Monthly Meeting
A Medicinal Chemistry Symposium at Genzyme-Waltham
“New Drug Therapies for the Modulation of Metabolism”

Summer Scholar Report
Mechanistic Investigation of TiO₂ Photocatalysis

How I Got My First Academic Position
By Morton Z. Hoffman

STEM Journey II
By Jack Driscoll and Jennifer Maclachlan
Introduction
Water purification is a pressing issue around the globe, from California to India to Ghana. This project focuses on a method to create a water purification system that is off-grid and driven via sunlight using an economical and abundant material, titanium dioxide. TiO₂ is widely used as a white pigment, present in paint, toothpaste, sunscreen, candies, and more. The compound is also investigated by dozens of labs around the world, examining possible applications for splitting water, dye-sensitized solar cells, and photocatalysis. This report focuses on the photocatalytic properties of TiO₂ with the ultimate goal of using modified TiO₂ nanoparticles as a new method to decontaminate water.

The scope of this project was to investigate the mechanism of ultranano TiO₂ photocatalysis. A greater understanding of the mechanism will allow for a more targeted approach to synthesis to create more efficient particles. Other groups have investigated four principle species in the TiO₂ photocatalysis mechanism: superoxide radical, hydroxyl radical, and the photogenerated electron and hole.¹ Many of the studies utilized Degussa P25, a commercial form of TiO₂. Degussa P25 is a mix of anatase, rutile and amorphous crystal forms across a distribution of sizes, with an average size of 20 – 25nm. The crystals studied in this project were consistently synthesized as anatase with a 2nm particle diameter (Figure 1).² The smaller size of these crystals indicated a significantly larger surface: bulk ratio. The makeup of Degussa P25 varies from batch to batch, with different ratios of crystal structures and morphological interfaces. The TiO₂ synthesized for this project was consistently reproducible 2nm anatase particles. These different properties were the motivation for an investigation into the mechanism of these specific particles.

Methods and Results
Ultrananano TiO₂ was synthesized by adding 1.0mL of TiCl₄ dropwise to 300mL of deionized water at 0°C. After stirring for 40 minutes, the solution was dialyzed for two hours to raise the pH and grow the crystals to the appropriate size. The final step was to dry the solution using a rotary evaporator until solid white crystals remained. Adding 3.3mL of FeCl₃ to the reaction flask before adding the TiCl₄ created a more efficient TiO₂ nanoparticle with a stoichiometric ratio of one iron per every 200 TiO₂ units, thus called 0.5% Fe-TiO₂, with a single Fe³⁺ per nanoparticle. Both types of synthesized particles were probed using UV/Vis spectroscopy to determine the particle size using the Brus equation (Figure 2).² The iron-doped and undoped particles were almost identical in size, approximately 2nm in diameter.

The efficiency of these particles was tested using a dual-arm photocatalysis cell. This reaction vessel had two 20mL samples loaded at once, allowing a direct comparison of the results. One side contained undoped TiO₂ and the other 0.5% Fe-TiO₂, both with a 0.3125 g/L concentration. 0.2mL of methanol was added to each side, and a broadband Xenon lamp equipped with an IR filter irradiated the setup for 100 minutes, with aliquots taken at 10-minute intervals. The TiO₂ catalyzed the oxidation of methanol to formaldehyde. This product was reacted with O-(2,3,4,5,6-pentafluorobenzyl)hydroxylamine (PFBOA) to form a complex that was analyzed by GCMS to determine the amount of formaldehyde obtained at each experimental interval. These results are shown in Figure 3. The ratios of the rates for the doped versus the undoped reaction show the relative efficiency of the modified particles.

Discussion
Titanium dioxide is a semiconductor with a band gap of 3.2 eV; this band gap is large, and thus TiO₂ usually requires UV photons to excite an electron.³ An overview of the photocatalysis mechanism follows. A UV photon is absorbed that excites an electron (e⁻) to the conductance band, leaving behind a hole (h⁺) in the valence band. If the e⁻h⁺ pair...
Contents

Summer Scholar Report .......................................................... 2
Mechanistic Investigation of TiO2 Photocatalysis
By Jordin Metz and Mary Jane Shultz, Tufts University

How I Got My First (and only) Academic Position without the Internet ........................................... 4
By Morton Z. Hoffman

Monthly Meeting ................................................................. 5
A Medicinal Chemistry Symposium at Genzyme-Waltham
New Drug Therapies for the Modulation of Metabolism

STEM Journey II: Great White Sharks to Deep Ocean Exploration .................................................. 6
By Jack Driscoll and Jennifer Maclachlan

15th Annual Sukant Tripathy Memorial Symposium ................................................................. 7
UMass-Lowell Inn and Conference Center, December 4, 2015

