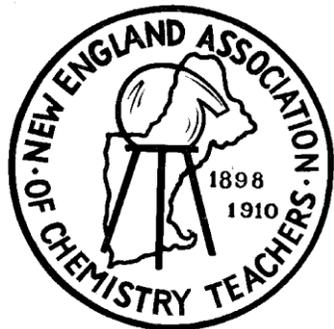


New England Association of Chemistry Teachers

76th Summer Conference



**Clark University
950 Main Street
Worcester, MA 01610**

**Monday
August 10, 2015**

Colorful Chemistry

76th Summer Conference Committee

Meledath Govindan, Chair

Mary Christian-Madden

Jerusha Vogel

Mark Turnbull

Kathy Siok, Registrar-Treasurer, Scholarships

Lorraine Kelly, Contact Hours/PDP

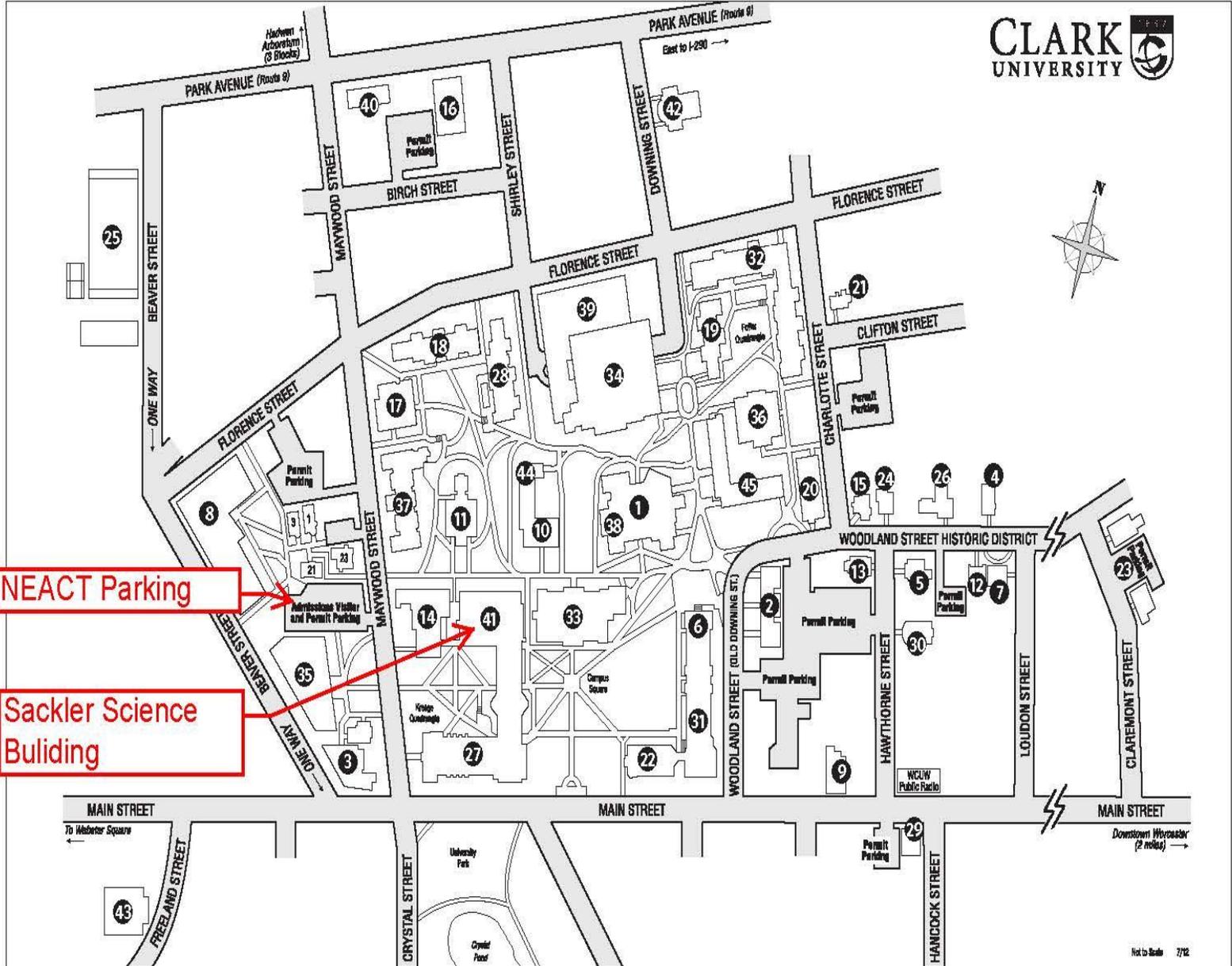
General Information for Participants

Register online at: www.neact.org or use the form on Page 11.

