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NESACS

THE NUCLEUS

Summer 2005 *Vol. LXXXIII, No. 10*

Election Results

NESACS Annual Election

1st NESACS Golf Tournament

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Esselen Award Address

Professor Jean Fréchet

Stem Cells

An Article by Martin Freier

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Contents

Cover: *From L to R the winning Vertex team of Mick Hurrey, David Miller, and Ray Forslund. See story on page 5 (photo: Amy Tapper).*

Deadlines: *October Issue: August 23, 2005*
November Issue: September 14, 2005

THE NUCLEUS

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2005 NESACS Election Results

There were a total of 504 ballots counted. * = Elected

Chair-Elect

*Mukund S. Chorghade	432

Secretary

*Michael Singer	453

Trustee

*Michael E. Strem	466

Councilor – 3 yrs.

*Doris I. Lewis	415
*Morton Z. Hoffman	399
*Christine Jaworek-Lopes	399
*Mary Burgess	398
*Donald O. Rickter	387

Alternate Councilor -3 yrs.

*Patrick M. Gordon	384
*Michael Filosa	370
*Lawrence Scott	369
*Liming Shao	356
*S.B. Rajur	328
Mukund S. Chorghade	223

Director-at-Large

*Henry Brown	416
*Ernest V. Groman	407

Nominating Committee

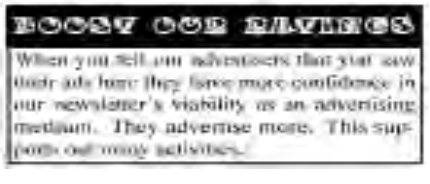
*Doris I. Lewis	284
*E. Joseph Billo	230
Nolan Flynn	225
Ernest V. Groman	154

Esselen Committee

*John L. Neumeyer	436
*Joseph A. Lima	420

Richards Committee

*Roy G. Gordon	356
*Paul Davidovits	319
Gregory L. Verdine	208 ◇



2005 Lyman C. Newell Grants

The Northeastern Section of the American Chemical Society has awarded the Lyman C. Newell Grants for the 67th Annual Summer Conference of the New England Association of Chemistry on *Teaching Chemistry Using Inquiry Approaches*. Grants of $225.00 each to partially cover the cost of the conference have been awarded to the following high school teachers:

Lorraine Kelly at Hull High School in Hull, MA

James Kresel at Martha's Vineyard Regional High School in Oak Bluffs, MA

Patricia Brandl at Medford High School in Medford, MA

Ernestine Struzziero at Lynnfield High School in Lynnfield, MA

The four-day conference on inquiry approaches to teaching chemistry gives participants opportunities to work in the lab and to design new activities, to view demonstrations and to discuss units of study. The conference is being held at Central Connecticut State University in New Britain, CT from Monday, August 1st through Thursday, August 4th, and is co-sponsored by NEACT and the Department of Chemistry, Central Connecticut State University.

The Lyman C. Newell Grants commemorate a former chair of the Northeastern Section who was a distinguished chemist, teacher, and historian of chemistry. For many years he was chair of the Chemistry Department at Boston University. Lyman Newell served as the first president of NEACT from 1889 to 1900 and expressed a continuing interest in training chemistry students throughout his long career. His efforts are celebrated by grants that bear his name. ◇

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Vertex

Next Meeting

NESACS September Symposium

Ion Channel Drug Discovery

Date: Thursday, September 8, 2005

Time: 1:00 – 4:00 PM (Symposium)
4:00 – 5:00 PM (Networking Cocktail Party)

Location: Cambridge Marriott Hotel

Moderator: Mark Varney (Sepracor)

Speakers: Nancy Barta (Pfizer), Francesco Belardetti (Neuromed), Valentin Gribkoff (Scion), Mark Suto (Icagen) ◇

1st NESACS Golf Tournament

Submitted by Amy Tapper and Michael Filosa

On Monday, June 6th forty-seven golfers teed off at Wentworth Hills Country Club in Plainville in the first NESACS String Scramble Golf Tournament.

Golfers came from as far away as Wisconsin to participate. Although the day started cool it turned into a beautiful sunny day for golf and the conditions on the course were perfect. Golf was preceded by a buffet luncheon.