Summary of Governance Issues and Actions ................................................................. 8
American Chemical Society 250th National Meeting, Boston, Massachusetts, August 16-20, 2015

Business Directory ................................................................. 14

Calendar ................................................................................. 16

Cover: Lauren Wolf (C&EN), former NSYCC Chair and German Exchange participant and Michael Strem (Strem Chemicals), a founder and longtime sponsor of the Exchange. (Photo by Morton Hoffman)

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Editor: Michael P. Filosa, Ph.D., 18 Tamarack Road, Medfield, MA 02052 Email: filosam(at)verizon.net; Tel: 508-843-9070
Associate Editors: Myron S. Simon, 60 Seminary Ave. apt 272, Auburndale, MA 02466 Morton Hoffman
Board of Publications: James Phillips (Chair), Vivian K. Walworth, Mary Mahaney, Ajay Purohit, Ken Drew
Business Manager: Vacant
Advertising Manager: Vacant: contact Michael Filosa at admanager@nesacs.org
Calendar Coordinator: Xavier Herault, Email: xherault(at)outlook.com
Photographers: Morton Hoffman and James Phillips
Proofreaders: Donald O. Rickter, Vivian K. Walworth, Morton Z. Hoffman
Webmaster: Roy Hagen
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How I Got My First (And Only) Academic Position Without The Internet

Morton Z. Hoffman
Professor Emeritus of Chemistry
Boston University

The August 17, 2015, issue of C&EN featured an article by Linda Wang (pp. 16-17) on how the internet has changed the way chemists look for work. Here is my personal story.

The year was 1961. I was a postdoctoral research associate in the laboratory of Professor George Porter in the chemistry department at Sheffield University in England. I had started there in late August 1960 after having received my Ph.D. in physical chemistry two months earlier from the University of Michigan and having spent the summer on an extended tour of Europe, including the Soviet Union, and Israel.

By the time I received my Ph.D., I knew I wanted to pursue a career in academia, but also understood that by being overseas for a postdoc, I would have difficulty in securing a position back in the U.S. After all, trans-Atlantic telephone communications had to go through an operator and often required a reserved time slot, airmail delivery could take up to a week, and Western Union telegraph service was restricted in the number of words in a message. I anticipated that I would return to the U.S. (probably to New York City where I grew up) in August 1961 without a job, and try to find another postdoc or a temporary teaching position at a high school (I had taken the requisite education courses as an undergraduate) or local college.

It turned out that when I arrived in Sheffield in 1960, I overlapped for about three weeks with another American postdoc who was going back to the U.S. to another postdoctoral position while he looked for a faculty position. Before he left, he promised to keep me informed about the academic openings he heard about. It also turned out that my Ph.D. research supervisor from Michigan, Richard Bernstein, was spending 1960-61 on sabbatical leave in London, so we were able to remain in close contact without difficulty.

Early in 1961, I began to receive letters from the American postdoc with information about college and university chemistry departments that were looking to hire new faculty for the 1961-62 academic year. Over the course of months, I must have sent a couple of dozen letters of inquiry (via airmail, of course) with my resume and a research prospectus. I received back a handful of replies, most of them continued on page 5
Monthly Meeting

The 956th Meeting of the Northeastern Section of the American Chemical Society

Organized by the Medicinal Chemistry Section of the Northeastern Section American Chemical Society, Sponsored by Sanofi

A Medicinal Chemistry Symposium

“New Drug Therapies for the Modulation of Metabolism”

Thursday – December 10th, 2015

Genzyme, a Sanofi Company
153 Second Avenue, Waltham, MA 02451, Northeastern Conference Room

3:00 pm Refreshments

3:15 pm Welcome: Raj (SB) Rajur, Medicinal Chemistry Program Chair, CreaGen Biosciences, Inc., Woburn, MA

3:20 pm Introductory Remarks: (Moderator)

3:30 pm Eddine Saiah, Ph.D., Vice President of Drug Discovery, Navator Pharmaceuticals, Cambridge MA

4:15 pm Kimberly O. Cameron, Ph.D., Research Fellow, Pfizer Worldwide Medicinal Chemistry, Cambridge, MA

5:00 pm Nello Mainolfi, Ph.D., Director, Head of Chemistry, Raze Therapeutics, Cambridge, MA

6:00 pm Social Hour

6:45 pm Dinner

7:45 pm Keynote Presentation by Sanofi

Symposium Organizing Team: Raj (SB) Rajur, Andrew Scholte, Mark Ashwell, John Williams, Dan Elbaum, Lisa Marcaurelle, Adrian Hobson, Robert Goodnow

NESACS BOARD MEETING: The Board Meeting will be held from 4:30-5:30 PM. at Celtics Conference Room.