- **Conference Site Information**

- Clark University website: www.clarku.edu
- Address: Clark University, 950 Main St., Worcester, MA 01610.
- Directions: <http://www.clarku.edu/directions.cfm>
- Campus Map: http://www.clarku.edu/campusmap/pdfs/mapwithlegend_11_05_2012.pdf
- Parking. Admissions Visitor Parking on Maywood St. This is next to the Biological Science Bldg (#35 on map) and across from Sackler Science Center (#41 on map). If this is full, try the Downing Street Parking Garage (#39 on the Campus Map) next to the Kneller Athletic Center; enter and exit on Downing Street only. See campus map on p.3.

- **Hotel Accommodation for August 9th and/or 10th.** For those who would like to stay overnight, rooms have been blocked at the **Courtyard by Marriott Hotel, 72 Grove St., Worcester, MA 01605** for the group rate of \$109+tax (single or double occupancy). Call the hotel at 508-363-0300 and ask for *NEACT Conference* rate. **Reservation must be made by July 9th in order to guarantee this rate; so book early.** If necessary you may e-mail Patricia Elkins: pelkins@colwenhotels.com
 - The informal social hour Monday night will be at this hotel's conference room.
 - There are also several other hotels in the area but we have not negotiated any special rate with them. Here are two of them:
 - Holiday Inn Express, 110 Summer St, Worcester, MA 01608. Phone: (508) 757-0400
 - Hilton Garden Inn, 35 Major Taylor Blvd, Worcester, MA 01608. Phone: (508) 753-5700
- Sign-up for workshops at the time you check-in. If you are attending the Tour of the Worcester Arts Museum, you will need to drive there or carpool with others. Museum admission is extra. If you plan to attend either of the computer workshops by Dan Damelin, please bring your own device to connect to the Internet – laptop, iPad or another kind of tablet.
- To receive Contact Hours/PDP you should see Lorraine Kelly at the time of check-in.



NEACT Parking

Sackler Science Building

New England Association of Chemistry Teachers 76th Summer Conference Schedule (Tentative)

Sackler Science Bldg., Clark University (#41 on Campus Map)

8:30 am	Arrival, registration, light breakfast : Sackler Science Hall Foyer		
9:00 – 9:15	Welcome Greetings Dr. Meledath Govindan , <i>Professor of Chemistry, Fitchburg University, President, NEACT</i> Prof. Nancy Budwig , <i>Associate Provost and Dean of Research, Clark University</i>		Room: Sackler 121
9:15 – 10:15	Sr. Mary Virginia Orna, College of New Rochelle. "HISTORIC MINERAL PIGMENTS: COLORFUL BENCHMARKS OF ANCIENT CIVILIZATIONS"		
10:15 – 10:30	Recessed Annual Meeting		
10:30 – 11:50	Workshop 1: Daniel Damelin , Concord Consortium, Concord, MA. "Infusing curricula with modeling: Explore and discuss a sample of Next Generation Science Standards (NGSS) inspired materials." S-123 .	Workshop 2: Sue Klemmer , Camden Hills Regional High School, Rockport, ME. "Mostly Purple Stuff" Room: Chem Lab	Workshop 3: Dr. Gonghu Li , University of New Hampshire. "Quantum Dots: Colorful Chemistry in Teaching and Research." S-121
12:00	Lunch : Faculty Lounge		
1-2	Dr. James Kaufman , Laboratory Safety Institute, Natick, MA. "Learning by Accident." S-123	Dr. Frank Lamelas , Worcester State University, Worcester, MA. "Using Optics and Modern Physics to Analyze Art Objects" S-121	
2:30 – 4:30	Dr. Sudha Swaminathan , Worcester State University, Worcester, MA "Physics Tour of the Worcester Art Museum" (Limit: 20; Museum admission free of charge) Participants must drive there or carpool.	2:00 – 3:30. Workshop 4: Lolita Pellizzari , North Country Union High School, Newport, VT. "Changes in Matter – A Modeling Workshop Using POGIL Concepts." Room: Chem Lab	2:00 – 3:30. Workshop 5: Daniel Damelin , Concord Consortium, Concord, MA. "Designing formative assessments for performance expectations as expressed in the NGSS." Room S-123
3:30 – 4:00	Afternoon break		
4:00 – 5:30	Workshop 6: Dr. Mathangi Krishnamurthy , Fitchburg State University. "Colorful Chemistry with Glucose Oxidation." Room: Chem Lab		4:00 -5:30 Workshop 7: Mary Christian-Madden , NEACT Immediate Past President and Curator, "The Colorful Chemistry of Semi-Precious Gems & Minerals." S-223
5:30 Conference Photo: Location TBA 5:30 - 7: 30 Reception and Dinner: Winton Family Dining Room 7:30 – 8:30 Sr. Mary Virginia Orna, "FASHION, PHARMACEUTICALS, FOOD, AND FUN: THE CHEMICAL HISTORY OF COLOR" 9:00 - You are cordially invited to an Evening Social at Courtyard by Marriott, 72 Grove St., Worcester. (Cash Bar)			

