray fluorescence spectrometer to study production and trade during the late prehistoric and protohistoric periods. Analyses using

a Bruker III-V were conducted on 500 ceramic samples from 8 archaeological sites, for 180 seconds and using a filter that provides highly precise data for trace elements Rb, Sr, Y, Zr, and Nb. While these ceramics were not painted or glazed, analyses were done on both inside and outside surfaces, and on broken edges. Quantitative values in ppm were produced using widely shared calibration software for these elements, and principal components analysis of the data show that the ceramics fall into distinguishable site groups, with most of the artifacts tested most likely coming from clay sources near each site. Further investigation assesses whether there are patterns based on object type and decoration, and the advantages and disadvantages of using this method.

HIST 41 - Roman rainbow: Investigation of ancient pigments by portable X-ray fluorescence spectroscopy and polarized light microscopy

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The subject of this study is a collection of raw pigments from a 2nd-3rd century C.E. pigment shop located in the Area Sacra di S. Omobono, in the Forum Boarium of Rome. The shop was excavated during the 1970's, yielding over fifteen containers of blue, light blue, green, yellow, orange, red, pink, and white pigments. A Bruker Tracer III-SD portable x-ray fluorescence spectrometer was used on-site to determine major, minor and trace elements, allowing us to identify the types of pigments present and to distinguish unique elemental profiles. Additional characterization was conducted using polarized light microscopy. Pigments were examined with transmitted and reflected light and between crossed polars, and particle characteristics were compared to those of reference samples of historical pigments. The pigments identified include two preparations of Egyptian blue, green earth, at least five distinct iron earth pigments (red, yellow, and orange ochre) and calcium carbonate.

HIST 42 - Assessing pre-Inca subsistence patterns through elemental analysis of human bone using a non-destructive portable X-ray fluorescence spectrometer

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Peru is commonly known for having the largest empire in pre-Columbian America but relatively little is known about the subsistence patterns of the pre-Inca communities that existed during the Initial Period. Our research tests the hypothesis that there was a difference in food consumption and acquisition practices between coastal and inland communities, using a portable X-ray fluorescence spectrometer to measure strontium, barium, calcium, and other elements in human bone. The use of a non-destructive pXRF has become a very beneficial tool for the analysis of archaeological materials especially human remains. The pXRF analysis of fifty-three bone samples from the sites of Pacopampa and Cardal suggest that, although the pXRF produces precise results, there are outliers in the data that could only be explained by contamination or degradation of the bone after deposition into the earth. This may be corrected by thorough cleaning, multiple spot analyses, and selecting well-preserved samples.

HIST 43 - Lipid residue analysis of pottery at Liangchengzhen, Shandong, China

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A lipid residue analysis of 18 pottery sherds excavated in Liangchengzhen, a Longshan site (2600-1900 B.C.) was undertaken to compare the chemical compositions of pottery forms with the actual food residues contained in the vessels and to identify trace biomarkers for food sources. The total lipid was extracted from pottery samples using a Soxhlet extraction device. Modern reference samples of dried fish, rice, millet, and pig bone were extracted using a Dionex 200 accelerated solvent extractor. The alkane lipid fraction was separated by column chromatography. Samples were run on a Varian 320 gas chromatograph/mass spectrometer equipped with a Varian Factor 4 VF-5MS fused silica capillary column. Biomarker peaks for marine samples were the ratio of the

C15 and C17 alkane peaks and the ratio of the C25 to C27 alkane peaks for terrestrial samples. The results of the residue analysis supported the hypothesized pottery use and function during the Longshan.

HIST 44 - Metal plate connectors of the Tripitaka Koreana woodblocks

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Composition of the metal plate connectors on the corners of the Korean Buddhist Tripitaka (Canon) Printing woodblocks was analyzed using X-ray fluorescence spectroscopy (XRF). The Buddhist Canon Printing Woodblocks were carved during AD 1236-1251. The woodblocks are one of Korean Treasures and enlisted as a World Cultural heritage in 1995 and documentary heritage in 2007 by UNESCO. Copper was the main component according to XRF analysis. Shapes and composition of the iron nails used for metal plate connectors connecting end pieces and main printing wooden plate were also examined using XRF. Period of attaching the metal plate connectors to the woodblocks were examined with other related documents. It is believed that the copper plates in addition to Japanese lacquer coatings helped the conservation of the woodblocks from fungi digestion because copper metal exhibits antimicrobial properties and copper compounds are actually used as wood preservative to prevent dry rot.