The Vertex team of Mick Hurrey, David Miller, and Ray Forslund won the spirited competition with an outstanding score of 55 (par 71). Second was claimed by the team of Marc Cadell, Jeff Wilson, Bruce Shutts, and Ed Price and third by the team of Amy Tapper, Panos Kalaritis, Brian Robbins, and Gary McGhee. The men's long drive competition was won by Mark Cirolo with a drive of 374 yards and the women's long drive was won by Amy Tapper. The closest to the pin award was won by Brian Robbins.

The awards were given at the banquet which followed the tournament. Much fun was had by all.

Thanks to generous sponsorships by IRIX (*Osmium level*); Hovione, Lyophilization Service of New England, DSM, and Cardinal Health (*Platinum level*);, Rhodia Pharma Solutions, Teledyne ISCO (*Gold level*); and Vertex, Genzyme Drug Discovery and Development, and Peptimmune (*Silver level*) a total of $8,400 was raised to support NESACS activities.

Many thanks to Amy Tapper and Harry Mandeville for organizing this event, to our participating golfers and to Wentworth Country Club for their hospitality. Look for details in upcoming Nucleus issues about next year 's tournament which will be held on Monday, June 5, 2006. ◇

Right to Left: Bridge Hunter, Carl Morris, Kelly Mizer, and Nathan Lebrasseur (photo by Amy Tapper)

Minuteman Bikeway Ride

by Joe Snodgrass

An even half dozen chemists from the NESACS met at the Uncle Sam statue in Arlington on June 1 to bike and walk the Minuteman Bikeway. After being postponed due to a late-season Nor'easter on May 27th, we were pleased to have a very beautiful evening for the ride. Four of us took a leisurely bike ride up to Lexington, where we enjoyed the evening light. Our section webmaster broke away from the pack, rocketing up the path all the way to the terminus in Bedford, about 9 miles each way. One person took a walking tour of the bike path and the town of Arlington, visiting the library and the town gardens.

At dusk we met at Krazy Karry's Backyard BBQ for some excellent burgers and a discussion of the connections between biking and chemistry. Tom Hansen Ph.D., CMC Manager at ARIAD Pharmaceuticals told us about the use of flow cytometry for blood analysis, and how this analytical technique was recently used to disqualify local cycling hero Tyler Hamilton. Our ride leader Joe Snodgrass Ph.D., also of ARIAD Pharmaceuticals brought along a copy of "Bicycle: The History" by Cape Cod author David Herlihy. From this excellent and intriguing book we learned how the popularity of the bicycle took a quantum leap once pneumatic rubber tires replaced the "boneshaking" iron wheels found on early "safety bicycles". Although pneumatic tires were first introduced in 1888 by a veterinarian living in Belfast, John Dunlop, we all agreed that he must have had to take his share of chemistry classes. Pneumatic tires for bicycles were improved by Edouard Michelin of France, who introduced a detachable tire and easily replaced "inner tube". These innovations fueled both the bicycle boom of the 1890's and the development of the rubber industry, providing opportunities for many chemists. Later, pneumatic rubber tires were adapted for use on automobiles. ◇

From Left to Right: Sonia Taktak (Tufts), Charles Krueger, Leann Williams, Viatcheslav Azev (NSYCC webmaster and Tufts), Joe Snodgrass (ARIAD), Thomsen Hansen (ARIAD) (photo by Joe Snodgrass)

From the April 14, 2004 Esselen Award Address

"Functional macromolecules: from design and synthesis to applications"

Dr. Jean M. J. Fréchet
Department of Chemistry, University of California, Berkeley CA 94720-1460
And Lawrence Berkeley National Laboratory, Materials Sciences Division, Berkeley, CA, 94720. USA
frechet@.Berkeley.edu http://www.frechet.com

The development of polymers in the last century has had a profound impact on our society with "blockbuster" discoveries in areas such as synthetic rubber, plastics, and artificial fibers. As Polymer Science matured, numerous specialty polymers were developed for their mechanical properties under demanding conditions, ability to form composites with a variety of materials, ability to promote or negate adhesion, etc. In the second half of the twentieth century, macromolecules that would today be described as "functional polymers" began to emer ge. Among notable examples, one may quote Merrifield's chloromethylated polystyrene resin that enabled the concept and the method of solid phase synthesis so widely used to prepare polypeptide, oligonucleotides and even oligosaccharides today. Other early examples of functional polymers include poly(lactic acid) used widely in medical applications as exemplified by dissolvable sutures; polyacetylene and a number of other conducting polymers, which have opened the field of organic electronics, a field that is now in full bloom.