THE PUBLIC IS INVITED TO THE EVENT. ATTENDEES NEED TO BE AWARE THAT THE HOST FACILITY IS A PRIVATE FACILITY WITH ITS OWN SECURITY AND GUIDELINES FOR ADMISSION. IT IS REQUIRED BY THE HOST SITE THAT ALL ATTENDEES BE REGISTERED IN ADVANCE. FAILURE TO ADVANCE REGISTER MAY RESULT IN NOT BEING ADMITTED TO THE PROGRAM.

Dinner reservations should be made no later than noon, Thursday, December 3, 2015. Reservations are to be made using PayPal: http://acsssymposium.com/paypal.html. Select pay with credit or debit card option and follow the additional instructions on the page. Members, $30; Non-members, $35; Retirees, $20; Students, $10. Reservations for new members and for additional information, contact the Administrative Coordinator, Anna Singer, at (781) 272-1966 during regular business hours, or via e-mail (preferred) at secretary@nesacs.org. *Please note: The office is open on a PART TIME basis only. Reservations not cancelled at least 24 hours in advance must be paid.

Link to directions:
http://www.genzyme.com/~/media/Files/GenzymeCorp/PDF/directions_waltham.pdf

First Academic
Continued from page 4

thanking me for my interest but “no thanks” and a few indicating that my application would remain active. The majority of my letters were simply not answered. One of the schools that provided a glimmer of hope was Boston University.

In April 1961, Gordon Harris, the chair of the chemistry department at the University of Buffalo, visited Bernstein in London and came to Sheffield to give a seminar. I had met Harris while I was a graduate student; his research interests overlapped with Bernstein’s, and the members of the two groups (together with Peter Yankwich’s group from Illinois) had met in Ann Arbor for a mini-conference on isotope effects in chemical reactions. Harris told me that the department at Buffalo, in anticipation of the university becoming part of SUNY within a year or two, was expanding; he offered me a position as assistant professor on the spot. To sweeten the deal, he even made the offer for a two-year probationary period rather than the usual one. I told him I would let him know my decision in due course.

Then early in May, I received a totally unexpected telephone call from Lowell Coulter, chair of the department at B.U., who offered me a position. Almost a week later I received the follow-up letter with the details of the offer (the salary for the first academic year was to be $6,800), which involved teaching lab and discussion sections of a new first-year general and physical chemistry course in the newly-created six-year combined B.A.-M.D. program for highly capable and motivated students; in addition, I was expected to develop my independent research.

It didn’t take me very long to decide to accept the offer at B.U. for what I thought were three very good reasons. In the first place, I was intrigued by the educational challenge to develop a new course for very good students. Secondly, I was told that I would not be under any pressure in the

continued on page 14
Saturday March 28, 2015 was the day that we took over the campus of Cape Cod Community College in Barnstable, MA for our STEM Journey II event. Events were held in Telden Hall, Grossman (Cafeteria), Larusso Science building, Lecture Hall B and the STEMnasium. The sponsors of the program are shown in Fig. 1.

We had two keynote speakers: Dr. Dave Gallo, Director of Special Projects at the Woods Hole Oceanographic Institute, and Tobey Curtis, Fishing Analyst and Shark expert of the National Oceanographic and Atmospheric Administration. About 450 bracelets were handed out for the two keynote speakers. Each speaker spoke twice and the talks were very educational and enjoyable for the children, parents and grandparents.

Dr. Gallo talked about how little we know about the ocean, since only about 8% has been explored. The tallest mountain in the world at 50,000’ is beneath the sea off the coast of Iceland. He has gone with Bob Ballard of WHOI on three trips to the Titanic. He also helped to find the Bismark. More recently, he worked on finding Malaysian Air Flight 740 that was lost in the Indian Ocean and still hasn’t been found. He also talked about the amazing sea creatures that he has seen in the ocean depths. He talked about how little water that there actually is on the earth, even though 70% of the earth is covered with water. To find out more http://www.whoi.edu/profile/dgallo/ .

Tobey Curtis talked about the habitats and migratory patterns of the great white sharks. The great whites had not been protected until the early nineties when their numbers dropped perilously low. It took until 2005 for the great white population begin to increase. The media noticed a NOAA report about the increase and reported “an explosion in the great white shark population” when the actual numbers were only 40% of the 1992 population. Tobey went on TV to explain that the “explosion” was only a fabrication of the media. It was only recently that NOAA and other groups began to tag great whites to determine their migratory habits. They have tagged nearly 70 and found many unexpected results. In the summer they like to vacation in Southern NE and Cape Cod. They love to feast on the abundant seal population at the Cape. To find out more: http://www.nmfs.noaa.gov/stories/2014/08/shark_stories_365.html

The cafeteria had 26 organizations exhibiting STEM related activities, including a Walk through Right Whale, making Shark hats, Squishy circuits, a Lego Lab, duct tape kayaks, Ruminate Home building, Cambridge Science in the Streets . This area was overflowing for the entire event.

