

THE NUCLEUS

April 2001

Vol. LXXIX, No. 8



Monthly Meeting

Esselen Award to Joseph M. DeSimone

Book Review

Chemistry in Science Fiction

A Jungle Story

Richard E. Schultes, rubber trees and WWII

Summer Scholar Report

Matthew Cardello on molecular recognition

Eastern Analytical Symposium

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Deadlines: *Summer and NERM 2001 meeting issue: April 30 (note change)*

THE NUCLEUS

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Biography

Dr. Joseph M. DeSimone, William R. Kenan Jr. Distinguished Professor of Chemistry and Chemical Engineering, joined the Department of Chemistry at the University of North Carolina at Chapel Hill in 1990 as an Assistant Professor. The University named DeSimone as the Mary Ann Smith Professor of Chemistry in 1995. The Smith professorships, the oldest continuous endowed posts at the University, were established in 1891 so the holder could 'teach both the science of chemistry and its experimental application to the useful arts.' In 1995, he was also appointed Professor in the Department of Chemical Engineering at North Carolina State University. DeSimone received a B.S. Degree in Chemistry in 1986 from Ursinus College in Collegeville, Pennsylvania and a Ph.D. Degree in 1990 from the Department of Chemistry at Virginia Polytechnic Institute and State University where he worked with Professor James E. McGrath. DeSimone currently holds the only endowed professorship to span both NC State (chemical engineering) and UNC at Chapel Hill (chemistry). DeSimone's chair, the William R. Kenan Jr. Distinguished Professorship, was newly established this year to recognize the impact that he has had on both the fundamental and the applied chemical sciences at both of these institutions. With over 100 refereed publications, including three seminal papers in Science and one in Nature, and fifty-two issued US patents (83% of which have been licensed or have options to be licensed), DeSimone's pioneering work has led to the establishment of what others are now calling the "carbon dioxide technology platform."

The NY Times (Sunday September 11, 1994) hailed DeSimone as a "wunderkind of chemical engineering" for his work proving that CO₂ could be used as a solvent for the synthesis of polymers (*Science* 1994, vol. 265, p. 356), and for his synthesis of technologically important fluoropolymers such as Teflon™ (*Science* 1992,

Gustavus John Esselen, 1888-1952

An extensive biography was published in the April 2000 issue of The NUCLEUS.

Gustavus John Esselen was one of the movers and shakers in the Northeastern Section, having been on numerous committees, was Chairman twice (1922, 1923) and also was a Director of the national ACS. He chaired the national meetings of the ACS held in Boston in 1928 and 1939. He was employed by General Electric Co. in Lynn, then Arthur D. Little, Inc. of Cambridge. In 1921 he founded Gustavus J. Esselen, Inc., which later became the Research Division of the United States Testing Co., Inc. and addressed problems submitted by commercial clients, especially in polymer chemistry and technology. He was greatly interested in furthering the profession of chemistry, and it is in this spirit that the funds donated by the Esselen family to the Northeastern Section were used for establishing the award named in his honor, "...to recognize and reward a chemist whose scientific and technical work has contributed to the public well-being and has thereby communicated positive values of the chemical profession."

At this year's 14th anniversary of the award, the recipient Dr. Joseph M. DeSimone amply fulfills these criteria. *A full discussion of the criteria for the award were published in The NUCLEUS, Vol. 75(8), April 1997, p.10. ◇*

vol. 257, p. 245). His discovery launched an almost decade-long research partnership with scientists and engineers at DuPont to further understand the fundamentals of heterogeneous precipitation polymerizations in highly plasticizing media like CO₂. This research has culminated in Dupont's announcement this past summer that they will invest \$275 million

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to build a world-scale Teflon™ manufacturing plant that will utilize DeSimone's environmentally friendly, energy-efficient and technologically superior CO₂-based polymerization process. This transfer of technology from our university system to DuPont has also come full-circle, as DuPont will be building this facility in economically-challenged eastern North Carolina in order to be close to the research epicenter that DeSimone helped to create. DuPont's commercialization plans will create more than 500 needed construction jobs and approximately 100 permanent, high-paying plant operational jobs in NC.

In 1996, DeSimone and his students established the design criteria necessary for effective surfactants or detergents for CO₂ (*Science* 1996, vol. 274, p. 2049). Using molecularly-engineered block and graft copolymers and small angle X-ray and neutron scattering, they found the first conclusive evidence for the formation of micelles in

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Monthly Meeting

The 824th Meeting of the Northeastern Section of the American Chemical Society

Esselen Award Meeting

Thursday, April 19, 2001

Harvard University, Cambridge, MA

Harvard Faculty Club, 20 Quincy St.

5:30 pm Social Hour; a table of Career Services Literature and Aids will be available

6:30 pm Dinner

8:15 pm Award Meeting, *Mallinckrodt Building, 12 Oxford St.*

Pfizer Lecture Hall (MB23), ground floor.

Dr. Timothy B. Frigo, NESACS Chair, presiding

The Esselen Award - Dr. Iclal S. Hartman, Chair, Esselen Award Committee

Introduction of the Award Recipient - Dr. Edward T. Samulski, Cary C. Boshamer Professor of Chemistry, The University of North Carolina at Chapel Hill, Chapel Hill, NC.

Presentation of the Award - Gustavus J. Esselen, III

Green Chemistry for Sustainable Economic Development - Dr.

Joseph M. DeSimone, William R. Kenan Jr. Distinguished Professor of Chemistry and Chemical Engineering, The University of North Carolina at Chapel Hill, Chapel Hill, NC. and Department of Chemical Engineering, North Carolina State University.

Dinner reservations should be made no later than noon, April 12. Please call or fax Marilou Cashman at (800) 872-2054 or e-mail at MCash0953@aol.com. Please indicate entrée choice: Pecan Chicken Breast, Grilled Shrimp and Scallops, or Vegetarian Dinner. Reservations not cancelled at least 24 hours in advance must be paid. Members, \$30.00; Non-members, \$35.00; Retirees, \$20.00; Students, \$ 8.00. THE PUBLIC IS INVITED.

Special services or transportation, please call Marilou Cashman a few days in advance so that suitable arrangements can be made.

Free Parking in the Broadway St. Garage (3rd level or higher), enter from Cambridge St. via Felton St.

Next Meeting: *May 10, 2001, Education Night. Boston University School of Management, 595 Commonwealth Ave., Boston, MA.*

Dr. John J. Fortman, Wright State University, Dayton, OH to speak on; "The Serious and Delirious Use of Chemistry in Movies."

Biography

Continued from page 4

CO₂. The design of surfactants for CO₂ is the enabling discovery that will allow for the broad-based utilization of environmentally friendly CO₂ in many applications including separations, catalysis, and thin film deposition technologies. From an offshoot of this surfactant research DeSimone started a company called Micell Technologies to

commercialize the use of liquid CO₂ in dry cleaning to replace the hazardous solvents used in over 100,000 dry cleaning plants throughout the world. Micell Technologies has raised over \$52 million in venture capital and currently has over 50 employees. Their commercial liquid CO₂ dry cleaning systems can now be found operating in North Carolina, Rhode Island, Nevada, Texas, Florida and Illinois where they are servicing

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Abstract

Green Chemistry for Sustainable Economic Development

Imagine an alternative for the automotive industry that would eliminate the use of toxic chlorinated solvents during metal degreasing processes. What if the electronics industry deposited specially designed photoresists by a spin coating process that eliminated organic solvents, and the use of water in lithographic processes? Imagine a hydrogenation reaction that proceeds in an environmentally friendly solvent and yet achieves 100% conversion and selectivity. What if a nontoxic alternative to perchloroethylene could be offered to the dry cleaning industry -improving the quality of life for the employees of this industry as well as the customers? What if manufacturing industries didn't need to spend billions of dollars on environmental compliance issues to control the level of organic solvents emitted to the environment? Furthermore, what if the demands on municipal water and waste water systems could be dramatically reduced by changes in manufacturing technology? Imagine a polymer industry that avoids using trillions of BTUs annually to dry commercial polymers manufactured in aqueous reaction media. Imagine a textile industry that doesn't need to use 100 pounds of water for every pound of yarn dyed. A more sobering viewpoint would be to imagine the next century without alternative pollution prevention technologies.

Environmental concerns over the extensive use of volatile organic solvents, halogenated solvents and inordinate amounts of water by industries throughout the world have lead to an extensive search for environmentally responsible solvents. Various applications using carbon dioxide (CO₂) have developed within the last decade and, if current trends continue, the CO₂ technology platform could emerge as the most commonly used solvent in the

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Biography

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about 45 dry cleaning storefronts under the name of Hangers™. They expect to be in every major market in the US within two years.

