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NESACS

THE NUCLEUS

December 2001 *Vol. LXXX, No. 4*

Monthly Meeting

Medicinal Chemistry Group Symposium on Lyosomal Storage Diseases

Book Review

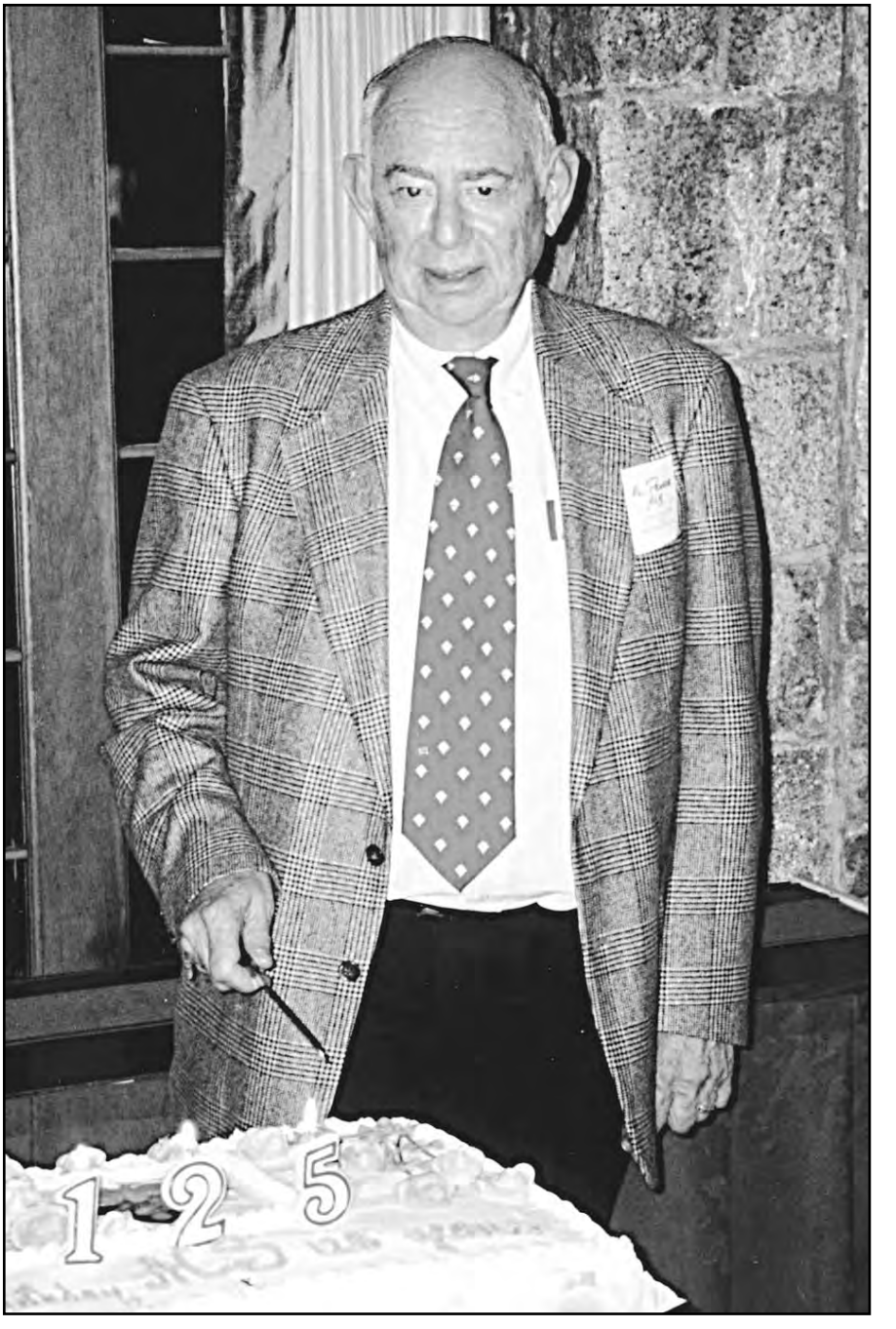
Emergency Preparedness Planning by T.S. Pasquarelli and F.K. Wood-Black

Board of Directors

Notes of the meeting of September 13

Amino Acid Tales

Teaching the amino acids for an introductory biochemistry course à la Chaucer



Cover: *ACS President-Elect Eli M. Pearce cutting the ACS' 125th birthday cake (photo by M.Z. Hoffman)*

Deadlines: *February 2002 issue: December 14, 2001*
March 2002 issue: January 17, 2002

THE NUCLEUS

The Nucleus is distributed to the members of the Northeastern Section of the American Chemical Society, to the secretaries of the Local Sections, and to editors of all local A.C.S. Section publications. Forms close for advertising on the 1st of the month of the preceding issue. Text must be received by the editor six weeks before the date of issue.