Some info from the Girl Scout attendees: one wants to be a geologist or a marine biologist; another is interested in being a veterinarian or a marine biologist. Apparently, they heard our keynote speaker’s lectures! Mary Ann Bragg, the Cape Cod Times reporter, was amazed to see a thousand boys and girls come together and be so excited to meet and talk to down-to-earth STEM professionals.

A popular attraction in the STEMnasium was a 55’ right whale from WDC in Plymouth. This was in a small lecture area that could hold about 20 people at a time. There was a duct tape boat and the opportunity for students to make a scale model of the boat out of duct tape.

Hands-on experiments were demonstrated at the tables of ACS.NESACS and the Greenbriar Nature Center. Cambridge Science in the Streets had 5 tables of hands-on experiments.

Some of the numbers for the STEM Journey event are continued on page 14
15th Annual Sukant Tripathy Memorial Symposium

December 4, 2015
8:00 a.m. - 4:00 p.m

University of Massachusetts Lowell Inn & Conference Center
50 Warren St., Lowell, MA 01852

Directions at http://www.acc-UMLinnandconferencecenter.com/maps-directions

Speakers
Abhishek Kumar, NIBIB, National Institutes of Health, Bethesda, MD
Light Sheet Fluorescence Microscopy: Imaging Faster and Gentler

Anthony Dinsmore, University of MA Amherst
Liquid Interfaces and Solid Particles: Using Interface Geometry to Direct Assembly

Young-Gi Kim, Delaware State University
World’s Best Electroactive Polymers: Tactical Solutions for the Needs in Energy, Bio and Optoelectroncis Areas

Thomas Webster, Northeastern University
Polymeric Nanostructures for Medical Applications: What Have We Learned and What Do We Need to Learn

Garrett D. Poe, Executive VP, Blueshift Materials, San Antonio, TX (a subsidiary of FLEXcon Co., Inc.)
Polyimide Aerogels: Nanostructured Architectures for Insulation, RF and Filtration Applications

Samuel Thomas, Tufts University
Beyond Alkyl: New Roles for Conjugated Polymer Side Chains

Matthew Nugent, University of MA Lowell
Extracellular Matrix Dynamics: Implications for Treating Human Disease

Registration: Pre-registration (free) is required by Nov 27, 2015. Online registration:

Parking: Garage gate right of ICC surface lot (student parking) will be open. If no spots are available, proceed to 2nd level entrance of the adjacent Lower Locks Municipal Garage (take left out of parking lot and another immediate left into garage). Parking rate is $8/day max. FREE shuttle bus to ICC is also available from UML campuses.

Details and Changes: Order of Program and all updates about this symposium will be posted on the website http://www.uml.edu/Research/CAM/Tripathy-Memorial/symposium.aspx or you may contact Michele_Vercellin@uml.edu or 978-934-3695.

This year’s event sponsored by: FLEXcon and UMass Lowell College of Engineering and Kennedy College of Sciences

Historical Notes

Haig Markarian
1911-2015

Haig Markarian died March 28, 2015 at age 103. He was born June 27, 1911 in Lowell, MA. He graduated from Lowell Tech University and worked at the Natick Army Laboratories for 35 years. During WW II he was an instructor in Chemical Warfare in the US Army.

Benedict J. Gallo
1934-2015

Benedict J. Gallo died June 3, 2015. He was the son of Francisco and Maria Carmella (Bruno) Gallo. He was born an American citizen in Mevito, Italy on March 2, 1934 and raised in Mamaroneck, NY from the age of three. He graduated from Stepinac High School in White Plains, NY and earned a B.A. degree at the University of Connecticut, a Masters of Geology at University of Michigan, a Masters of Science degree at Eastern Michigan University and a Ph.D. in microbiology at the University of Michigan.

His early career was in high school teaching. His second career was as a microbiologist at the Soldiers Systems Command, Natick Labs from 1976-1995. He was recognized as the first scientist to patent a microorganism with a total of three patents by the United States Army. Some of his interests were the use of microorganisms to degrade cellulose and the action of microorganisms upon a variety of chemicals.

Looking for seminars in the Boston area?

Check out the NESACS Calendar
www.nesacs.org/seminars
The following summary is provided to help Councilors report to their Local Sections and Divisions on key actions and information from the ACS Council and Board of Directors at the 2015 fall national meeting. Full reports will be posted on the ACS Website as they become available.