DeSimone and Ruben Carbonell, KoSa Professor of Chemical Engineering at NC State, successfully led a team of 31 from UNC-CH, NC State, NC A&T and the University of Texas, to secure a NSF Science and Technology Center on Environmentally Responsible Solvents and Processes. This five-year \$18 million research grant is the largest grant the University of North Carolina system has ever received. Beyond its scientific and engineering activities, the new NSF STC is unique in spearheading the inclusion of social scientists into the research activities. It will investigate the importance of communication roles in integrating information within research teams.

In 1992, Professor DeSimone was named a recipient of a National Science Foundation Young Investigator

Award. In 1993, Dr. DeSimone was honored by the White House with his naming as a Presidential Faculty Fellow, one of only thirty given nationally to young faculty members in science and engineering. In 1997 the White House honored DeSimone again with his selection to receive the 1997 Presidential Green Chemistry Award and the Governor of NC selected DeSimone to receive the Governor's Award for Excellence. In 1998, DeSimone was part of the research team at Micell Technologies that was honored with an R&D 100 Award. In 1999, DeSimone was selected by the American Chemical Society to receive the Carl S. Marvel Creative Polymer Chemistry Award. Recently, Joe was selected as 2001 Inventor of the Year Award from the Triangle Intellectual Property Law Association and his company, Micell Technologies received the 2001 Governor's Entrepreneurial Company of the Year Awards.

Joe, his wife Suzanne, their 12-year-old son Philip, and their 8-year-old daughter Emily, reside in Chapel Hill, North Carolina. ◇

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Note: Candidates may be nominated by petition, accompanied by signatures of 130 members, to be submitted to the NESACS office by March 18, 2001. ◇

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Book Review

Chemistry in Science Fiction, Jack H. Stocker, Ed. (ACS Books, 1998) 292 pp., ISBN 0-8412-32482; \$19.95 (paperback)

Reviewed by Dennis J. Sardella, Department of Chemistry, Merkert Chemistry Center, Boston College, Chestnut Hill, MA 02467

Although I have no firm data with which to support my prejudice, I would guess that many, if not most, scientists have at some time in their lives been readers of science fiction. Long before we understand enough science to be able to follow the details of technical arguments, science fiction provides an avenue for participating vicariously in the romance of science, in much the same way that good expository science writing does at a somewhat more advanced level (e.g., like that in *Scientific American*). I recall with pleasure reading over the years a range of science fiction tales, ranging from Isaac Asimov's fascinating "I, Robot" to Ray Bradbury's "The Martian Chronicles," to William Miller's "A Canticle For Leibowitz", to Leo Szilard's post-apocalyptic short stories in his collection "The Voice of the Dolphins".

Interestingly, though, in thinking back over my admittedly eclectic "life reading list", I cannot recall having seen many stories revolving around chemistry - biology definitely, physics aplenty, even some geology, but not much that I could honestly call chemistry (Asimov's work obviously excepted). So it was with a mixture of interest and curiosity that I turned to "Chemistry and Science Fiction", a collection of essays edited by Jack H. Stocker that grew out of the 1992 ACS Symposium sponsored by the History of Chemistry Division, wondering if there was really enough chemically-based science fiction to justify an entire book.

The answer (as is the case with so many things) seems to be "It depends on your definition." In his introductory essay, Stocker surveys the science fiction landscape and tackles the difficult (and probably ultimately impossible) task of trying to decide where the borders of science fiction are reached on

the slippery slope beginning with what he calls "hard science fiction" (stories driven by science, even if the scientific basis is a bit tenuous), and proceeding through "social science fiction", e.g., George Orwell's *1984*, "space opera", e.g. the *Star Wars* sequence, to "swords and sorcery", ranging from Edgar Rice Burroughs to Ann Rice's vampire novels. I should probably admit that I am a purist, preferring the science in my science fiction to be real - or at least a plausible extrapolation or speculation - and to go beyond vocabulary merely used to dress up a tale in scientific trappings. In a subsequent chapter, Connie Willis looks at the various roles played by science in science fiction - as the subject of the story, as plot device, as background and as metaphor - eventually arguing that science in fact informs all science fiction because, as she puts it, science fiction:

"is one huge thought experiment, with each author observing the world, developing hypotheses about it, and setting up experiments in the form of stories to examine those hypotheses."

Given the breadth of this seemingly all-encompassing definition, one might be tempted to classify even such disparate works as Alan Lightman's *Einstein's Dreams* and Umberto Eco's *The Name of the Rose* under the rubric of science fiction!

The book's second section ("History and Tradition") consists of seven chapters devoted successively to H.G. Wells, Planetary Chemistry, the science fiction of Isaac Asimov, Thomas Pynchon's *Gravity's Rainbow*, Sherlock Holmes as chemist, "Real Chemistry as the Basis for Science Fiction", and the cover art of science fiction magazines. I found most of the chapters interesting, but particularly enjoyed Ben Chastain's essay on Asimov (*Beryllium*, *Thiotimoline*, and *Paté de Foie Gras*), which confirmed

my opinion that Asimov is arguably the best writer to have used chemistry intelligently and plausibly in his fiction. The final chapter in this section (*On the Covers of Science Fiction Magazines*), which consists of reproductions of eight covers from the mid-twenties to the early sixties, along with brief commentaries on each, had only the most tenuous connection to chemistry, and was largely eye candy.

The book's brief third section (two chapters) focused on television and film, in particular the several *Star Trek* TV series end films and the Dr. Who TV series, and included discussion of several legitimately chemistry-based stories from each.

The fourth section ("Scientists at Play") is a gem, containing three amusing short stories written by scientists with tongues firmly in cheek. Isaac Asimov accounts for two stories, *The Endochronic Properties of Re-sublimated Thiotimoline* and *Paté de Foie Gras* (a scientific retelling of the fable of "The Goose That Laid the Golden Egg"), and the third - unexpectedly - by Michael Dewar and several imaginatively named colleagues is on temporal chirality. A story I would have liked to see included in this section is Szilard's *Report On Grand Central Terminal*, the tale of an archeological expedition from another planet sent to explore the ruins of post-apocalyptic New York City, and specifically their examination of Grand Central Terminal. The way in which they propose correct hypotheses based on incorrect reasoning and absurd conclusions based on apparently solid reasoning, besides being humorous, is also a caution about taking ourselves too seriously.

A final bit of solidly chemical humor that might have made a good addition is an article I recall having read during the sixties in the fictitious *Berichte der Durstigen Chemischen Gesellschaft* (an April Fool's parody of the real *Berichte*, if memory serves) on the remarkable chemical unreactivity of diaza-bicyclo[0.0.0]ethane, a compound whose chemical inertness is seemingly inconsistent with the enor-

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ACS SHORT COURSE

Designed to improve the skills and marketability of practicing B.S., M.S., and Ph.D. chemists. National ACS is making top-rated ACS Short Courses available to local sections at tuition fees greatly reduced from the normal \$845. The NESACS Committee on Continuing Education is pleased to present this newly updated course, formerly titled: *Dispersion of Fine Particles in Liquids*.

DISPERSIONS, EMULSIONS, and FOAMS: Modern Methods and Applications

Save over 50% of the registration fee charged for this course when it is offered at ACS National and Regional Meetings.

This Two-day Short Course, sponsored by the Committee on Continuing Education of the Northeastern Section, ACS, is designed for scientists and engineers engaged in R & D in the chemical, petroleum, coatings, food, electronics, pharmaceutical, cosmetics, and ceramics industries.

DATES and TIME: Thursday, May 17, 2001, 8:00 a.m.-5:00 p.m.
and Friday, May 18, 2001, 8:30 a.m.-5:00 p.m.

PLACE: Snell Library, Room 88, Northeastern University, 360 Huntington Ave., Boston, MA

PROGRAM AGENDA:

Surfaces and Interfaces: Basic principles of the nature and stability of interfaces; Energies of spreading, wetting and adhesion; Molecular models of interactions across interfaces.

Fine Particle Technology: Properties of dispersed-phase systems; Light scattering; Particle size analysis.

Surface-Active Solutes: Adsorption from solution at the liquid-vapor and solid-liquid interfaces; Mechanisms to stabilize interfaces; Classification of surface-active solutes.

Dispersion Processing: Rates of adsorption, attrition, and comminution; Commercial equipment.

Interparticle Forces – Sources and Estimates of Their Magnitudes

Kinetics of Flocculation

Dispersion Stability by Electrostatic Repulsion Mechanisms of Particle Charging in Aqueous and Nonaqueous Dispersions

Electrokinetic Phenomena

Methods of Measuring Particle Charge

Rheology of Dispersions

Instruments for Rheological Measurements

Relation of Rheology to Interparticle Forces and Dispersion Stability

Polymer Adsorption

Dispersion Stability by Steric Repulsion: Relation of steric stabilization to molecular properties of polymers and to polymer phase diagrams.