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Directions

Since the MIT Lot is likely to be full and on-street parking is tight, use the T, if possible.

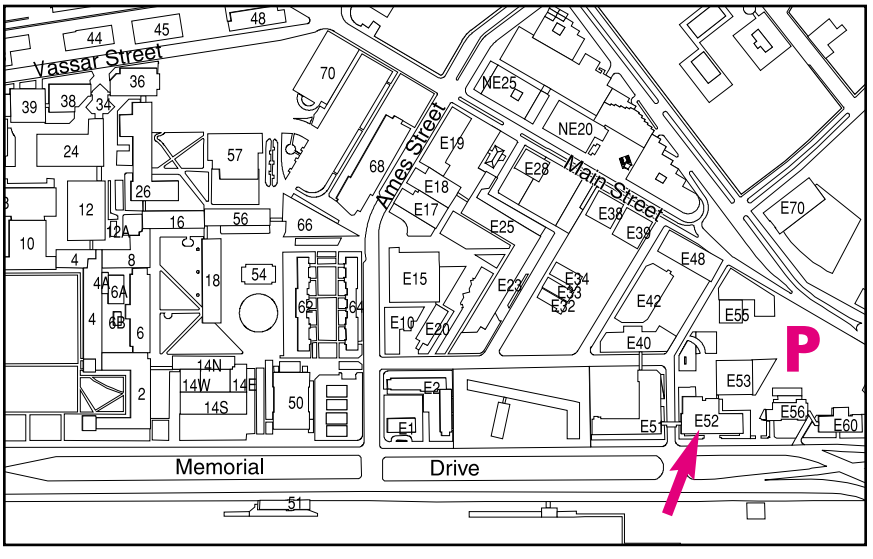
Red Line: Exit at Kendall, walk towards Boston on Main St., turn right into Wadsworth St. The large building on the left at the corner of Wadsworth and Memorial Drive is the Sloan Ctr. (less than 500 feet from the T).

Driving:

From Down-town Boston:* Cross to Cambridge on the Longfellow Bridge and at the end of the bridge take the right turns into Memorial Drive (westbound). Take the first right, into Wadsworth St. and at the end of Wadsworth Street, turn right into Main Street. The entrance to the MIT Sloan parking lot is 1/2 block on the right. Parking free after 3:30 pm.

From Back Bay, Brookline, etc.: Take Storrow Drive to the Cambridge St. Exit, stay left and cross the Charles River on Longfellow Bridge, follow * above.

From Cambridge: Take Main St. eastbound. The MIT Sloan parking lot is on the right shortly after the Kendall Square T-stop, just beyond Wadsworth St. Parking free after 3:30 pm. ◇



Nominations

James Flack Norris Award For Outstanding Achievement In The Teaching Of Chemistry

Nominations are being received for the 2002 James Flack Norris Award for Outstanding Achievement in the Teaching of Chemistry. The Norris Award, one of the oldest awards given by a section of the American Chemical Society, is presented annually by the Northeastern Section. The Award consists of a certificate and an honorarium of $3,000. Nominees must have served with special distinction as teachers of chemistry at any level: secondary school, college, and/or graduate school. Since 1951, awardees have included eminent and less-widely-known but equally effective teachers at all levels. The awardee for 2001 was Dr. Dennis G. Peters of the Department of Chemistry at Indiana University, Bloomington, IN.

Nominations for 2002 will be received until April 16, 2002. The nominating material must be limited to 30 pages and focus specifically on the nominee's contribution to and effectiveness in teaching chemistry, as distinguished from research. These qualities are demonstrated by a condensed curriculum vitae as a portion of a nominating letter which, in turn, is supported by as many seconding letters as are necessary to convey the nominee's qualification for the award. These may show the impact of the nominee's teaching in inspiring colleagues and students toward an active life in chemistry and/or related sciences, or may attest to the influence of the nominee's other activities in chemical education, such as textbooks, journal articles, or other professional activity at the national level. Materials should be of 8 1/2 by 11 inch size but should not include books or reprints or software. Please direct questions about the content of a nomination to Dr. Patricia Samuel, graycote@acadia.net. Nominations should be sent before **April 16, 2002**, to Ms. Marilou Cashman, NESACS, 23 Cottage St., Natick, MA 01760. ◇

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The Northeastern Section Office will be closed from Friday, November 30 through Sunday, December 9.
Dinner reservations for the December Meeting should be called in to the Section office at 800-872-2054 or e-mailed to mcash0953@aol.com through November 29.
Any changes after Nov. 29, please call Mrs. Karen Piper at 978-456-8622.