Actions of the Council

Elections: By electronic ballot, the Council elected Christopher J. Bannochie, Michelle V. Buchanan, Alan B. Cooper, Donna G. Friedman, and Carolyn Ribes for a 2016-2018 term, and Jetty Duffy-Matzner for a two-year term, 2016-2017, on the Committee on Committees.

*Christopher J. Bannochie 265  
*Michelle V. Buchanan 199  
*Alan B. Cooper 268  
*Jetty Duffy-Matzner 164  
*Donna G. Friedman 176  
*Lynn G. Hartshorn 132  
Fran K. Kravitz 129  
Patricia A. Redden 96  
*Carolyn Ribes 260  
Sharon P. Shoemaker 106  
Julianne M. D. Smist 120  
Stephanie J. Watson 158

By electronic ballot, the Council elected Frank D. Blum, Mary K. Carroll, Lisa Houston, and Lee H. Latimer for a 2016-2018 term on the Committee on the Council Policy Committee.

John R. Berg 97  
*Frank D. Blum 259  
*Mary K. Carroll 305  
Dwight W. Chasar 133  
*Lisa Houston 178  
*Lee H. Latimer 285  
Doris I. Lewis 146  
Barbara P. Sitzman 144


V. Dean Adams 121  
Matthew K. Chan 187  
David A. Dixon 94  
*Mary K. (Moore) Engelman 227  
Joseph A. Heppert 154  
*Roland F. Hirsch 203  
*C. Marvin Lang 191  
*Les W. McQuire 302  
*Donivan R. Porterfield 220  
Ralph A. Wheeler 146

Petitions to Amend Bylaws

• The Council VOTED to approve the Petition on Preferential Voting, contingent upon confirmation by the ACS Board of Directors.

• The Council VOTED to approve the Petition on Member Expulsion, contingent upon confirmation by the ACS Board of Directors.

Procedures (relating to the Petitions, above)

• On the recommendation of the Committee on Nominations and Elections, the Council VOTED to approve the Balloting and Preferential Voting Procedures for Elections of President-Elect, District Directors, and Directors-at-Large, contingent upon approval of the Petition on Preferential Voting.

• On the recommendation of the Committee on Membership Affairs, the Council VOTED to approve the Procedure for Expulsion of a Member, contingent upon approval of the Petition on Member Expulsion.

International Chemical Sciences Chapters

• On the recommendation of the Committee on International Activities, Council VOTED to approve the establishment of the Australia, Brazil, Nigeria, Peru, and United Arab Emirates International Chemical Sciences Chapters, subject to confirmation by the Board of Directors.

Resolutions

• The Council passed several resolutions, including one acknowledging President Diane Grob Schmidt’s service as presiding officer of the Council and expressing gratitude for her 48 years of service to the Society.

Reports of Elected Committees (Highlights)

Nominations and Elections (N&E)

N&E announced the candidates for the fall 2015 ACS national election:

Candidates for President-Elect, 2016
- G. Bryan Balazs, Associate Program Leader, Lawrence Livermore National Laboratory, Livermore, CA
- Allison A. Campbell, Associate Laboratory Director, Pacific Northwest National Laboratory, Richland, WA

Candidates for Directors-at-Large, 2016-2018
- Lee H. Latimer, Head of Chemistry, NeurOp, Inc., Oakland, CA
- Willem R. Leenstra, Associate Professor, University of Vermont, Burlington, VT
- Ingrid Montes, Professor, University of Puerto Rico - Rio Piedras Campus, San Juan, PR
- Mary Jo Ondrechen, Professor of Chemistry and Chemical Biology, Northeastern University, Boston, MA
**Governance**

Continued from page 8

- Thomas W. Smith, Professor, Chemistry & Microsystems Engineering, School of Chemistry and Materials Science, Rochester Institute of Technology, Rochester, NY
- Candidates for District I Director, 2016-2018
  - Thomas R. Gilbert, Professor, Northeastern University, Boston, MA
  - Laura E. Pence, Professor of Chemistry, University of Hartford, West Hartford, CT
- Candidates for District V Director, 2016-2018
  - John E. Adams, Curators’ Teaching Professor, University of Missouri-Columbia, Columbia, MO
  - Kenneth P. Fivizzani, Retired, Nalco Company, Naperville, IL

**Committees:**

(ConC): ConC is developing its recommendations for 2016 committee chairs, members, associates, and consultant appointments for consideration by the President-Elect and the Chair of the Board of Directors.

(Council Policy (CPC)): The CPC Long-Range Planning Subcommittee was asked to review the way Local Sections and Divisions are currently represented on Council. The Task Force is examining issues that affect the Divisor formulae set out in the Bylaws; for example, how sacrosanct is the rule that twenty percent of elected Councilors shall be elected by Divisions, and eighty percent shall be elected by Local Sections? What would Council look like if the ratio were changed, for example to 70/30? Should there be more Division representation on Council and what would be the impact? Would this result in more resources for Divisions? Should a cap be placed on the number of Councilors per Local Section and Divisions to ensure more balance? What does representation look like for international members of Local sections and Divisions? Comments on these questions can be submitted to President@acs.org.