Stabilization by Block Copolymers

Combined Electrostatic and Steric Stabilization

Mechanisms of Flocculation

Dispersions in Industry – Examples and Practical Applications

INSTRUCTORS:

Sydney Ross, Professor of Colloid Science, Emeritus, Rensselaer Polytechnic Institute, is the author of over 150 publications and patents and has written and edited several books.

Ian Morrison, Director of Ink Technology at E Ink. Prior to this he was a Principal Scientist at Xerox Corporation for 20 years and has authored over 35 publications and patents.

PRE-REGISTRATION REQUIRED – Registration Fees:

ACS Members if **received** before May 2 \$400.00; after May 2 \$475.00

Non-ACS Members if **received** before May 2 \$475.00; after May 2 \$550.00

There will be a limited number of scholarships for unemployed ACS Members on a space-available basis.

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For further information contact: Prof. Alfred Viola at (617) 373 2809

Registration form for Short Course: *Dispersions, Emulsions, and Foams: Modern Methods and Applications*

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Call for Papers

Undergraduate Research Poster Session

222nd National Meeting of the American Chemical Society
Chicago, Illinois, August 26-30, 2001

The ACS invites undergraduate students to submit abstracts of their research papers for presentation at the Undergraduate Research Poster Session, which will be part of the programming for undergraduates at this national meeting.

Abstracts must be submitted electronically:

- Go to the meeting web site: <http://www.acs.org/meetings/chicago2001/>
- Click on "Submitting a Paper"
- Click on "CHED" (Division of Chemical Education)
- Go to "Undergraduate Research Posters"

For further information, contact:

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Deadline for receipt of abstracts: April 17, 2001

Northeast Student Chemistry Research Conference 2001

Open to undergraduates, graduates, and post-doctoral fellows in all areas of chemical research

Saturday, April 28, 2001

Boston University, Photonics Center

Keynote Speaker- Dr. Robert Langer of MIT: *Advances in Drug Delivery and Tissue Engineering*

Invited Guests- President of the ACS, Attila Pavlath, and members of the Jungchemikerforum of the German Chemical Society

For details, visit the NESACS YCC website at <http://people.bu.edu/nsycc>

Abstracts will be accepted on this site. There is no registration fee.

Students are invited to present a poster. Two graduate-level students will be eligible to give 15 min. oral presentations, each.

Deadlines:

Oral presentations: March 28, 2001

Poster presentations: April 14, 2001. ◇

Preliminary Announcement

Chemical Education in the United States and Germany:

A Look into the 21st Century

A symposium sponsored by the Northeastern Section of the American Chemical Society (NESACS) and the Gesellschaft Deutscher Chemiker (GDCh) as part of the Younger Chemists Committee (YCC)-Jungchemikerforum (JCF) Initiative.

Thursday, May 3, 2001, 1:00 P.M.

Boston University, School of Management Auditorium
595 Commonwealth Avenue, Boston, Massachusetts

Dr. Sylvia A. Ware, Director, Education and International Activities Division, American Chemical Society, *Chemistry for the Citizen and Chemists as Responsible Citizens*

Professor Glenn A. Crosby, Department of Chemistry, Washington State University, *Current Problems of Science Education in American Schools*

Dr. Robert L. Lichter, Executive Director, Dreyfus Foundation, *Chemistry Education: Freude am Leben or Sturm and Drang?*

Prof. Dr. Christiane S. Reinert, Department of Chemistry and Education, University of Cologne, *Teaching, Discovering, and Applying Chemistry in Germany: Current State and Selected Recent Developments*

Prof. Dr. Carsten Bolm, Institute for Organic Chemistry, Rhine-Westphalia Technical University, Aachen, *Chemical Education in Germany*

Prof. Dr. Terence N. Mitchell, Department of Chemistry, University of Dortmund, *Post-Bologna Chemical Education in Europe*

The program will conclude with a panel discussion.

For more information contact Morton Hoffman (617-353-2494; hoffman@chem.bu.edu). ◇

Book Review

Continued from page 7

mous strain energy expected for a bicyclic compound with zero-bridges (until one realizes that the molecule in question is dinitrogen!).*

The last section, "Encouraging Creativity in the Classroom", consists of three chapters devoted to the use of science fiction in education. The first chapter points readers to some resources for using science fiction stories

* Another example comes to mind: A publication by the spurious S.C.H. Windler in *Annalen der Pharmacie*, the forerunner of *Liebigs Annalen*, in the 1830, supposedly written by Wöhler, a take-off on Dumas' substitution theory, in which each atom in potassium permanganate is successively substituted by chlorine, and each resulting compound is still water soluble, giving a violet solution. (The supposed author written as Schwindler is, of course, the German for "liar").[ed.]

in the classroom (which I found useful), then looks at having students examine scientific concepts through writing their own fiction (scientific fables?). The second reports the results of a survey of scientists' attitudes about using science fiction to teach science, while the last chapter is a reprint of a 1953 article from *Astounding Science Fiction* magazine that describes the intriguing "Arcturus Project", in which students in MIT's Industrial Design course were given the assignment of designing products for the residents of a fictional world.

Chemistry and Science Fiction concludes with a sixteen-page appendix entitled "Recommendations For Further Readings", in which five of the authors propose fairly extensive reading lists (mostly annotated), providing a springboard for the interested reader. For the science fiction neophyte, this may turn out to be the most useful section of the book.

Overall, I found *Chemistry And Science Fiction* interesting, though

somewhat uneven in tone. I cannot say it convinced me that a great deal of science fiction involves chemistry in a significant way, although there does appear to be more than I had expected. In the world of science fiction, though, it appears that the Central Science is perhaps less central and more peripheral, and I was left longing for the arrival of another Asimov. ◇

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A Jungle Story

by Myron S. Simon, Ph.D.

In the mid 1940s, when I was a graduate student in Dr. Robert B. Woodward's group, isolating and studying curare alkaloids, I began to hear about a man who had been doing research on the plants of the jungles of South America. He had earned his doctorate at Harvard about six years earlier, had published significant studies on several hallucinogenic drugs, and then had gone into the jungles again, and had not been heard from since. The local lore in the chemistry lab was that he had probably been killed by one of the remote tribes, maybe a cannibal tribe previously unknown to the outside world. His name was Richard Evans Schultes. I heard his name pronounced "Schultz" and also "Schulties".

The tale of the lost Harvard botanist never really left my memory, so this December past I was excited to learn about the man and his career, and especially about his World War II mission and the consequences. I had bought a book by Wade Davis, "One River", which I expected to be a report on canoeing in the Amazon region. In fact, it did include river travels, but the book was mostly about plant collecting in the jungles, centering primarily on Schultes. (Davis prefers the term "forests" to "jungles")

In short, to answer my long held curiosity, after 12 years spent mostly in the forests of Colombia, Schultes came back to Harvard, headed the Botanical Museum, and continued his field trips to the forests of South America and plantations of Malaysia. Wade Davis was one of his students, as was Timothy Plowman. The book describes their travels, as well as Schultes'.

His mysterious disappearance into the forests and his subsequent work in an area of chemical interest are described in two chapters, Chapter 10, "White Blood of the Forest, 1943", and Chapter 11, "The Betrayal of the Dream, 1944-1954".

United States was in the war after December, 1941, and the government became faced with a serious problem in 1942. The economy of the period was seriously dependent on rubber — as it is today, of course. While rubber originally was a product of the Brazilian Amazon forests, in the 1870's seeds of *Hevea brasiliensis* were obtained by the Royal Botanical Gardens at Kew, England at the instigation of Clements Markham in the British India Office. Eventually these seeds formed the source for the British and Dutch plantations of the Far East. In 1910 Brazil still produced half of the world's rubber, but by 1918 the Southeast Asian plantations produced 80% of the supply, and was significantly cheaper than the rubber collected from individual trees in the wild in Brazil. That, plus a leaf blight that attacked the Brazilian trees, essentially wiped out the South American source for rubber. By 1941 99% of the world's rubber came from the plantations in British Malaya and the Dutch East Indies.

The Japanese war plan was to capture the countries which produced rubber, and they succeeded in this early in the war. The Allied sources of rubber were now in enemy hands.

Into this scene Schultes enters. He has already earned a reputation as a botanist who can work with native peoples to learn their plant lore, an ethnobotanist. He has already been working, in the forests of southern Colombia, that most northwestern segment of the great Amazon basin, studying the curares, the arrow poisons of the natives.

He is summoned from the jungle to Washington, where he is told that he is already hired on as a field technician to the Rubber Reserve Company in the Commerce Department, working on a project of the Bureau of Plant Industry of the Department of Agriculture. His mission is to find where *Hevea* rubber can be obtained in the jungles of Colombia, to make an inventory of standing trees and to study the practicality of getting the rubber out. Leaf blight has not yet reached the area. Disease resistant strains might be

found; the ultimate goal is to set up plantations of disease resistant stock and have an American source of rubber again.