Inspired by Merrifield's success, my initial foray into functional macromolecules led to the first reported solid phase synthesis of oligosaccharides, a very challenging task given the limited synthetic toolbox available in those days for the coupling of sugar molecules. This was followed by numerous studies on syntheses using solid supports, including the use of polymers as reagents, protecting groups or chiral auxiliaries in organic synthesis. Polymeric scavengers were also demonstrated and commercialized, first in the context of the removal of allergenic substances from the natural oils used in perfumes. A decade and a half later this work on synthesis on solid supports would be re-discovered with the advent of combinatorial chemistry and the preparation of libraries of organic compounds on functionalized polymer beads.

In 1979 while on sabbatical leave at the IBM research centre in San Jose, CA, I had the good fortune to work with Grant Willson who had recently joined IBM and managed a research group in the area of photoresists. Instead of furthering the study of classical photoresists for optical or electron beam lithography, we decided to explore radically new concepts in imaging materials for microlithography. This was a bold project aimed at the distant target of introducing the use of shorter wavelength - deep-UV light - for the production of a new generation of faster and more powerful computer chips with smaller critical dimensions. The bottlenecks were significant as they included both material and fundamental mechanistic issues. The novolac-diazonaphthoquinone materials used at that time had truly outstanding properties but they were too opaque for use below 300nm and their classical photochemistry was not efficient enough as more than one photon was consumed by each chemical transformation. Given the very low light output of the mercury lamps used

in the exposure tools at that time, a process involving a drastically more efficient use of photons had to be developed to maintain reasonable throughput in chip production.

The first issue of optical clarity led us to poly-p-hydroxystyrene, which I had been experimenting with at the University of Ottawa in an unrelated academic project. It of fered low absorbency at 250nm while preserving aqueous base solubility making it an excellent alternative to novolac. The second issue suggested that a process highly economical in terms of photons consumed would have to be discovered.

Within the first month of this project the concept of chemical amplification had emerged, whereby a single photochemical event generates a cascade of reactions propagating through a polymer chain and leading to a lar ge change in solubility, thus enabling three dimensional imaging. In the next few months Grant and I developed the "cascade" concept through experiments with poly(phthalaldehyde) molecules incorporating photoactive depolymerization triggers. We also introduced the thermally removable t-BOC protecting groups onto poly-p-hydroxystyrene and explored means to remove them by thermolysis or catalyzed thermolysis in order to provide the solubility switch (from organic-soluble to soluble in aqueous base) needed for image development. While the basic elements of the concept of chemical amplification were in place by the end of 1979, full development took significantly longer and Hiroshi Ito, hired by Grant Willson in 1980 to continue the collaborative project, finally put all the pieces together while work of 4-t-butyloxycarbonyl-oxystyrene and its polymerization was being completed at the University of Ottawa. A few years later, millions of state-of-the-art chips were quietly being produced in IBM plants using the poly(t-BOC-styrene) produced for IBM at the Eastman Kodak Company. Today, chemical amplification is used universally with resists derived from our original design to produce our most powerful chips and countless electronic devices.

In the late 1980's spurred by James Economy who managed the polymer department at IBM research centre in San Jose, IBM Corporation offered several universities a significant amount of research funding to encourage the development of polymer and material science at top-level US institutions. I was fortunate to be asked by Cornell University to take the IBM professorship and join their outstanding chemistry department. The unrestricted funding provided by IBM and the outstanding and stimulating environment of Cornell University allowed me to start several new projects in the area of functional polymers. One was in the emerging area of dendrimers and another focused on the design and development of polymeric separation media.

Very early on, I was able to convince Frantisek Svec to leave the Macromolecular Institute in Prague where he had a distinguished scientific career to join my research group at Cornell. This fortunate event started a highly productive collaboration in the area of separation media, a collaboration that continues to this day.