Program Descriptions:

9:15 – 10:15 am. Historic Mineral Pigments: Colorful Benchmarks of Ancient Civilizations.

Sr. Mary Virginia Orna, College of New Rochelle, New Rochelle, NY 10805

Our ancient forebears certainly made use of pigments to color virtually everything they used or had: bodies, caves, pottery, sculpture, stone structures, clothing and other textiles. This paper will document their usage with an emphasis on mineral pigments, natural and synthetic. Modern investigations on their preparation and uses have gradually increased our awareness, and in some cases, awe, of the degree of sophistication possessed by these early civilizations.

BIO: Sister Mary Virginia Orna, O.S.U. (Order of Saint Ursula) is Professor of Chemistry at the College of New Rochelle. She is also Editor-at-Large of Chemical Heritage magazine, former Director of Educational Services at the Chemical Heritage Foundation, and former Publications Coordinator of the Journal of Chemical Education. She received her Ph.D. in analytical chemistry from Fordham University. She has lectured and published widely in the areas of color chemistry and archaeological chemistry. Her articles have appeared in the *Journal of Chemical Education*, *Color Research and Application*, *Studies in Conservation*, *Analytical Chemistry*, *Microchemical Journal*, *Journal of Biological Chemistry*, American Chemical Society monographs, and various other journals. She has also authored numerous book chapters and encyclopedia articles, five books and edited nine others. She is active in several divisions of the American Chemical Society, having served as Chair, Program Chair and Treasurer of the Division of the History of Chemistry. She is currently serving as ACS Councilor and a member of the ACS Local Section Activities Committee. Her two forthcoming books, “The Lost Elements: The Periodic Table’s Shadow Side” will be published by Oxford University Press in November, and “Science History Study Tours” will be published by the American Chemical Society in 2015. Sr. Orna has received numerous awards and honors including the Timm Award from the NEACT.

10:30 am – 12:00 Noon. Workshop. Infusing curricula with modeling: Explore and discuss a sample of Next Generation Science Standards (NGSS) inspired materials.

Daniel Damelin, Concord Consortium, Concord, MA

Modeling is a central practice that is part of the Next Generation Science Standards. Participants will explore a range of freely available simulations and see how some have been used in the context of a curriculum specifically designed to respond to the NGSS call for greater student engagement in scientific and engineering practices coupled with disciplinary core ideas and cross cutting concepts. Participants will share how they currently use similar tools, and the pedagogical considerations that go along with integrating these components in an online curriculum. The curricular materials are freely available as are the simulations, which are easily integrated into any curriculum, either through links or directly embedded into web-based materials. Learn how to do this for yourself at this hands-on workshop. **Computers are not provided. Bring your own laptop, iPad or tablet to connect to the Internet, or share with someone else.**

Bio: Daniel Damelin has worked in the field of education for 20 years, as a teacher, curriculum and technology developer, professional development leader, and educational researcher. A long standing NEACT member, he is currently an employee of the non-profit Concord Consortium, where he has worked on numerous NSF and foundation funded projects that resulted in open educational resources to support the learning of science through simulation, interactive curriculum and pedagogy, and formative assessment.