The mission is to be kept secret; the public must not know how desperate the situation is. Schultes is given a week to get ready. He becomes engaged, but his fiancée will have to wait seventeen years before they finally marry. Schultes is back in Colombia before his friends at Harvard learn of his quick return. He simply disappears into the jungle again.

Jules Mayer, an elderly Dutchman with long experience in the rubber plantations in the Dutch East Indies, headed up the search for rubber in Colombia. The role of Mayer was crucial, because he had to support his field men, try to make the bureaucrats in Washington understand the difficulties and dangers the men were going through, the differences between the Far Eastern plantations, with their miles and miles of trees planted in grids twenty feet apart, and the uncharted river valleys and mountains, without roads, without trails, even with very few native settlements. His was the task of acting as a buffer to deflect the order from Washington which casually suggested that Schultes, while he was in the neighborhood, might look at another nearby site, which would have required a month of trail cutting to get to the river, followed by a 600 mile dugout canoe trip through uninhabited lands.

The overall assignment Mayer gave Schultes was to find and estimate the density of *Hevea* rubber trees, to set up sites where appropriate to collect the rubber, to solve the problem of getting the rubber out and to study the species *Hevea*, looking for blight resistant trees.

When you look at a physical map of Colombia you are struck with the fact that, while the western side and northern spike of the country are mountainous, three fifths of the country, the central, eastern and southern areas, are dominated by rivers, with only occasional heights lifting up between river valleys. There are very

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A Jungle Story

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few settlements shown in this area. This is the Colombian part of the Amazon basin. The rivers are the key to movement and exploration, and the presence of major waterfalls and long stretches of rapids has led to separation of Indian tribes and to areas completely unexplored by white men.

Before being called to Washington, Schultes had done some of his notable botanical collecting along the Sucumbíos (San Miguel), Caquetá and Putumayo Rivers. Now he was to find that the Apaporis River, the most isolated of the tributaries of the Amazon, was the route to finding large numbers of the trees he sought. In the seven months of 1943 that he worked on the Apaporis he had run the entire length of the river from the rapids at Chiribiquete, past the great falls and cataracts at Jirijirimo and those at Yayacopi where the Apaporis flows into the Amazon at the Brazilian border. In that time he had set up work parties, made camps and depots, landing fields, made ready for the collection of rubber.

His count of 16,713 trees calcu-

lated to more than 1.5 million trees within a half mile of the river bank. Ten thousand gatherers would be able to take out around 6.6 million pounds of rubber a year. Mayer's report to Washington in December, 1943, recommended the Apaporis basin as the best source of rubber in Colombia.

Schultes was given another, more long range assignment. The Bureau of Plant Industry's plan was to make the Western Hemisphere independent of Asia by finding a way to circumvent the leaf blight disease, so that plantations of rubber trees could exist in the Americas. A previous attempt in the '20s by Henry Ford in Brazil had set up a town, Fordlandia, and 8400 acres had been planted with nearly 1.5 million trees from Asian clones. Within a year the blight had struck and wiped out the plantation. A second, larger attempt in another site in Brazil went the same way, as did attempts by major rubber companies, Firestone, Goodyear, in a number of locations in Africa, Haiti, Central America as well as Colombia.

One clue remained from the many attempts. Hans Sorensen, a Danish agronomist, had found some *Hevea*

brasiliensis trees which seemed to be highly productive and to have unusual resistance to the leaf blight disease, growing near Leticia, a town on the Amazon at the southeasternmost tip of Colombia, where Colombia, Peru and Brazil meet. In July, 1944 Schultes went to Leticia, and, with occasional expeditions to *Hevea* sites in Peru, Bolivia, and Brazil, spent the next two years studying the rubber trees, collecting and sending tons of seeds to experimental stations at Villarteaga in Colombia and Turrialba in Costa Rica where development of the resistant trees was taking place. By the end of 1947 the program to establish plantations of rubber trees in the Americas seemed ready to roll. The war had been over for two years.

The wartime shortages of rubber were not alleviated by Colombian rubber. From April, 1942 to June, 1946, Colombia produced only 2400 tons; all of Latin America, 127,000 tons. The annual needs of the United States during the war was 800,000 to one million tons.

The task of producing 800,000 tons of rubber a year fell to the chemists and chemical engineers of America. In 1940 the government had authorized construction of four plants to manufacture Buna-S, the butadiene-styrene copolymer invented at I.G.Farben. By April, 1942, these plants were called upon to take on the huge task of replacing the unavailable Asian rubber, now in Japanese hands. Plants were run by Goodyear, Goodrich, U.S. Rubber, and Firestone, and located close to oil refineries where the butadiene and styrene were made. By the end of the war the synthetic rubber program was capable of producing over 800,000 tons a year. Wade Davis notes that, absent the atomic bomb project, the synthetic rubber program was "the greatest technological breakthrough of the war."

Synthetic rubber was not as cheap, as strong, nor as flexible and durable as the natural product. The Asian rubber plantations recovered after the war, and began to reclaim position in the world's rubber market. By 1948 the natural product had displaced many

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uses of synthetic rubber, and synthetic production had dropped to 500,000 tons. Natural rubber was mixed with synthetic to improve its characteristics for tires, once the natural again became available, and work continued to improve the synthetic product. But the opportunity for the Western Hemisphere to have its own plantations of rubber trees, and rubber trees resistant to the leaf blight, was scotched. And here Wade Davis tells how it happened.

The work to find rubber in Colombia began under the Rubber Investigations Division of the Bureau of Plant Industry (BPI) of the U.S. Department of Agriculture. In 1940 the Rubber Reserve Company was set up in the Commerce Department to acquire a supply of natural rubber, but the field work in Colombia remained in the BPI. The State Department took over financing the BPI work in 1943, and paying for the rubber program became a source of contention after the end of the war. By 1952 it had become apparent that a major effort was being made to eliminate the entire program for starting plantations in Latin America. The idea was disputed on several counts: The plantations would not be located in the United States, while the manufacture of synthetic rubber was. The synthetic rubber industry would be threatened by Latin American natural rubber. A stockpile of Far East rubber would be adequate. Better synthetics will be discovered which will match or improve upon natural rubber. As Davis sums up, "There were far more votes in Texas than in Costa Rica."

The head of the rubber program at BPI, Robert Rands, countered: The Far East plantations are susceptible to the leaf blight disease. (Only the fact that the fungus cannot survive for the length of time to reach Asia by ship had prevented the blight from reaching the plantations. The strains developed for Southeast Asia had been chosen for yield, and were especially susceptible to the disease.) The American plantations would be the future stockpile, and would be much cheaper than a billion

dollar stockpile which had to be rotated every three years. The cost of the BPI program was only \$2,800,000 for its fourteen years, while the government already had spent \$40,000,000 in the eight years after the war to improve the synthetic. The research station at Turrialba under Ernest Imle had done much of the basic science. A garden of every rare clone preserved the germplasm of Latin American rubber. Experimental plantings had been established, and the project was ready to produce trees for the formation of plantations

The funding for the BPI rubber program was transferred to the Institute of Inter-American Affairs (IIAA) of the State Department early in 1952. Rands and CEOs of the major rubber companies requested a continuation and expansion of the program. The State Department's director of IIAA, Rey Hill, had other ideas. He was determined to cut off the program for political reasons. The British were fighting Communists in Malaya. American plantations could destroy the rubber based economy there. Further, he had a dispute with Imle when he went to inspect the research station and was convinced that Imle and all his workers at Turrialba were Communists. Hill, knowing next to nothing about rubber, had no idea of the value of the work done in Costa Rica.

In early 1953, Rands, after 20 years on the program, was displaced as head of the Division of Rubber Plant Investigations. His successor, Marion Parker, believed in the program, and pushed to get Hill to agree to proceed beyond the research stage. Hill countered with a delaying request for an external investigation. The entire matter was kicked upstairs to Harold Stassen, director of Foreign Operations Administration, and Arthur Flemming, director of the Office of Defense Mobilization. Flemming strongly supported continuation as a strengthening of the security interest in natural rubber. Again, the rubber industry executives attempted to circumvent loss of the program by letters to Stassen. Secretary of Agriculture Ezra Benson demanded that Stassen return the pro-

gram to the Department of Agriculture. All these efforts were unavailing. In October, 1953, Rey Hill proposed eliminating the program, and ten days later Stassen wrote the rubber executives that he was ending it. In December he cancelled the BPI program to build an American rubber plantation system.