While all commercial separation media used in the early 1990's were based on particulate media - mostly spherical silica beads - we focused on the development of a novel continuous medium: macroporous polymer monoliths. The monolithic media consist of a framework of functional polymer permeated by a network of pores allowing both convective liquid flow through large pores and diffusion through smaller pores, high surface area pores for separation efficiency.

Polymer monoliths shine in their ease of preparation and ability to be implemented in any format from the smallest microchannels in capillaries or microfluidic chips to large preparative separation columns. Unlike beads, they do not need to be packed into columns, nor do they have the large interstitial volume that is characteristic of all packed spherical media, where uncontrolled diffusion can occur. While columns or capillaries packed with very small beads requires extremely high pressures in order to sustain flow, monolithic media have low resistance to flow making them suitable for the design of media for very fast separations (as used by Symyx Technology for the fast analysis of libraries of polymers) or nanoscale reactors in which a catalyst is attached to the surface of the monoliths.

The macroporous polymer monoliths were first commercialized for applications in chromatography columns where the speed of operation and the controlled surface chemistry proved to be useful attributes. We have since developed an array of applications where monoliths offer clear advantages over classical separation media. This includes immobilized enzyme reactors or columns for the fast analysis of polymers where the low back pressure of the monoliths is a key advantage. More recently the monolithic media have expanded drastically the options available for the design of functional microfluidic systems. We have demonstrated their ability to function as pumps for electro-osmotic flow, separation media, immobilized enzyme reactors, solid phase extraction devices, mixers, valves, active injection needles for mass spectrometry, etc. We have also developed a lithography-like process that enables the combination of any or all of these functions *in situ* by grafting a functional layer with the desired reactive groups on the surface of the pores of a generic monolith. This photo initiated surface grafting process makes use of simple free radical chemistry to attach a very thin layer of functional polymer to the surface of the pores of the monoliths. The extent of surface growth is readily controlled and does not affect the flow properties of the monolith.

Since our first publication in 1992, the literature on monolithic separation and other functional porous media has exploded and today, a wide variety of implementations have been described. It is likely that as their commercialization proceeds, monolithic media will continue to gain importance in the

Continued on page 13

The Important Role for Chemists in Future Stem Cell Medical Discoveries

By Martin Freier

The idea that in the near future stem cells can be used to restore damaged tissues and organs in disease or injury and that patients will be able to regenerate their worn hearts and aging brains is becoming quite popular. As the momentum in stem cell research is accelerating, chemists may also want to consider a promising future in that research endeavor.

Assistant Professor Sheng Ding of the Scripps Research Institute Chemistry Department, who heads The Ding Laboratory and is a scientific adviser to the Genomics Institute of the Novartis Research Foundation (GNF), agreed to share with us some of his insight into the significant roles for chemists in stem cell research.

"No question about it, chemists already play very important roles in stem cell research," Ding said. "One of their primary functions is to create small molecules that would regulate the stem cell fate and lead to various drug discoveries."

Ding anticipates that as significant biomedical discoveries are made in the next few decades, chemists will become more important. "Ultimately, small molecule therapeutics will become a main stream of future regenerative medicine," he emphasized. "But all I could say is that stem cell research projects are not only challenging but already offer chemists an interdisciplinary, highly interactive research environment, in spite of the controversy."

The controversy surrounding stem cell research that for years impeded progress (and still does in some areas) has to do primarily with human Embryonic Stem (hES) cell research. hES cells are derived from unused embryos created for couples seeking *in vitro* fertilization (IVF). After the embryos have been frozen cryogenically for years and then thawed, scientists have been tempted to use their derived hES cells in many applications because they consider those cells pluripotent. That means in response to appropriate signaling molecules, hES cells have the ability to change (differentiate) into any desired type of cells in any living organ. In contrast, even though adult stem cells are present in various organs, they are multipotent – their significant shortcoming is their ability to only differentiate into cell types of the tissue in which they reside.

Professor Ding added, "In order to gain a better understanding of functions and mechanisms of stem cells, it is highly desirable for scientists to control stem cell fate by means of specific small molecules. From a chemist's point of view, the goal in all stem cell research is similar; that is, to attain the ability to modulate stem cell fate at the chemical (molecular) level, regardless of the type of stem cells chemists are likely to encounter."

What exactly are some of the functions that chemists perform in stem cell research?