10:30 am – 12:00 Noon. Workshop. Mostly Purple Stuff

Sue Klemmer, Camden Hills Regional High School, Rockport, ME.

Color is a great way to capture students' attention. But what do you do with that attention once you've caught it? This workshop will feature some of my favorite demonstrations and labs that feature color as keys to show off and help explain the behavior of materials. We'll start with a short discussion of what I look for in a good demo or lab to promote students' actively thinking about what they are seeing, and how I weave "live events" into assessments. We'll spend the bulk of the time trying out a buffet of activities, and close with a round-up of participants' questions and insights. Oddly enough, most of these reactions feature purple or its color neighbors blue and pink. Activities will include: doping agar with indicators to show off oxidation & reduction sites in nails; a simple reaction for exploring the effects of concentration & temperature on reaction rate (an NGSS performance indicator) plus another demo for assessing what students got from the first one, how to find the composition of brass via colorimetry, plus some stuff on stoichiometry and maybe solution volume and pressure.

Bio: Sue Klemmer teaches chemistry at Camden Hills Regional High School, a 650-student public high school serving five towns on the mid-coast of Maine. Her special interests are the use of history of chemistry to teach content and scientific methods, concept mapping, and modeling. She is currently the Northern Division Chair and always looking for ways to connect to the teachers in this geographically isolated part of NE. She is also a member of the Instruction and Professional Development (IPD) Committee of the Maine Education Association. Sue earned her BA in Chemistry at Wesleyan University in 1975, then spent a year as a volunteer teacher on the southern tip of Lake Michigan. She then went off to Carnegie Mellon for a PhD in theoretical chemistry but had fallen in love with teaching and left after a year. She has been teaching high school ever since. She took a sabbatical for 2012-2013, pursuing an MS in Science Education at the University of Maine, and plans to complete the thesis and graduate in December, 2015.

10:30 am – 12:00 Noon. Workshop. Quantum Dots: Colorful Chemistry in Teaching and Research

Gonghu Li, Department of Chemistry & Materials Science Program, University of New Hampshire

Quantum dots are semiconductor nanoparticles that are small enough to exhibit quantum mechanical properties. The optical absorption and emission properties of a quantum dot are often strongly dependent on its size and shape. In this lecture, we will introduce quantum size effect and discuss how quantum dots are incorporated in our physical chemistry curriculum at UNH. We will also present selected results on solar energy research using quantum dots.

Bio: Dr. Gonghu Li grew up in a small village near Wuhan City in China. In 2000, he started graduate studies at the University of Iowa where he received a PhD degree in Chemistry. After postdoctoral training at Northwestern University and Yale University, Dr. Li joined the faculty of chemistry at UNH in 2009. He also has a joint appointment in the Materials Science Program. His current research focuses on developing innovative materials for solar energy applications.

1:00 – 2:00 pm. "Learning by Accident."

Dr. James Kaufman, Laboratory Safety Institute, Natick, MA.

For over 40 years, I've been interested in and concerned about laboratory accidents. I want to share with you what prompted my sudden interest after 25 years in school. What led me to believe that the accident rate in schools and colleges was 10-100 times greater than the chemical industry! The Laboratory Safety Institute's (LSI) lab accident collection includes over 5,000 examples drawn from more than 150 different types of labs in over 30 countries. I'm going to share lots of examples including some from Clark University and WPI. And, I'm going to include a couple of examples to

illustrate the point that we sometimes don't know what we don't know. LSI has taken several approaches to sharing its knowledge about laboratory accidents. I want to describe these including serving as an expert witness in dozens of lab accident cases. LSI has also come up with six important recommendations to help reduce the frequency of lab accidents. I would like to share them with you. Please join me and learn by accident. Learn the answer to the question: "what does it take to convince people to care?" Please bring your own example of the most serious lab accident that you, a colleague, or a student has experienced to share with others.