Agents of the State Department quickly closed down Turrialba, seizing all the records; the rubber trees and clonal garden were destroyed and within a few years the experimental plantations were taken over by the jungle. The work of Schultes, Mayer, Imle and the other rubber researchers came to naught, felled by bureaucratic folly.

Synthetic rubber made a comeback after 1948 when the demand for rubber sextupled over the next thirty years. By 1964 it produced 75 % of the world's rubber. For a while it appeared that the folly was really prescience. That idea was turned on its head when the OPEC oil embargo in 1973 doubled the price of the butadiene and styrene, since a ton of rubber required 3.5 tons of oil to produce. The economics were now on the side of natural rubber, since only a half ton of oil was needed to produce a ton of natural rubber.

The next blow to hit the synthetics came with the invention of radial tires. The sidewalls of these tires require the stronger natural rubber. The rubber in the tires on aircraft, trucks and bulldozers are 100% natural. By 1993 the world consumed 5.5 million tons of rubber, 85% of which came from Asia. The United States depended more and spent more on imported rubber than at any earlier time.

In a Fortune magazine article entitled "The Rubber Industry's Biological Nightmare" Davis cited several points to underline the shakiness of our dependence on imported natural rubber. The possibility of the leaf blight reaching and destroying the plantations of Southeast Asia is always there. But another problem is that supply of natural rubber may not grow much further. In 1995 international production was 5.87 million tons. This may be as high

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Summer Scholar Report

Molecular Recognition in a New Class of Organic Compounds, (1-octynyl)-pyridin-2-ones

Matthew Cardello*, Cynthia McGowan

Department of Chemistry, Merrimack College, North Andover, Massachusetts

Introduction

Molecular recognition is an important phenomenon in the association of many biological molecules, such as nucleic acids, proteins, and enzymes.¹ Forces commonly responsible for the association of these and other molecules are hydrogen bonding, π -stacking, and London Forces between alkyl groups. The objective of this research is to study by ¹H-NMR the hydrogen bonding association of the novel class of compounds, (1-octynyl)-pyridin-2-ones and eventually (1,3-decadiynyl)-pyridin-2-ones.

Wuest has extensively studied the strong hydrogen bonding of pyridinones and used it to control molecular aggregation². He has shown that dipyridinones form dimers, trimers, and polymers through hydrogen bonding of the pyridinone rings. The type of aggregate formed depends on the substitution pattern of the pyridinone rings.

Our target molecules also have the potential to undergo

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as present technology can go. Further, land once used for rubber in Malaya, formerly the largest producer, is being converted to oil palm production. Thailand, now the largest producer, is experiencing a tourism boom which is drawing away workers from the plantations. Other countries, Cambodia, Viet Nam, China, are picking up production, and Indonesia is another country where growth may happen. But the nations of Southeast Asia are using more and exporting less, and China and India are expected to become big consumers as bias tires are replaced by radials in those countries. How to react to the situation where demand is greater than supply?

The American response may be the work being done in our laboratories. Goodyear came out with a 1,4-cis-polyisoprene, Natsyn, in 1960. While it has most of the properties of natural rubber, it has some branching which causes "subtle differences in performance." Polymerization methods have become more sophisticated since 1960, and there may already be rubbers in the laboratory that are equal to, or better than, natural rubber. Then the big question will be cost and scale.

And, there are disease resistant *Hevea* trees out there, waiting for their own plantations!

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Wade Davis, *One River; Explorations and Discoveries in the Amazon Rain Forest*, Simon and Schuster, NY, 1996. The Fortune magazine article is reprinted in Wade Davis, *Shadows in the Sun; Travels to Landscapes of Spirit and Desire*, Inland Press, Washington, DC/ Covelo, CA, 1998. \diamond

a dimerization through hydrogen bonding of the 2-pyridinone heterocycle. It is expected that, in an aprotic, polar solvent, hydrogen bonding will be the dominant force in molecular association.

Discussion

The first target molecule to be synthesized in this study was 6-(1-octynyl)pyridin-2-one (**5**). The initial synthetic plan utilized classic solution phase procedures. The condensation of 2,6-dibromo pyridine with benzyl alcohol went according to published procedure in good yield.³ The coupling of the substituted pyridine with 1-octyne in the presence of CuI and Pd(PPh₃)₄ resulted in a reaction mixture that was extremely difficult to purify. Extensive chromatography resulted in very low yields of an impure product. Therefore, to facilitate ease of preparation and purification, 6-(1-octynyl)-pyridin-2-one was prepared on a polymer support according to the synthetic scheme shown in Figure 1.

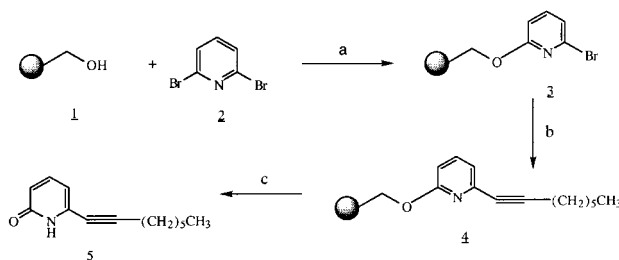
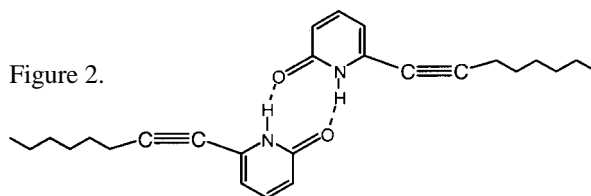


Figure 1 Reagents: (a) KOH, 18-crown-6; (b) Pd(PPh₃)₄, CuI, Et₃N; (c) (CH₃)₃SiI

The condensation of dibromo pyridine and 1% cross-linked hydroxymethyl polystyrene was accomplished by refluxing in toluene and the product was used without further characterization. The palladium catalyzed cross coupling between the bromopyridine and the terminal end of the acetylene followed Yamanka's procedure for ethynyl-substituted heteroaromatic compounds.⁴ Finally the substituted pyridinone was cleaved from its polymer support with trimethylsilyl iodide.⁵



The molecular association study was performed by variable temperature ¹H-NMR on differing concentrations of the product solution in CDCl₃. Figure 2 illustrates the

* 2000 Norris/Richards Summer Fellow

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hydrogen bonding dimer of the product. With a more extensive association between the two molecules, the N-H signal moves to higher ppm and narrows and sharpens.

Figure 3 illustrates the lactam-lactim tautomerism that is possible in the product as a proton migrates between the nitrogen and the oxygen. In the lactim form, the proton is bonded to the oxygen and the electron pair of the N-H bond returns to the ring and restores aromaticity, thus stabilizing the molecule in the absence of dimerization. Model temperature and concentration NMR studies were performed with 2-pyridone and 2-hydroxyquinoline. The 2-pyridone showed strong dimerization of the lactam form at low temperature with the signal of the N-H proton shifting to 14.7 ppm. At room temperature and higher, significant amounts of the lactim form could be detected by the signal of the O-H proton at 2.5 ppm. In contrast, the 2-hydroxyquinoline showed no proton signal between 11-15 ppm even at very cold temperatures or high concentrations and only the lactim tautomer was detected by NMR.⁶

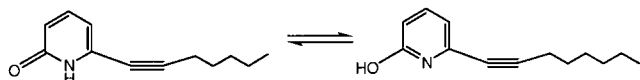


Figure 3

Two samples of product **5** were studied, one at a concentration of 70 mM and the other at a concentration of 47 mM. Spectra of the 70 mM sample were taken at 10 °C intervals from 25 °C to -55 °C, and also at -60 °C and -62 °C. The spectra (Figure 4) do not, under any conditions, show a signal for the hydroxyl proton, which should appear in the range of 2-3 ppm. The amide proton signal first has a significant integration at 5°C. Its chemical shift moves to higher ppm until the sample temperature is -60 °C, at and below which temperature the chemical shift is constant at 13.5 ppm. The presence of the N-H signal and absence of the O-H signal indicates that a significant hydrogen bonding dimerization has occurred in the sample at the temperatures studied.