**Reports of Society Committees and the Committee on Science**

**Budget and Finance (B&F):** B&F reviewed the Society’s 2015 probable year-end financial projection which expects a Net Contribution from Operations of $15.5 million, or $2.1 million higher than the Approved Budget. Total revenues are projected at $512.1 million, which at $481,000 favorable is essentially on Budget. Total expenses are projected at $496.6 million, which is $1.6 million or 0.3% favorable to the Approved. This variance is the result of lower-than-budgeted expenses across almost all major expense categories.

**Education (SOCED):** SOCED voted to approve revisions to the ACS Guidelines for Chemistry in Two-Year Colleges. The committee voted to make the pilot program of ACS International Student Chapters a permanent feature of the student chapters program. ACS has chartered 15 International Student Chapters since the pilot launched last year.

**Science (ComSci):** ComSci voted to recommend approval of the draft ACS policy statement on energy, a notably improved statement on this critical economic and environmental issue. At this meeting, the committee sponsored a roundtable discussion with leaders of Divisions, journals, and outside experts on moving advanced materials from discovery to application.

**Reports of Standing Committees**

**Divisional Activities (DAC):** DAC recently completed a review of a white paper to help Divisions identify, evaluate, and pursue international engagement opportunities; received an update on several changes to the Meeting Abstracts Programming System (MAPS); was briefed on a recently-created task force that seeks to enhance the content and functionality of the acs.org web pages that help Division and Local Section volunteers execute their volunteer duties; and voted to fund 14 Innovative Project Grants (IPG) totaling $77,050.

The Multidisciplinary Program Planning Group is proposing the following 2018 national meeting themes to the Divisions for their consideration: Nexus of Food, Energy and Water (Spring/New Orleans), and Nanotechnology (Fall/Boston). continued on page 10
The committee approved the ACS Global Innovation Initiatives (Gii) Singapore White Paper and chose South America and Mexico for the 2017 joint ACS-Pittcon program to foster exchange and research collaboration in analytical chemistry.

Minority Affairs (CMA): CMA focused its activities at this meeting on the 20th anniversary celebration of the ACS Scholars Program. The program continued on page 11
has awarded more than $17 million in scholarship assistance since 1995 to enable 2,500 talented minority students to pursue their dreams of a degree in the chemical sciences. The new Scholars Endowment Fund now has commitments of more than $2 million.

Nominations are being sought for the Stanley C. Israel Award. Instructions for nominations can be found at www.acs.org/stan-israel-award.

**Patents and Related Matters (CPRM):** CPRM continues to monitor legislative and regulatory developments influencing intellectual property in ways that impact the chemical enterprise. The committee website is updated frequently and contains a wealth of helpful information about intellectual property matters relevant to those in the chemical enterprise.

**Project SEED (SEED):** SEED announced another successful SEED program with the participation of 411 high school students. These students are currently placed in over 100 laboratories across the nation, under the supervision of over 400 volunteer scientists and coordinators in 39 states, the District of Columbia, and Puerto Rico. The committee awarded 32 first year non-renewable College Scholarships to SEED alumni in 17 states and Puerto Rico.

**Public Relations and Communications (CPRC):** CPRC co-sponsored a number of events in Boston to showcase ways to increase public appreciation for chemistry; the PBS preview of “Mystery of Matter: Search for the Elements”; a symposium on the public perception of chemistry co-sponsored with Chemical & Engineering News, and the ACS Office of Public Affairs; ChemChamps; and Wikipedia Edit-a-thon, co-sponsored with the Division of Chemical Information.

**Senior Chemists (SCC):** This meeting marked the third anniversary of the formation of the SCC at the Philadelphia National Meeting. SCC has been able to establish a number of initiatives thru its provision of mini-grants to Local Sections to sponsor senior-related activities, several of which were recognized by the initial ChemLumi- nary awards at Boston. A committee retreat is being planned for this fall to identify priorities that will serve the SCC constituency as well as meeting the strategic goals of the committee.

**Technician Affairs (CTA):** CTA is now accepting nominations for the 2016 National Chemical Technician Award. This annual award is presented in recognition of outstanding technical and communication skills, reliability, leadership, teamwork, publications, and presentations. For more information about the award, please visit the committee website at acs.org/cta.

**Younger Chemists (YCC):** The Program in a Box effort continues to grow rapidly with a 43% increase in the number of disseminated boxes between the fall 2014 and February 2015, when 181 boxes were delivered to local sections and international chapters.