Bio. Dr. James Kaufman is President/CEO of The Laboratory Safety Institute (LSI) and former Professor of Chemistry and EHS Director at Curry College. He received his Bachelor's degree in chemistry from Tufts University and his doctorate in organic chemistry from Worcester Polytechnic Institute (WPI). After two years as a post-doctoral fellow in the WPI Chemical Engineering Department converting garbage into fuel oil, Dr. Kaufman joined the Dow Chemical Company's New England Research Laboratory as a Process Research Chemist. During his four years with Dow, he became increasingly involved in laboratory safety related activities. He authored "Laboratory Safety Guidelines". Originally distributed by Dow, now over four million copies (in thirteen languages) of the widely requested and reprinted brochure are in circulation. Dr. Kaufman is the founder and President/CEO of The Laboratory Safety Institute – an international, non-profit center for safety in science and science education. LSI's lectures and training programs, AV-lending library, Mini-Grants, Internet discussion list, and publications help both academic and non-academic institutions throughout the world. LSI is supported, in part, by grants from individuals, foundations, companies and professional societies.

1:00 – 2:00 pm. Physics in Art: Using Optics and Modern Physics to Analyze Art Objects.
Frank Lamelas and Sudha Swaminathan, Worcester State University, Worcester, MA 01602

We have developed an introductory lab course where we show how physical methods can be used to study art objects. We start with a basic description of particles, atoms, and matter, and then introduce geometrical optics and imaging. Next, the physical structure of traditional oil paintings is covered in detail, using a textbook written for students of art conservation.¹ Specific components which are discussed include the painting support, the ground, paint pigments and binders, and varnishes. We also discuss the procedures followed by traditional artists, since these are essential in the analysis of a finished painting. We simultaneously introduce x-ray, infrared, and raking-light imaging, which are commonly used in art conservation labs. Other topics which are covered include optical and mass spectroscopy, carbon dating, and dendrochronology. The talk will include a brief summary of the course content and a discussion of specific lab activities, with a "how-to" emphasis on techniques such as the fabrication of inexpensive detectors and cameras. Participants are encouraged to also attend the tour of the Worcester Arts Museum that follows.

Sarah Wentworth Apthorp Morton (Mrs. Perez Morton), Gilbert Stuart, 1755-1828.
Worcester Art Museum, Gift of the grandchildren of Joseph Tuckerman, 1899.2.
Oil on canvas.

The inset shows an infrared image² which helps to reveal an *underpainting*. The explanation of this painting includes a discussion of white "pigment" particles, the index of refraction, and a chemical reaction involving oil-based paint binders.



¹ *Seeing Through Paintings*, Andrea Kirsh and Rustin Levenson (Yale University Press, New London, 2000).

² Rights to the images of the painting and the underpainting are held by the Worcester Art Museum.

2:30 – 4:30 pm. Physics Tour of the Worcester Art Museum. Participants should drive themselves to the Museum or carpool with others.

Sudha Swaminathan and Frank Lamelas, Worcester State University, Worcester, MA.

Analytical techniques based on physical principles are widely used in art conservation. Most students have favorable impressions of museums and art objects. Therefore, describing scientific analyses of art is one way of introducing students to the fundamental science underlying the analyses. The Worcester Art Museum is close to the Worcester State University campus. Since many objects in the permanent collection have been studied using physical methods, one can use a museum tour as an observational laboratory experience. Through the tour, students learn how physical principles are used to solve interesting problems in an appealing real-world setting. In our case, the tour complements hands-on experiments in an instructional laboratory which is part of a physics course titled Physics in Art. We present a tour of nine objects at the Worcester Art Museum which have been studied using multi-spectral imaging, optical analysis, and a nuclear isotope technique. We will give a brief description of each object and an explanation of scientific data obtained by museum staff and other researchers.

Bios. Dr. Frank Lamelas is Professor in the Department of Earth, Environment and Physics at Worcester State University. He received his B.S. in applied math and physics at the University of Wisconsin – Milwaukee, and M.S. in materials science at UW-Madison, and the Ph.D. in physics, at the University of Michigan. He then worked as an engineer at IBM, conducted postdoctoral research at AT&T Bell Labs and the University of Missouri. He has served as a faculty member at Marquette University, Boise State University, and Worcester State University.

Dr. Sudha Swaminathan received her Bachelor's degree in Physics and Mathematics from Mount Holyoke College in South Hadley, Massachusetts and her PhD in Theoretical Nuclear Physics from the University of Michigan in Ann Arbor. She is currently an Associate Professor in the Department of Earth, Environment and Physics at Worcester State University. Together with Frank Lamelas, she developed the *Physics in Art* course and the *Physics at WAM* tour, which is the subject of the workshop.