To begin with, stem cells serve as the sources or the "stems" for all other specialized cells formed, and their differentiation process is generally irreversible. In other words, once they are committed to one specific cell type, they have irreversibly lost the capacity to generate other cell types in the body. One of the problems scientists face is

Martin Freier is a consultant specializing in technical management, technical, and training strategies. He holds a BS in Chemistry from Brooklyn College and an MS degree in Engineering and Management Science from Worcester Polytechnic Institute. He is a member of the ACS, Northeastern Section.

that stem cells can only be distinguished from the other cells by their molecular signatures (markers), not by their appearance. In the laboratory, what is important is finding the means to examine markers while stem cells are differentiating. Scientists need to be able to observe genes (that are turned on or off) or the gene products as the stem cells are directed toward a particular tissue type.

Another major problem scientists face is that the stem cells will not do much of anything useful (like differentiation) on their own initiative. They have to be coaxed into action by specific signaling molecules. Stem cells' fates can be controlled by regulators intrinsic in the cells and the cellular environment (niche). Chemists are needed for creating similar molecules that could control stem cell fate in a temporal and spatial fashion.

Ding emphasized that the design and synthesis of small signaling molecules is one area where chemists are indispensable. "For a number of years at Scripps Research Institute, Schultz, Gray, and I directed a team of chemists in the synthesis of libraries of more than several hundred thousands of molecules," Ding said. "As we learn new chemistry and stem cell biology, there is this constant need for new signaling molecules."

Although the combinatorial technologies today make it possible to synthesize an immense number of molecules with structural diversity, to optimize the research process, it is preferable to place some designs ahead of others when selecting which molecules to include in the library. In making selections, chemists may consider only those candidates known to exhibit properties that would allow their interaction with specific bio-molecules or a collection of molecules of interest.

Among the more preferable core molecular scaffolds are the naturally occurring and synthetic biological recognition motifs that can interact with proteins involved in cell signaling (e.g., kinases, cell surface receptors, etc.). Examples of preferable scaffolds are purines, pyrimidines, indoles, quinazolines, pyrazines, pyrrolopyrimidines, pyrazolopyrimidines, phthalazines, pyridazines, pyridines, triazines, and quinoxalines. In addition, some general synthetic schemes use parallel reactions with additional chemical diversities and thus allow chemists to introduce a variety of substitutents to these scaffolds. As a result, libraries of diverse molecules can be synthesized efficiently and cost-effectively. For example, substitutents are introduced by means of solution phase alkylation, acylation, or by palladium-mediated cross-coupling reactions, etc.

Using the chemistries thus far discussed in conjunction with the "directed-sorting" method, a privileged heterocyclic library consisting of over 35 distinct structural classes and more than a hundred thousand discrete small molecules have been developed at Scripps Research Institute.

The chemical molecular libraries have been supplemented by arrayed cDNA (which includes more 30,000 human and mouse genes thus far) and siRNA libraries (targeting over 16,000 human and mouse genes with more than three designed sequences per gene).

By means of Scripps Research Institute's libraries, chemists and biologists continue to perform high throughput screens to determine which of the small molecules and genes are effective in controlling specific stem cell fate. Stem cell-based phenotypic and, more recently, developmental pathway-specific screens of synthetic small molecules, natural products and arrayed cDNA/siRNA libraries provide useful chemical tools as well as important genes for modulating and studying complex cellular processes involved in stem cell fate control. Small molecules and genes discovered through these screens are currently followed up biochemically and functionally in various stem cell systems.

Purmophamine, one of the small molecules in the Scripps Institute Library, is one of the chemical stem cell success stories in the laboratory. It was used to differentiate adult mesenchymal stem cells into new bone cells (osteocytes)(1) by activating the "hedgehog" pathway. The hedgehog pathway regulates a number of genes that promote proliferation and differen-

Continued on page 12

NESACS-YCC News

by Prof. Morton Hoffman

Mike Strem awarded the Golden Gesellschaft Deutscher Chemiker (GDCh) Pin

At the farewell dinner for the NESACS-YCC delegation April 9, 2005, in Berlin, Prof. Henning Hopf, President of the Gesellschaft Deutscher Chemiker (GDCh) presented Mike Strem with the Golden GDCh Pin for his work in promoting the cooperation between the GDCh and the ACS.