Spectra of the 47 mM sample were taken at 10 °C intervals from 55 °C to -55 °C, and also at -60 °C and -62 °C. The spectra show the same trends as those of the sample at higher concentration, including having the same maximum chemical shift of the amide proton signal (13.5 ppm). The first significant integration of the amide proton signal is at 5 °C; however, the chemical shift of the signal at that temperature is 11.0 ppm, as opposed to 12.1 ppm for the more concentrated sample. The phenomenon described by Gallant of association occurring at lower temperatures with a less concentrated sample has not yet been observed.^{2d}

Conclusions and Further Studies

The synthesis of 6-(1-octynyl)-pyridin-2-one was successful, once the solid phase supported approach was applied; this has proven to be the method of choice. Initial

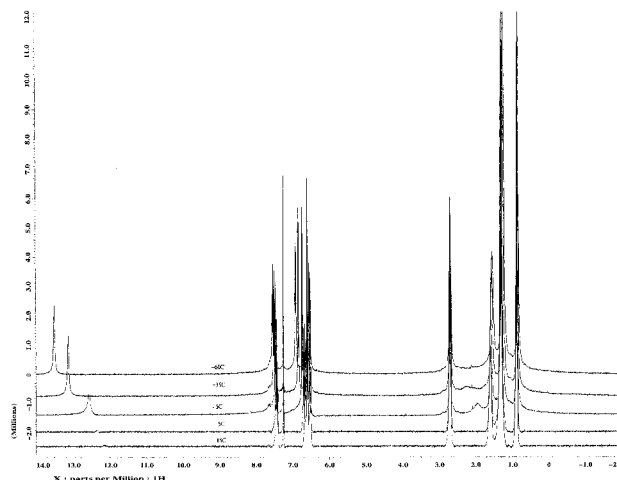


Figure 4 (Temperatures Shown: 15, 5, -5, -35, -60 °C)

NMR studies indicate that, in CDCl₃, hydrogen bonding is the predominate force in molecular association. Further NMR studies are to be done at variable concentration in order to determine the free energy of hydrogen bonding and the formation constant of the dimer. Also, different solvents are to be used to determine if the other modes of association can be detected by suppressing the hydrogen bonding. The isomer of the first target molecule, 3-(1-octynyl)-pyridin-2-one, is to be synthesized, along with the diacetylene analogue of each isomer.

Experimental

The synthetic strategy involves the use of a polymer support, 1% cross-linked hydroxymethyl polystyrene (Figure 1), in order to facilitate ease of preparation and purification. All compounds were obtained from Aldrich and used without further purification. All solvents were obtained from Fisher and used without further purification. The NMR spectra were obtained on a JEOL 300 MHz FT-NMR and IR spectra were obtained on a Perkin Elmer Spectrum One FT-IR.

Compound 3. To a suspension of hydroxy-methyl polystyrene (1.0 g, 0.6-1.0 mmol/g) in toluene (25 ml), were added 2,6-dibromopyridine (1.678 g, 7.083 mmol), KOH (0.843 g, 15.0 mmol), and 18-crown-6 (0.200 g). The solution was refluxed for three hours, then cooled to room temperature and vacuum filtered. The polymer-supported product was washed with two 10 mL portions of toluene followed by 5 mL portions of water until the filtrate was neutral to pH paper. The functionalized polystyrene was dried under reduced pressure overnight. 1.434 g were isolated.

Compound 4. A mixture of the polymer-supported pyridine (**3**), 1-octyne (1.475 ml, 9.998 mmol), tetrakis(triphenylphosphine) palladium (0) (0.330 g, 0.286 mmol), and copper (I) iodide (0.103 g, 0.541 mmol), was maintained at 70 °C in 3 mL triethylamine for three hours in a sealed tube. The mixture was cooled to room temperature, diluted with water and vacuum filtered. The polymer-supported product was washed with several 5 mL portions of

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water, then with 10 mL of 5 % HCl (aq.) to neutralize the remaining solvent. The product was washed with 10 mL water and the pH of the filtrate was checked and found to be 7. The product was washed with diethyl ether and dried under reduced pressure overnight. 1.031 g were isolated.

6-(1-octynyl)-pyridin-2-one (**5**).

A mixture of the polymer-supported product (**4**) and trimethylsilyl iodide (0.50 mL) was stirred in 5 mL chloroform overnight under nitrogen. Methanol (1 mL) was added and the mixture was vacuum filtered to separate the product from the cleaved polymer support. The filtrate was collected and the volatile components were removed under reduced pressure. The residue was taken up in diethyl ether, washed with NaHSO₃ (aq.), NaHCO₃ (aq), saturated NaCl (aq), and dried over Na₂SO₄ (anhydrous). The ether was removed under reduced pressure. Crude yield was 0.261 g. Trituration with ether resulted in solid and soluble fractions. The solid (10 mg, 5-8 %

proved to be compound **5**. The soluble fraction also contained compound **5** by TLC (ether).

¹H-NMR (CDCl₃) δ 11.9 (NH); 7.45 (1H,t); 6.55 (2H, m); 2.70 (2H, t); 1.6-1.3 (8H, m); 0.9 (3H, t). ¹³C-NMR 164.6 (C=O), 143.4 (C); 141.0 (CH), 126.6 (CH); 119.6 (CH); 113.4 (C); 107.6 (CH); 47.7 (CH₂); 31.7 (CH₂); 29.6 (CH₂); 28.0 (CH₂); 22.7 (CH₂); 14.1 (CH₃). IR (neat) 3154, 2931, 2858, 2253, 1654 cm⁻¹.

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Acknowledgement

Matthew Cardello acknowledges the support from the Northeastern Section of the American Chemical Society through a Norris/Richards Summer Research Fellowship, and the help and guidance of Prof, Cynthia McGowan.

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Calendar

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Apr 24

Prof. Robert Gordon (Univ. of Illinois, Chicago) Physical Chemistry Seminar Series
"Using Coherent Phase Control to Understand Molecular Continuum Structure"
MIT, Room 2-105, 4:00 pm

Prof. Michael Maroney (Univ. of Massachusetts, Amherst)

"Structure and Function in Metalloenzymes: A Nickel Tour"
Tufts Univ., Pearson Chem. Building, 62 Talbot Ave., Medford, Room 106, 4:30 pm

Mr. Guimy Cesar (Univ. Mass. Boston)
"The Chemistry of Fluoran Leuco Dyes"
(Literature Seminar)
Univ. Mass. Boston, Science Building Room 089, 4:30 pm

Apr 24-25

"2001: A Laboratory Odyssey"
Northeast Region Conference and Exhibition -- Joint meeting of the Northeast Sections of AACC, CLMA, and CLAS
(For additional information, call Am. Assoc. Clinical Chemists.) Boxborough Holiday Inn

Apr 25

Dr. Tom Hancewicz (Unilever)
"Multivariate Raman Imaging"
Univ. New Hampshire, Iddles Auditorium Room L103, 11:10 am

Prof. Susan M. Kauzlarich (Univ. of California, Davis)

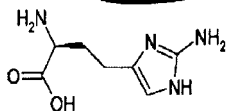
Harvard/MIT Inorganic Chemistry Seminar Series
"Solid State and Materials Chemistry: Colossal Magnetoresistance in Ternary Transition Metal Pnictides and Synthesis of Alkyl-terminated Si Nanoparticles."
Harvard Univ., Pfizer Lecture Hall, 4:00 pm

Apr 26

Prof. Owen W. Webster (Univ. of Pennsylvania)
"Cyanocarbons-a Review of the Strange Reactivity of Organic Compounds Substituted with a Number of Cyano Groups"
Dartmouth College, Room 101 Fairchild, 10:30 AM



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- ACS National Meeting in Chicago, August 27-29, 2001
- CPhI in London, United Kingdom, October 8-10, 2001

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Correction

In the Monthly Meeting notice of the March 8 Meeting we neglected to state that the meeting is jointly sponsored by NESACS, the American Institute of Chemical Engineers and the International Society for Pharmaceutical Engineering.

We have sought to correct this serious error by having the correct sponsorship listed both in the flier and on the website announcing the meeting. ◇

Abstract

Continued from page 5

twenty-first century. Utilizing CO₂ as an alternative solvent in conventional processes has the potential to favorably impact the environment and our communities. There are, however, several barriers to adopting CO₂-based applications. Several concepts as well as obstacles to adopting the carbon dioxide technology platform will be highlighted in this lecture. ◇

Calendar

Continued from page 16

Prof. James Watkins (UMass Amherst)
"Dilation of Multi-component Polymer Systems with Supercritical Fluids: Kinetic and Thermodynamic Considerations for Materials Processing"

UMass Lowell, Olney 428, 3:30 pm

Prof. Tamio Hayashi (Kyoto University)

Novartis Lecture, Title TBA
MIT, Room 6-120, 4:00 pm

Prof. Adam Arkin (Lawrence Berkeley Labs, Berkeley, CA)

Title: TBA (Physical Chemistry Lecture Series at Harvard)

Harvard University, Pfizer Hall, 12 Oxford Street, Cambridge, 5:00 pm

Apr 30

Dr. Eleftherios Terry Papoutsakis

"Oxygen and its Transport in Hematopoietic Life and Death"

Tufts University, Dept. of Chemical & Biological Engineering

Science and Technology Building, Room 136, 4 Colby Street Medford, MA, 11:30 am

Prof. Andrew F. Kiely (Boston College)

"Hafnium Aminoborole Complexes as Neutral Analogues of Ziegler-Natta Catalysts"

Boston College, Merkert Chemistry Center, Room 130, 2609 Beacon St. 4:00 pm ◇

Summerthing 2001

June 7, 2001, Red Sox-Detroit Tigers Game, 7:05 pm

Pre-game party at BU

Jointly sponsored by NESACS and its Younger Chemists Committee

100 right field box seats have been reserved at a special price. For reservations, send a check for \$16.00 per tickets to Marilou Cashman, 23 Cottage St., Natick, MA 01760. Details about the pre-game party at the B.U. Chemistry Dept. will be in the next issue, but the tickets may be gone by then! ◇

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Board of Directors

Notes of Meeting of January 11, 2001

NOTE: Board Meetings are held on the monthly meeting day at 4:30 p.m. Section members are invited to attend.