At this meeting YCC participated in the 5th Younger Chemists Crossing Borders, an exchange which brings younger chemists from parts of Europe to the meeting.

YCC is currently in discussions with N&E, ACS Webinars, ACS Office of Public Affairs, and the presidential candidates about holding a roundtable webinar, “Catalyze the Vote,” where the candidates can speak to the younger constituency about their vision for the Society in the future.

**Actions of the Board of Directors**

The Board of Directors received reports from its Executive Committee, the Committee on Grants and Awards (G&A), the Society Committee on Budget and Finance (B&F), and the ACS Governing Board for Publishing.

- On the recommendation of the Committee on Grants and Awards, and of the Committee on Public Relations and Communications, the Board VOTED to approve a Society nominee for the 2016 Alan T. Waterman Award.
- On the recommendation of the Committee on Budget and Finance, the Board VOTED to approve an advance member registration fee of $415 for national meetings held in 2016; to authorize a new program funding request for the ACS Festival Series program; and to reauthorize funding for the ACS Science Coaches program.

**The Executive Director/Chief Executive Officer’s Report:** The Executive Director/CEO and his direct reports updated the Board on the activities of Chemical Abstracts Service (CAS), the ACS Publications Division, and the Society’s Secretary and General Counsel.

- On the recommendation of the Joint Board-Council Committee on Publications, the Board VOTED to reappoint an Editor-in-Chief of an ACS journal.

**Other Society Business**

The Board also:

- Held a discussion on strategic questions related to the health and strength of Local Sections and Divisions.
- Received reports from the Presidential Succession on their symposia and events in Boston, and planned activities for 2016.
- Approved a resolution to extend sincere congratulations to the Sociedad Química de México on the occasion of the 50th Congreso Mexicano de Química, 7-10 October 2015, in Querétaro, Querétaro México.

**The Board’s Regular (Open) Session:** The Board held an overflow open session on Sunday, August 16, that featured George Whitesides. Professor Whitesides’ topic was “Reengineering Chemistry.” Following the presentation, members of the presidential succession and the Executive Director and CEO offered brief reports on their activities. (The officers provided more extensive reports on their activities and/or future plans as part of their reports to the Council.)

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*Continued from page 10*
recombines, the utility of that photon is lost. If the e/h+ pair remains separated, the photogenerated electron reduces an electron acceptor and the hole oxidizes an electron donor, regenerating the catalyst. Many experimenters consider the electron acceptor to be molecular oxygen and the donor to be the molecule being oxidized (methanol in these experiments). The question that arises is: does TiO2 photocatalysis occur via a heterogeneous or homogeneous mechanism? This question is important because TiO2 has a low photoefficiency. Knowing the mechanism will facilitate targeting the slow steps to increase the viability of using TiO2 as a photocatalyst for water purification.

A heterogeneous reaction occurs between two substances in different physical states, while a homogeneous reaction occurs between two substances in the same physical state. A hole on the surface of a TiO2 nanoparticle directly oxidizing methanol to formaldehyde is an example of a heterogeneous reaction, as methanol is a dissolved liquid and TiO2 is a solid suspended in water. If the hole oxidizes H2O to hydroxyl radical (OH•), this radical could oxidize methanol in solution as part of a homogeneous reaction. Both of these pathways may be possible (Figure 4). Direct oxidation by the hole should be the most efficient method, as a radical species could react with other molecules in solution rather than the target of oxidation. An investigation of these pathways can be performed using radical quenchers, specifically tert-butyl alcohol for the hydroxyl radical, p-benzoquinone for the superoxide radical, K2S2O8 for the photogenerated electron and ammonium oxalate for the hole. The results for modified Degussa P25 in organic solvents indicate that the hydroxyl radical does not play a significant role in the mechanism and the other three species have varying levels of importance. Given that the goal of this project is to use TiO2 as a method for purifying water, identifying the important species in an aqueous system is crucial. These experiments are still ongoing for ultranano TiO2.