2:00 – 3:30 pm. Designing Formative Assessments for Performance Expectations as Expressed in the NGSS.

Daniel Damelin, Concord Consortium, Concord, MA.

The Next Generation Science Standards represent a shift toward performance expectations. Developing assessments for student performance is challenging. Participants in this workshop will share current efforts and learn about a principled process for developing formative assessments to gauge student progress toward achieving mastery of these kinds of goals. Explore exemplar items, and develop your own as part of this interactive workshop. **Computers are not provided. Bring your own laptop, iPad or tablet to connect to the Internet, or share with someone else.**

2:00 – 3:30 pm. Workshop. Changes in Matter – A Modeling Workshop Using POGIL Concepts.

Lolita Pellizzari, North Country Union High School in Newport, Vermont.

These activities are designed for students who find it difficult to understand abstract ideas or concepts such as the idea that mass is conserved during all types of reactions. Student will use bingo chips to represent particles or atoms, and colored pencil to draw the particles or atoms in balancing chemical equations. In activity 1, students will perform a series of activities involving mass measurement before and after a reaction. A teacher

guided discussion will follow. The discussion also includes particle diagramming of each reaction. In this process, students will use colored bongo chips to represent the atoms or particles. The particle diagram (using bingo chips) will illustrate that the mass is the same before and after a reaction. This will lead students in defining the law of conservation of mass. In activity 2, students will then write the chemical reactions in word. They will write the reactant(s) and products(s). Using colored pencils, they can draw a particle diagram for atoms, or molecules involved in each of the reactions. They will use different color for different atoms in a molecule. Then, they will evaluate their equation and see whether there is the same number of colored atoms in both side of the equation. In the end, student will be able to write a complete and balanced chemical equation.

Bio. Lolita Victoria Pellizzari is teaching chemistry at North Country Union High School in Newport, Vermont. She completed a Bachelor's Degree in Secondary Education with a concentration in General Science at Central Mindanao Colleges, Philippines and subsequently earned 30 credits towards Master's Degree in teaching chemistry at the University of Immaculate Conception, Davao City, Philippines. She moved to the United States in 2001. After completing the teacher certification requirements in Rhode Island and Vermont, she moved to Vermont and accepted a teaching position at Concord High School. After working at Concord High School for three years, she moved to her current position at North Country Union High school in Newport, Vermont where, she, her husband and son presently reside.

4:00 – 5:30 pm. Workshop: Colorful Chemistry with Glucose Oxidation.

Dr. Mathangi Krishnamurthy, Department of Biology and Chemistry, Fitchburg State University.

This experiment is a demonstration of a simple redox reaction. Glucose is a reducing agent, which in an alkaline solution will reduce methylene blue, a redox indicator, to its colorless form. If the reaction is carried out in a stoppered flask which is shaken to introduce oxygen, the methylene blue gets converted back to its oxidized form (blue in color). It is possible to cycle between the reduced and oxidized forms of methylene blue by shaking intermittently. The same reaction can be performed with other redox indicators which also produce distinct color changes when they cycle between their reduced and oxidized states.

Bio: Dr. Krishnamurthy received her Bachelors in Pharmacy (B.Pharm.) degree from Chennai, India. She then came to the U.S. to pursue graduate studies at the University of Tennessee Health Science Center, Memphis and received her PhD in Pharmaceutical Sciences from there. She then worked as a Research Fellow at the Howard Hughes Medical Institute of the Mass General Hospital and Harvard Medical School for two years before accepting the position of Assistant Professor at Fitchburg State University.

4:00 -5:30 pm. Workshop: The Colorful Chemistry of Semi-Precious Gems & Minerals.

Mary Christian-Madden, Immediate Past-President and Curator, NEACT, East Greenwich, Rhode Island 02818.

Mary Christian-Madden is completing her 44th year in public education, 13 years which were spent as a high school principal and 31 years as a high school chemistry teacher and a community college general chemistry instructor. Teaching is her passion and her calling, a trait she shares with NEACT members. Mary uses color to motivate students, and her jewelry collection invites participants of this lecture-workshop to examine the chemical formulas, bonding, composition, and colors of gemstones, with some surprises about the cause of some gems' colors.