Officers' Reports:

Chair: T. Frigo, 2001 Chair, presented Past Chair D. Lewis with the Past Chair ACS pin. By acclamation the Chair and the Board expressed thanks and gratitude to D. Lewis for her past year of service to the Section.

T. Frigo announced that NERM2001 will be held at the University of New Hampshire under the sponsorship of NESACS.

On March 7 M. De Vito is arranging for a "Day on the Hill" as part of the government relations activities. M. Strem suggested that the national ACS may be able to set up an exhibition

Continued on page 18

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by Saltus

Board of Directors

Continued from page 17

"The Role of Chemistry". D. Lewis suggested involving the Section's Corporate Sponsors and Patrons.

B. Paul, Holliston Elementary School, has requested \$300 to support a local Science Fair, an event previously supported by NESACS.

The Sino-American Chemical Society has requested funds to support their annual meeting, to be held June 8-9 at MIT. The 2001 NESACS budget contains a line item of \$500 for this event.

Chair-Elect: By written report, M. Hoffman pointed out that the "Connections to Chemistry" program, held last October 19, was featured on p.5 of *C&ENews* of Dec. 11, 2000. (<http://cen.acs.org/isubscribe/journals/cen/78/i50/html/7850awar.html>)

Secretary: The minutes of the December 13, 2000 meeting were ACCEPTED after two modifications, one already included in the published report, the other, that D. Lewis will chair an ad-hoc committee on establishing an annual Phyllis Brauner Lecture.

Treasurer: It was MOVED and VOTED to accept the December 2000 Treasurer's report.

Standing Committees:

Bd. Of Publications: J. Billo, reporting for the new Chair, M. Schwartz, gave the composition of the Board of Publications for 2001: M. Schwartz (chair), P. Gordon, F. Gorga.

The Board acknowledged the work of V. Gale for increasing advertising revenue for the *Nucleus*.

Editor: A. Heyn announced that the February issue will be 20 pages and will include a Summer Scholar's report.

Budget: J. Piper presented the 2001 Budget for review, to be voted at the February Board meeting.

Public Relations: M. Chorghade stated that public relations presentations are planned for February 16 at Kent State College and for the National ACS Meeting in San Diego in April, 2001.

Board of Directors

Continued from page 18

Chemistry Education: M. Tanner reported that National ACS has sent copies of *Chem Matters* to all attendees of the *Connections to Chemistry* workshop held October 19, 2000.

Norris/Richards Summer Fellows have been announced.

Other Committees:

Summerthing: D. Lewis announced that W. Gleekman will chair the 2001 Summerthing event, to be attendance at a Red Sox game again.

Younger Chemists: M. Strem announced that the April Undergraduate/Graduate Research Day is well along in the planning stage.

Planning for the German Exchange Chemistry Student Program is also progressing well, with a steering committee having been set up.

May 3, 2001 a Chemistry Education Conference will be held, with German and American Faculty and the head of the ACS Dept. of Education being speakers. ACS President A. Pavlath will attend. National ACS has committed \$10,000 so far, with another \$10,000 being requested. On May 1 and May 2, respectively, industrial and academic excursions are planned.

Old Business: D. Lewis reported on the Phyllis Brauner Memorial Lecture: Donations have been received and turned over to the Treasurer. Ideas are solicited for these lectures and a possible award.

From the minutes of M. Singer ◇

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at the NESACS
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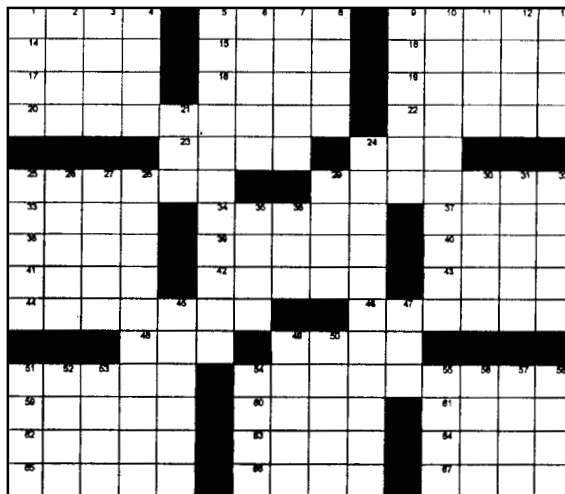
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Puzzle Column

IR SPECTROSCOPY

by Colleen M. Parriott

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ACROSS

1. Admit
5. Scrub
9. Venerate
14. Categories
15. Treaty partner
16. Turnpike currency
17. Fruit spray
18. Word with null
19. Veers
20. Optical path with no sample used to compare with sample
22. Lessen
23. Sheltered
24. Kuwait currency
25. C-8 compound giving rise to bands in the 1380 and 1460 cm^{-1} regions
29. Dilute acetic acid solution with bands in the 1825 to 1575 cm^{-1} region
33. West Point freshman
34. “_ _ _ is an Island entire of itself”
Donne
37. _ _ one’s time
38. Tattles
39. Word for an auctioneer
40. Jacob’s twin
41. Irish exclamation
42. Number of musketeers
43. Units of electrical Current
44. Fireplace floors
46. Distant
48. Ballet step
49. Engrossed
51. Baby Broncos
54. A molecular motion that gives rise to IR spectra
59. Expect
60. Both: comb. form
61. This: Spanish
62. Black tea
63. What Jack sprat ate
64. Hawaii necklaces
65. Perfect gardens
66. Prepare to publish
67. Minus

DOWN

1. From a distance,
2. Wretched
3. Norwegian saint
4. The way we _ _

5. About 1 micrometer to 1 millimeter for IR
6. Solo
7. Pizza serving
8. Jekyll’s alter ego
9. Achieve
10. Spectrophotometer with light path that rapidly switches from sample to sampleless cells
11. Gumbo vegetable
12. Lease
13. Else: Scottish
21. Sprinted
24. Name given to mid IR region because of the uniqueness of a compound’s spectrum
25. Talk show host
26. _ _ Booth Luce
27. Cycline or hydrofuran lead-in
28. Type of IR spectra
29. Wind direction indicator
30. Gadget
31. Adjust to the situation
32. Reduce, _ _ _ , recycle
35. _ _ and aahs
36. Soviet space station
45. Savors
47. Between zeta and theta
49. Covered with hoarfrost
50. Blue Nile region
51. Apparel for Batman
52. Was in debt
53. Michigan or Ontario
54. Valley
55. Spread the word
56. Words of understanding
57. He’ll give you a lift
58. Famed loch

Historical Notes

By Edward R. Atkinson, Amherst, MA

We present here short biographies of chemists and chemical engineers whose deaths have been reported to us during the past twelve months. Please continue to send us obituary notices from community newspapers that we do not regularly see.

Robert H. Abeles, 74, died on June 18, 2000. He came from Vienna to Chicago in 1939. During World War II he served in the Allied occupation forces in Europe and was involved in the capture of a renegade American named "Axis Sally", who broadcast Nazi propaganda from Berlin. After the war he studied at the University of Chicago and obtained the Ph.D. in biochemistry at the University of Colorado. Following service on the faculties of Ohio

State University and the University of Michigan he joined the faculty of Brandeis University in 1962. As an authority on enzymes he was the recipient of the Robert A. Welch Award for research.

Konrad Emil Bloch, 88, died on October 15, 2000 of congestive heart failure. He was a Nobel Prize winner in 1964 for his study of the biosynthesis of cholesterol. His death was noted in extensive obituaries in *C&EN* (Nov. 6, 2000, p. 51; see also Jan. 22, 2001, p. 10) and the *Boston Globe* (Oct. 17, 2000, p. D19, with 1994 portrait). Bloch was a member of the Harvard University faculty from 1954 until his retirement in 1982.

John E. Campbell, 77, died on November 24, 2000. He was a Boston native who served in the Army's 8th Air Force 421st Bombardier Group. He then received the B.A. from Harvard University (1946), the M.S. from Boston University (1948), and the Ph.D. from the Rensselaer Polytechnic Institute (1952). For the 35 years

before his retirement in 1986 he was employed as a research chemist for the Polaroid Corporation.