As a member of the ACS Board of Directors in 1998, Mike was instrumental in the founding of the German-American Frontiers of Chemistry series of symposia, which has now been expanded to include the Royal Society of Chemistry of the United Kingdom in a Trans-Atlantic Frontiers series. Mike was the initial driving force in the establishment of the exchange of young chemists between the GDCh and NESACS, and has been a member of the GDCh since 1991.

The Golden Pin was established by GDCh in 1995 to recognize members and non-members who have rendered outstanding service to chemistry and the chemical society. Mike is the third person to receive the Golden Pin; previous awardees are Prof. Rolf Sammet, the former CEO of Hoechst, and Prof. Wilhelm Fresenius, the former President of the Fresenius Institute.

Sarah Chobot awarded Best Oral Presentation prize at 2005 Frühjahrssymposium of the Jungchemikerformum (JCF)

Sarah Chobot, a graduating senior at Boston University who is doing research with Professor Sean Elliott, was awarded the prize for the best oral presentation at the 2005 Frühjahrssymposium of the Jungchemikerformum (JCF) of the Gesellschaft Deutscher Chemiker (GDCh) that was held in Berlin, Germany, April 7-9. Sarah's prize consists of a cash award of 250 euros (~$325) and a flight ticket to attend any scientific meeting in the world during the next year.

Sarah was a member of the delegation of twelve students from NESACS that attended the Frühjahrssymposium; her talk was entitled, "Electrochemical Studies of Thioredoxin and Thioredoxin Reductase - Gaining Insight into Molecular Mechanisms Affecting Oxidative Stress." Oral presentations were also made by Pia Lopez (Schrock), M.I.T. (graduate student); Will Neeley (Essigmann), M.I.T. (graduate student); Alex Taylor (Schreiber), Harvard University (graduate student). Poster presentations were made by Liz O'Day (Kantrowitz), Boston College (undergraduate student); Rukman De Silva (Kull), Dartmouth College (graduate student); Tim Gay (Tullius), Boston University (graduate student); Ivan Korendovych (Rybak-Akimova), Tufts University (graduate student); Xiaoguang Lei (Porco) Boston University (graduate student); Liz Vogel (Imperiali), M.I.T. (graduate student); Dan Kennedy (Planalp), University of New Hampshire (graduate student); Amritanshu Sinha (Schrock), M.I.T. (graduate student)

A poster presentation was also made by Lauren Wolf (Georgiadis), Boston University (graduate student). She attended as the Immediate Past Chair of the NESACS Younger Chemists Committee; the current NESACS-YCC Chair is Ivan Korendovych.

A poster on the NESACS educational programs was also presented by Morton Hoffman (Boston University), Ruth Tanner (University of Massachusetts Lowell), Mike Strem (Strem Chemicals, Inc.), Amy Tapper (Peptimmune, Inc.), and Lauren Wolf. Because of other commitments, Amy was not able to attend.

Continued on page 13

National Chemistry Week

The Joy of Toys!!

Phyllis A. Brauner Memorial Lecture by Dr. Bassam Shakhashiri

Dr. Bassam Shakhashiri is a Professor of Chemistry at the University of Wisconsin-Madison and is the William T. Evjue Distinguished Chair for the Wisconsin Idea. Professor Shakhashiri has captivated audiences with his scientific demonstrations at a variety of locations including Boston's Museum of Science, the National Academy of Sciences and the Smithsonian's National Air and Space Museum in Washington.

Sunday, October 16, 2005

11 am – 12 pm

repeated from 2 pm – 3 pm

Wellesley College, Science Center, Room 277

The Sunday presentations are free and open to the public. Tickets are available on a first come, first serve basis though reservations are recommended. To reserve tickets, please contact Marilou Cashman either via email mcash0953@aol.com (preferred) or by phone 1-800-872-2054. Tickets will be available for pick-up outside the Science Center on the 16th. Parking is free. For directions to Wellesley College, please visit http://www.wellesley.edu/Admin/travel.html. While at Wellesley, a visit to the arboretum and greenhouses (which are open to the public) is a must. For more information, visit http://www.wellesley.edu/FOH/greenhouse.html.