7:30 – 8:30 pm. Fashion, Pharmaceuticals, Food, and Fun: The Chemical History of Color

Sr. Mary Virginia Orna, Professor of Chemistry, College of New Rochelle, NY.

Color has been an exciting and enjoyable part of human life ever since the color-sensitive eye evolved over a million years ago. However, the junction between color and chemistry, and color and history, is of more recent origin. The first recorded use of chemistry to manufacture a color is the stunning set of cave paintings found in the Grotte Chauvet in Southern France. Executed over 32,000 years ago (20,000 years earlier than Lascaux!), they are a testimony to early humans' ability to create beauty and to engage in abstract thinking. This talk traces the history of color usage as a chemical endeavor from the earliest records to the present day focusing on four major areas: fashion, pharmaceuticals, food, and fun. It is a trajectory peppered with stories to help us understand the mystery of color as a universal experience and phenomenon; its chemical history, as you shall see, is no less so. This talk is based on her recent book, "The Chemical History of Color" (Springer, 2013).

Financial Grants are available to participants to this Conference.

Lyman C. Newell Grants

The Northeastern Section of the American Society (NESACS) is offering Lyman C. Newell Grants for the New England Association of Chemistry Teachers 2015 Summer Conference. Each Newell Grant will cover all or part of the fees and will be paid to the NEACT Summer Conference Registrar/Treasurer.

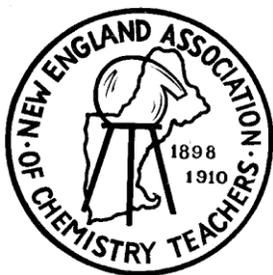
The Lyman C. Newell Grants commemorate a former chair of the Northeastern Section who was a distinguished chemist, teacher, and historian of chemistry. For many years he was chair of the Chemistry Department at Boston University. Lyman Newell served as the first president of NEACT from 1898 to 1900 and expressed a continuing interest in training chemistry students throughout his long career. His efforts are continued by grants that bear his name.

Other Grants provided by: Rhode Island Section of the American Chemical Society, Centennial Scholarships, and NEACT. Aid cannot be provided for transportation, optional lodging or personal expenses.

The awards are open to all secondary school chemistry teachers. Applicants need not be members of any of the organizations that provide the grants or to NEACT. Apply to NEACT directly. Please contact Kathy Siok, the Registrar –Treasurer of the Conference by email kathys5@cox.net (preference) or mail at: 86 Spring Road, North Kingstown, RI 02852, or via phone at 401.885.1608.

Please make contact as soon as possible. The number of applicants and total monies available will determine the number and amount of each grant. You will be asked to provide the following information:

- Name, Address and home telephone number
- Number of years you have been teaching
- Present school, the courses you taught this year and the courses you expect to teach next year
- Why you are a good candidate for a grant and your financial need at this time.



Registration Form
NEACT 2015 Summer Conference
"Colorful Chemistry"
Clark University, Worcester, Massachusetts
August 10, 2015

Please PRINT

Name _____

Address _____ City, State _____ Zip _____

Home phone # (____) _____ Cell # (____) _____ e-mail _____

School Affiliation _____

Best way to reach you after July 1st _____

Emergency Contact: *Name, phone number and relationship to you*

Spouse and/or Guest attending: _____

Membership dues may be paid (separate check) at Registration Desk at the conference.

Please CHECK if you are you applying for financial aid _____

One Day Conference Fee = \$75.00 \$ _____

Conference Fee includes: registration, program/sessions, workshops, contact hours, handouts, lunch, coffee break and evening dinner.

Spouse/Guest Evening Dinner (____@ \$25.00) \$ _____

Total Enclosed \$ _____

Please reserve your place by July 20, 2015. We must know who are attending to make the arrangements.

Refunds cannot be guaranteed for cancellations received after July 20, 2015

Make checks payable to: **76th NEACT Summer Conference**
Mail with this form to: **Kathleen Siok, Registrar-Treasurer**
86 Spring Road North Kingstown, R.I. 02852

Questions? Call or e-mail Kathy at: 401-885-1608 or kathys5@cox.net.

If you require lodging, you will need to make your own arrangements. Please see p.2 for details.