Mr. Campbell was a resident of Needham, Mass. for 43 years.

In retirement he was active in town affairs and served as a president of the Polaroid Retirees Association.

Nicholas Catsimpoolas, 69, died on January 11, 2001. He was a native of Athens, Greece and a graduate of the University there before serving in the Greek army. After employment as a research chemist at King Gustav V Research Institute in Sweden he came to the U.S. and earned the M.S. and Ph.D. at the University of Tennessee. He was employed as a biochemist at the Central Soya Co. in Chicago where his specialty was peptide and protein chemistry. He was a member of the M.I.T. faculty (1973-1980) and of the Boston University School of Medicine (1980-1987). In retirement in Newton, Mass. he pursued an interest in photography and Greek art. ◇

To be continued

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- Valerie Wilcox – Director of the National Plastics Museum: Tour of the Museum, Mobile Plastics Van, Workshop on Teaching Plastics in the Classroom
- Dr. Sam Gido – Professor of Polymer Science: Interactions with Regional High Schools
- Dr. David Adams – Authority on the History of Chemistry: History of Chemistry at UMass, including a Campus Tour of the Historic Sites and Artifacts
- Timm Award Banquet and Timm Award Presentation

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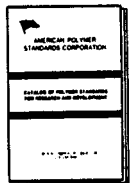
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Ivan Valiela, "Doing Science. Design, Analysis, and Communication of Scientific Research"

Timothy Pasquarelli and Frankie Woid-Black, "Emergency Preparedness Planning. A Primer For Chemists"

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Apr 2

Prof. Eric Sorensen (Scripps Research Institute)
"Reactivity in Bioactive Natural Product Synthesis and Chemical Proteomics"

Boston Univ., Science Center Auditorium, SCI 107, 4:00 pm

Apr 3

Prof. Vincent Rotello (Univ. of Massachusetts, Amherst)
"Polymers, Nanoparticles and Molecular Recognition: From 'Plug and Play' to 'Bricks and Mortar'"

Tufts Univ., Pearson Chem. Building, 62 Talbot Ave., Medford, Room 106, 4:30 pm

Apr 4

Prof. Geoffrey Davies (Northeastern Univ.)
"Adventures with Humic Acid."

UMass Dartmouth, Science & Engineering Building (Group II), Room 305, 4:00 pm

Apr 5

Prof. Ricardo Metz (Univ. of Mass., Amherst)
"Using Electronic Spectroscopy of Gas-Phase Ions to Study Methane Activation and Solvation of Multiply Charged Ions"

Dartmouth College, Room 101 Fairchild, 10:30AM

Apr 9

Prof. Seth Cohen (MIT)
"Interaction of Nuclear Proteins with Cisplatin-Modified DNA"

Boston College, Merkert Chemistry Center, Room 130, 2609 Beacon St. 4:00 pm

Prof. Andrew Marcus (Univ. of Oregon)
"Studies of Complex Fluid Dynamics using New Approaches to Fluorescence Imaging"

Boston Univ., Science Center Auditorium, SCI 107, 4:00 pm

Dr. Doug Cameron (CARGILL)
"Microbial Production of Chemicals: An Industrial Perspective"

Tufts Univ., Dept. of Chem. & Biological Engineering, 4 Colby Street, Science & Technology Center, Room 136, 11:30 am

Apr 10

Prof. Chris Enke (Univ. of New Mexico)
Iddles Lecture Series

"Electrospray Ionization for Mass Spectrometry: Bring the Theory and Practice Together", 11:10 am; and "The Evolution of Analytical Instrumentation and its Impact on the Chemistry Curriculum", 3:40 pm

Univ. New Hampshire, Iddles Auditorium Room L103

Prof. David Van Vranken (Univ. of Calif. at Irvine)

TBA
Boston College, Merkert Chemistry Center, Room 130, 2609 Beacon St. 4:00 pm

Prof. Bern Kohler (Ohio State Univ.)

Physical Chemistry Seminar Series
"Ultrafast Photoprocesses in Nucleic Acids: New Insights into Ancient Sunscreens"

MIT, Location TBA, 4:00 pm

Prof. Barbara Imperiali (MIT)
"Chemistry and Biology of Asparagine-Linked Protein Glycosylation"

Tufts Univ., Pearson Chem. Building, 62 Talbot Ave., Medford, Room 106, 4:30 pm

Ms. Maryjo Bent (Univ. Mass. Boston)

"The Versatility of Cyclodextrins" (Literature Seminar)
Univ. Mass. Boston, Science Building Room 089, 4:30 pm

Apr 11

Prof. Lynn Francesconi (City Univ. of New York - Hunter College)

Inorganic Chemistry Seminar Series
"Technetium: the good, the bad, the ugly"

MIT, Room 6-120, 4:00 pm

Apr 12

Prof. Brett Lucht (Univ. of Rhode Island)
"Transition Metal Mediated Routes to Conjugated Polymers"

Dartmouth College, Room 101 Fairchild, 10:30AM

Prof. James Donaldson (Univ. of Toronto)
"Recent Work in Atmospheric Physical Chemistry: (a) Adsorption of Trace Species at the Air-Aerosol Interface (b) Atmospheric Chemistry of Some Vibrationally Excited Species"

Univ. New Hampshire, Iddles Auditorium Room L103, 11:10 am

Dr. Martin Pralle (Ion Optics, Inc.)

TBA
UMass Lowell, Olney 428, 3:30 pm

Prof. James Leighton (Columbia Univ.)
Organic Chemistry Seminar Series: TBA
MIT, Room 6-120, 4:00 pm

Prof. Alan Koszickowski (Director, Georgetown Univ. Medical Center, Drug Discovery Program)
"Targeting Alzheimer's Disease and Cancer Through PKC-Directed Ligand Design"

Northeastern Univ., Hurtig Hall, 4:00 pm
Prof. Roberto Car (Princeton Univ.)
Title: TBA (Physical Chemistry Lecture Series)
Harvard Univ., 12 Oxford Street, Cambridge, 5:00 pm at Pfizer Hall

Apr 17

Prof. Alan Marchand (Univ. of North Texas)
"Crown Ethers, Cryptands, and Molecular boxes Derived from Functionalized Pentacyclic Diones, A New Class of Ionophores"

Univ. New Hampshire, Iddles Auditorium Room L103, 11:10 am
Prof. Craig Forsyth (Univ. of Minnesota)
"Synthesis of Cytologically Interesting Natural and Non-natural Products"

Boston College, Merkert Chemistry Center, Room 130, 2609 Beacon St. 4:00 pm
Dr. Robert Gerber (Pfizer, Inc.)
"Pharmacoeconomics in Health Care"

Apr 18

Univ. Mass. Boston, Science Building Room 089, 4:30 pm
Shawn Burdette (MIT [Lippard Group])
Inorganic Chemistry Seminar Series
"New Fluorescent Sensors for Zn²⁺ Based on a Fluorescein Platform; Synthesis, Properties and Intracellular Distribution"

Apr 19

MIT, Room 6-120, 4:00 pm
Prof. Ronald L. Christensen (Bowdoin College)
"The Long and the Short of Polyenes: The Optical Spectroscopy of Linearly Conjugated Systems"

Dartmouth College, Room 101 Fairchild, 10:30am
Prof. Roderic Quirk (Univ. of Akron)
"Recent Developments in Anionic Polymerization: Copolymerization, Functionalization and Star Polymer Formation"

UMass Lowell, Olney 428, 3:30 pm
Prof. Lawrence Que, Jr. (Univ. of Minnesota)
"Accessing High-Valent Iron-Oxo States Without Porphyrin in Nonheme Iron Enzymes and Models?"

Boston College, Merkert Chemistry Center, Room 127, 2609 Beacon St. 4:00 pm
Prof. Stuart Rice (Univ. of Chicago)
Title: TBA (Harvard-MIT Physical Chemistry Lecture Series)

Apr 23

MIT, Room 6-120, 5:00 pm
April 23 Prof Catalina Laplaza (Harvard Univ.)
"Synthesis and Characterization of Peptide Supported CODH Structural Analogues"

Boston College, Merkert Chemistry Center, Room 130, 2609 Beacon St. 4:00 pm
Prof. John Fourkas (Boston College)
"Exploring the Microscopic World with Multiphoton Absorption"

Boston Univ., 590 Commonwealth Avenue, Science Center Auditorium, SCI 107, 4:00 pm
Prof. Scott E. Denmark (Univ. of Illinois at Chicago)
"Asymmetric Catalysis with Chiral Lewis Bases"

Brandeis Univ.,
Room Gerstenzang 122, Building Edison Lecks, 4:00 pm

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