Non-aqueous solvents present another means to explore the mechanism. Hydroxyl radicals could easily be generated from the solvent in aqueous solution due to the large abundance of O—H bonds. In most organic solvents, the O—H bonds present are adsorbed OH groups on the TiO2 surface and the alcohol that is added to the system to be oxidized to an aldehyde. Thus, investigating TiO2 in an organic solvent using the same radical quenchers would allow for the role of water to be assessed in the mechanism. Acetonitrile was identified as a suitable solvent for these experiments due to its large dipole moment and ability to dissolve a wide range of substances. An issue arose when TiO2 particles precipitated out of the solvent. The ultranano TiO2 particles are so small that they form a transparent suspension in water, where they cannot be seen by the naked eye and do not scatter light. An organic solvent was required that would mimic water’s ability to suspend the TiO2 yet also be comparable to experiments performed in water. A key feature of these particles is their small size and large surface area; using a solvent that forces the particles to aggregate would not be comparable to results from the aqueous system. NaCl was used as a method to identify a suitable solvent, as the ultranano TiO2...
nano particles are comparable to a salt in that they are positively charged and coupled with an anion to form a crystal. Methanol was identified as the organic solvent that permitted the same TiO$_2$ concentration and particle size without scattering light. This system changed only one variable, the identity of the solvent, allowing all other components of the system to be directly comparable to the results from an aqueous system. A pilot study confirmed methanol as a suitable solvent. Figure 5 shows that formaldehyde was obtained linearly in time, confirming that this reaction was photon limited in methanol. This result enables further research into this area.

Conclusion
The photocatalysis mechanism of ultranano-titanium dioxide was investigated with the goal of applying knowledge of the mechanism towards improving the synthesis process. Heterogeneous and homogeneous pathways were discussed, creating a framework to analyze the data from radical quenching and solvent experiments. A deeper understanding of the mechanism is a crucial step towards building more efficient particles, with the ultimate goal of creating a solar-powered water purification system to address one of the greatest global health issues of our time.

References
STEM Journey II
Continued from page 6

shown below:

- Number of STEM Journey sponsors: 7
- Scout merit badges in Oceanography, Chemistry, Scientist: 150
- Volunteers: 100
- Number of bracelets issued for the 4 Keynote Talks: 450
- Number of visitors to STEM Journey II: 1,100+

Conclusions:
- We had a very successful STEM Journey II event with an increase of 46% in attendance, in spite of a snow storm.
- We had the first STEM Jobs Panel specifically for grade 8-12 students, guidance councilors and teachers. Many of the companies who participated indicated that the number of STEM Jobs varied from 45-87.5% of the total. A STEM education is very important to consider.
- We had significant attendance from K-7, parents and grandparents.
- We would like to increase the attendance for grades 8-12, parents, guidance councilors and teachers at our STEM Jobs panel next year.

STEM Jobs Panels:
Expected audience: students (grades 8-12) & parents, guidance counselors, teachers

1. Industries: Cape Cod Healthcare & Medical Device Manufacturing; Panelists- Dr. Jack Driscoll, Nova Biomedical, Anne Bastianelli Epiphany Software, Medtronic-Discussion about STEM Jobs, Background Needed, and number of STEM jobs in the various companies.

2. Industry: Oceanography & Education- Woods Hole Oceanographic Institute- Panelists- Tina VP of human Resources + 3 others; Discussion about background of each, how they got into science and their present job at WHOI, also STEM job % at WHOI.

The slides for STEM jobs are located on the NESACS website in the STEM section www.nesacs.org/stem

First Academic
Continued from page 5

first year to get my research up and running and to compete for grants. Thirdly, I had never been to Boston, but I had been to Buffalo!

Epilogue: I learned several years later that B.U. had originally made the offer to the American postdoc, who accepted the position. However, in the beginning of May 1961, he had decided that he really wanted to teach in a small undergraduate institution in the Midwest rather than in a large university in the Northeast. I also learned that B.U. had made the offer to me in desperation since the new B.A.-M.D. program was to begin in September and the department was running out of available candidates. So much for being at the bottom of the list!

Moral of my story: Don’t be afraid to do something out of the ordinary, be gutsy in your decisions, stay connected to your network of professionals, and have a lot of luck. As far as the latter is concerned, you don’t need the internet for that.

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The Nucleus December 2015 15

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http://www.NESACS.org

Note also the Chemistry Department web pages for travel directions and updates.
These include:
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December 1
Prof. Luke Fulton (Univ. of New Hampshire)
Univ. of New Hampshire, Room N104
11:10 am

December 3
Prof. Chen Hongyu (Nanyang Technological Univ., Singapore)
Boston College, Merkert 130
4:00 pm

December 4
Prof. Philippe Caroff (Australian National University)
Harvard, Pfizer Lecture Hall
4:15 pm

December 7
Prof. Douglas Mitchell (University of Illinois)
“Genomics-Enabled Natural Product Discovery.”
Harvard, Pfizer Lecture Hall
4:15 pm

December 8
Dr. Charles E. Chase (Eisai Research Institute)
Univ. of New Hampshire, Room N104
11:10 am

December 10
Prof. Aaron Esser-Kahn (UCal-Irvine)
“Chemical Biology Approaches to Innate Immunity: Probing a Code Without a Key”
Tufts, Pearson, Room P-106
4:00 pm

Notifications for The Nucleus Calendar of Seminars should be sent to:
Xavier Herault, email: xherault(at)outlook.com

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