HIST 45 - Chemical analyses of black pigments from Olmec pictographs in southern Mexico

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Pictographs in the Middle Formative site of Oxtotitlán were systematically analyzed using a portable XRF system determine the primary pigment materials. We also collected small paint chips from selected artifacts under a National Geographic /Waitt research grant for additional analyses in the laboratory. Of particular importance was selecting paints that could be radiocarbon dated. Several black paints at the site were considered viable for C-14 dating because the lack of Mn suggested that charcoal was used to make the paint. Additional analysis of the pigments indicated that charcoal is not the pigment, but bitumen is more likely the substance used to make the paint. If bitumen is the pigment, then this is the first evidence that it was used in the production of ancient parietal rock art. Moreover, since bitumen can be provenanced based on organic composition, it might be feasible to ultimately determine the source of the pigment material.

HIST 46 - Portable X-ray fluorescence in archaeology: Issues related to limitations of instrumentation and suggested methods to achieve desired results

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This is an exciting time for archaeology. The ongoing miniaturization of analytical instrumentation has advanced to a state where traditional lab based analysis can now be performed in the field (i.e. XRF, Raman, FTIR etc...). This in situ analysis can be enormously advantageous for archaeologists providing identification of artifacts on the spot and even helping guide excavation to be more beneficial. But what seems advantageous can also be detrimental if not fully understood. pXRF offers a utopian view of this on site elemental analysis, but what is often offered and promoted by manufacturers rarely will produce viable results when investigating the material types we encounter. The underlying physics of XRF limit what we should consider acceptable data, yet we can extract exceptionally useful information when this instrument is used responsibly. Several examples will be given to emphasize this position and methods of analysis will be recommended to aid in proper interpretation of raw data.

HIST 47 - Interregional interaction and Dilmun power in the Bronze Age: A provenance study of ceramics from Bronze Age sites in Kuwait, Bahrain, and the Indus Valley using non-destructive pXRF analysis

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Known as the most interactive period of trade and interregional interaction, socio-political regions in the Bronze Age were highly involved in the Near Eastern economy. Dilmun was in charge to control the commodities and transshipment between Gulf political entities such as Mesopotamia as well as Eastern Arabia and far-distance ones such as the Indus Valley. This paper seeks to launch the first scientific provenance study on a regional scale for 2nd millennium Dilmun pottery in the Persian-Arabian Gulf, particularly Kuwait and Bahrain. Going beyond typological technique, our aim is to reconstruct a chemical database of Bronze Age ceramics and fingerprint the production centers in the Persian-Arabian Gulf using trace elements Rb, Sr, Y, Zr, and Nb obtained with a non-destructive portable X-ray fluorescence spectrometer. Multiple spots on artifact surfaces were tested to inspect the quantitative precision of the technique and the homogeneity of ceramics analyzed non-destructively.

HIST 48 - Investigating human social dynamics and interaction in Ecuadorian prehistory through obsidian artifact provenience

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The exchange of non-local goods has long been considered an important component of life throughout much of Ecuadorian prehistory. While a large portion of our understanding of exchange in this region comes from ethnohistoric records, archaeologists primarily have contributed to the study of exchange by sourcing obsidian. We present the results of recent geochemical sourcing research with portable X-Ray Fluorescence (pXRF) instrumentation that analyzed more than 2500 obsidian artifacts from more than 60 archaeological sites, quadrupling the number of sourced obsidian artifacts from Ecuador. In addition to providing new insights on the relevant geochemical signatures for the region, this robust dataset allows for the opportunity to go beyond documenting the presence of various raw material sources at particular sites and begin to consider the potential processes that could have produced the wide distribution of non-local goods in Ecuadorian prehistory.

HIST 49 - Energy dispersive X-ray fluorescence analysis of sets of coins of the Kushan Empire, revolutionary France, and the state of Mysore: Three case studies throughout history

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Three series of copper coins have been analyzed by energy dispersive X-ray fluorescence spectrometry for elements including copper, zinc, tin, lead, silver, gold, and several other, possibly trace, elements. The coin sets are from the ancient Kushan Empire, from France during the revolutionary government of the late 1790's, and from the Indian state of Mysore. The elemental, compositional make up of each set, as well as the implications of the findings, will be presented and discussed.

HIST 50 - pXRF analysis of arsenic when lead is present: A cautionary tale

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Although the InnovXAlpha Series portable X-ray fluorescence device we used to qualitatively analyze ceramics pigments and Lowry Pueblo Kiva white paint repeatedly reported As (in hundreds of measurements), there was

no significant amounts of As present in those samples. Obviously, care must be taken when using that device to determine As when there are significant amounts of Pb present in the samples.