Kicking off National Chemistry Week 2005 festivities

Join us in a variety of hands-on activities including making slime, chromatography of magic markers, and other activities related to the yearly theme of toys. Taking place from 10 am – 4pm on October 16, 2005 at the Wellesley Science Center for more information, please visit www.nesacs.org.

Toy Drive

We will be holding a toy drive at the Wellesley Science Center as part of the kick-off event. Please donate new or gently used toys. All donations will be given to needy children in the Northeastern Section.

Stem Cell Discoveries

Continued from page 9

tiation in various cell types. Therefore, in the near future, this molecule and others like it, hold great promise in curing a host of debilitating diseases.

Given the ES cell versatility; I wondered why the scientists used adult stem cells for these types of advanced experiments rather than the more versatile ES cells.

According to Ding, despite their potential pluripotency, at this stage of stem cell research, ES cells still have some major technical and potential safety problems that need to be overcome; not least of which are the potential immune rejection reactions by the host, so common in or gan transplants— the hosts are known to treat non-autologous ESC-derived cells in the same way as they treat transplants. On the other hand, the immune rejection problem does not exist with autologous adult stem cells because they come from the host patient.

Currently, most of the transplantation studies using hESC-derived cells are limited to mice or other animals, without human involvement. However, scientists have used somatic cell nuclear transfer (genetic duplication) technique to derive people's own ES cells. Another approach considered is to de-differentiate somatic cells (chemically coaxing the differentiated stem cells to return to their more primitive state (where they would have their ability to differentiate restored).

Clearly, despite the importance ascribed to ES cell's pluripotency, when it comes to drug discovery application, adult stem cells have a temporary advantage. But at this early stage of stem cell research, it is hard to predict where that research will take us. As scientists, chemists should explore the challenges and opportunities available in developing the biochemical science involved in potential stem cell drug discovery.

(1) X.Wu, J.Walker, J. Zhang, S. Ding, and P.G. Schultz , *Purmorphamine Induces Osteogenesis by Activation of the Hedgehog Signaling Pathway*. *Journal of Chemistry and Biology (August 23, 2004)* . See: http://www.chembiol.com. ◇

Historical Notes

Short biographies of recently deceased chemists and chemical engineers whose deaths have been reported to us.

Michael P. Crimmins

Michael P. Crimmins of Randolph died September 21, 2004 at age 50. He graduated from Randolph High School and Eastern Nazarene College, earned a master's degree at Massachusetts College of Pharmacy and his doctorate in chemistry at Tufts University. He was a member of the American Chemical Society and worked as a private consultant. He is survived by his mother, Clara A. (Creutz) Crimmins, two sisters and two brothers. by M.S.S.

Edward Henson

Edward B. Henson died December 10, 2004. He was a member of the American Chemical Society, had been a U.S. Army veteran, and had been employed as a chemist at Children's Hospital. He leaves his wife, Mary T. (McBarron) Henson and a son and married daughter. His wife writes that he was" a wonderful human being who loved his profession" by M.S.S.

Hollis L. Leland

Hollis L. Leland died May 6, 2004 at the age of 92. His chemical training included a Bachelor 's Degree in Chemical Engineering from the University of Maine in 1933, a Master's Degree in Chemistry from the University of New Hampshire in 1935 and a Ph.D. in Thermodynamics from Ohio State University in 1937.

He worked in petroleum research management for Exxon Research and Engineering Company, retiring to Durham, NH in 1970.

He was a member of Tau Beta Pi, Phi Kappa Phi, Sigma Xi, American Chemical Society, Society of Automotive Engineers, American Society of Lubrication Engineers and Alpha Chi Sigma.

by Mrs. Rosamond Leland

to be continued

Macromolecules

Continued from page 7

coming years as they constitute a new and versatile form of separation and recognition tool ideally suited for miniature formats, and amenable to multiple applications.

In closing, I would like to thank my numerous coworkers and collaborators as well as the funding agencies and corporate sources that have made all of this possible ◇

YCC News

Continued from page 10

The meeting afforded the opportunity for the or ganizers of the NESACS-YCC and the GDCh-JCF to meet and make plans for the program beyond this exchange, which has been an annual event since 2001.

Morton Hoffman, Chair of the ACS Division of Chemical Education, met with his counterpart of the GDCh (Prof. Franz-Peter Montfors, Universität Bremen) to plan cooperative educational programs ◇

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