HIST 51 - Archaeological chemistry: A career in ruins

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This paper will give a brief review of the history of the applications of chemistry to archaeology, highlight a few modern examples, and discuss the challenges presented by the need to integrate research from two very different cultural traditions, straddling the science/humanities 'divide'.

HIST 52 - Lead and strontium isotopes in archaeology

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Lead and strontium isotopes are among the most powerful and widely applied tracers in archaeometry. Both together and separately, they are used to determine the provenance of many archaeological materials, including metals, glasses, glazes, minerals, ceramics, bone, teeth, and wood. Advances in the past decade have made these isotopic measurements more precise, rapid, and affordable than ever, creating opportunities to both re-examine older studies of provenance and initiate new ones. This talk describes recent applications of lead and strontium isotopes to materials preserved in the archaeological record of the American Southwest and Mexico (e.g. turquoise, metals, glazes). These new isotopic data revise our knowledge of artifact provenance across these regions and challenge long-held ideas about the nature of long-distance exchange networks in Prehispanic North America. The novel insights gained through these studies highlight the continuing power and potential of lead and strontium isotopes as tracers of archaeological materials.

HIST 53 - Use of isotopes to determine geographic origins of humans: Cautionary tales

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After decades of measuring various isotope ratios to determine geographic origins of humans, we have progressed beyond necessarily simplistic concepts to uncover dietary, ontogenetic, and methodological effects that create both problems and opportunities for a richer understanding of past human behavior. Illustrative case studies will be presented.

HIST 54 - Seasonal reproduction patterns by isotopic signatures ($\delta^{18}\text{O}$) on early Eneolithic sheep of Cheia (beginning of the 5th mil. cal BC, Romania)

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Cheia is an Early Eneolithic site (beginning of the Vth mill. BC; Hamangia culture) settled in the central hills of the Dobrogea province in south-eastern Romania. The site delivered an exceptional collection of faunal remains. Although the economy relied heavily on cattle husbandry, an important secondary role was given to domestic caprines. The recovered assemblage includes an important number of sheep tooth rows. We performed stable isotope analyses in tooth enamel from the second and third molars of different individuals. Variations in the sequential analyses of carbonate $\delta^{18}\text{O}$ values in both molars are used to investigate seasonal reproduction patterns. The results obtained are compared with recently available data from modern referential breed sheep populations in Europe with known birth dates. High seasonal resolution is finally obtained and the distribution of sheep births throughout the year is represented, adding significance information to the study of sheep management.

HIST 55 - Stone tools: Stable isotope analysis of organic residues

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We utilized plasma oxidation and stable isotope mass spectrometry to study organic residues on stone tools. Corn, a C4 plant, was processed using modern tools. Two different washing techniques were performed to remove surface contamination from handling prior to placing stone tools in an oxygen glow discharge. Organic residues trapped in stone tool micro-fracture cracks were oxidized to carbon dioxide for stable isotope mass spectrometry. This preliminary study demonstrates proof of concept for stable isotope analysis and radiocarbon dating of organic residues on stone tools using plasma oxidation.

HIST 56 - Biogeochemical contributions to our understanding of hominin diet

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Biogeochemical approaches have provided insights into the diets of early hominins and more recent humans. Revelations in the past few years, in particular, have fundamentally changed our understanding of the diets of several hominin taxa, and in so doing, are shaping the dialogue about the selective pressures faced by our ancestors. Moreover, data have recently been generated for nearly the entire suite of African hominins, which allows us to address questions about regional and temporal differences, as well as about the relationship between diet and morphology in new ways. Here, I discuss these data, how they are shaping our thinking about human evolution, and try to draw some general conclusions about the contributions of biogeochemistry to our understanding of the past.

HIST 57 - Identifying ancient population movement in Honduras using strontium and oxygen isotopes: New values and interpretations

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Strontium isotope ratios in human tooth enamel show widespread population movement among the Classic period Maya, including in-migration to both large centers and rural communities. Our ability to identify potential homelands for migrants is based on (1) understanding the relationship between geologic variability and $87\text{Sr}/86\text{Sr}$ values, and (2) obtaining values for all likely homelands in each study. This is particularly important for studies of sites like Copan, which is the major urban center located at the periphery of the Maya region. Thirty-four modern plant and animal samples from western Honduras show that the area's geologic regions have distinct average strontium isotope values. These data elucidate additional potential homelands for non-local individuals buried at Copan and other Maya sites, which we demonstrate by re-interpreting conclusions in previously published studies. Equally important is the potential for exploring migration patterns among diverse indigenous populations in Honduras, like the Maya, Jicaque, and Lenca.