Monthly Meeting

The 829th Meeting of the Northeastern Section of the American Chemical Society, held jointly with the Medicinal Chemistry Group

Mini-Symposium on Approaches to the Treatment of Lyosomal Storage Diseases

Thursday, December 6, 2001

MIT Faculty Club, 50 Memorial Drive, Cambridge, MA

3:00 pm Refreshments

3:30 pm Seng H. Cheng, Vice President of Genetic Diseases Science, Genzyme Corp, Framingham, MA
New Therapies for Lyosomal Storage Disorders

4:30 pm Dennis Vaccaro, President, Symbiontics, Inc., St. Louis, MO
Application of Protozoa for the Treatment of Genetic Disease

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

6:30 pm Dinner

7:45 pm Evening Meeting, T. Frigo, Chair, presiding
Mark S. Sands, Assoc. Professor in Internal Medicine and Genetics, Washington University School of Medicine, St. Louis, MO
Systemic and CNS-Directed Gene Therapy for Mucopolysaccharidosis Type VII

Dinner reservations should be made no later than noon, November 29. Please call or fax Marilou Cashman at (800) 872-2054 or e-mail at MCash0953@aol.com. The NESACS office will be **closed Nov. 30-December 9. *For changes or cancellations, please call Karen Piper at 978-456-8622.*** Reservations not cancelled at least 24 hours in advance must be paid. Members, $25.00; Non-members, $28.00; Retirees, $15.00; Students, $ 8.00.

THE PUBLIC IS INVITED.

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

Parking: *Limited free parking after 3:30 in the MIT lot, entering from Main Street. Meter parking on Memorial Drive and side streets (free after 6:00 pm)*

Next Meeting: *January 10, 2002 at the MIT Faculty Club, 50 Memorial Drive. Dr. David Lemal, Dartmouth College. "What's Different About Fluorocarbons?"*

Abstracts

New Therapies for Lyosomal Storage Disorders

Seng H. Cheng

Lysosomal storage disorders (LSD) are caused by an inherited deficiency of one or more of the several lysosomal enzymes that normally catalyze the metabolism of glycoproteins, glycolipids and other macromolecules. The available treatments for these diseases are currently limited to bone marrow transplantation and enzyme replacement therapy. Intravenous injections of purified enzyme are effective for the treatment of the non-neuropathic form of Gaucher disease and for Fabry disease, and enzyme replacement therapy is currently being developed for other LSD such as MPS I, Pompe and Niemann-Pick B disease.

Two other options that are being developed include gene therapy and substrate inhibition therapy. Gene therapy seeks to correct the enzyme deficiency through the transduction of a small number of the patients' cells with a normal copy of the gene. These genetically modified cells then serve as a depot for expression and secretion of the affected enzyme into the circulation. The degree of correction required will vary with each disease, but may be only 1 to 10% of normal levels, based on individuals with milder, late-onset disease. Several different gene delivery platforms including the use of retroviral, adenoviral, adeno-associated viral and synthetic gene delivery systems have been constructed and evaluated for use in the treatment of a number LSD. I will review our efforts at assessing the relative merits and limitations associated with each of these gene transfer systems using Fabry disease as an example.

Substrate inhibition therapy seeks to slow the accumulation of storage products and therefore the progression of disease through the inhibition of enzymes that catalyze the synthesis of these macromolecules. This strategy has been shown to be particularly effective for use in treating the glycosphingolipid storage disorders of which Gaucher, Fabry, and Tay-Sachs are examples. Several classes of small molecule inhibitors of glucosylceramide synthase, the enzyme that catalyzes the first step in the synthesis of glycosphingolipids, have been identified. These molecules have been shown to be effective at reducing the levels of glucosylceramide, the substrate that accumulates in Gaucher and of other downstream glycosphingolipids. I will review the data that supports the potential use of this strategy for treating LSD.

Application of Protozoa for the Treatment of Genetic Disease

Dennis Vaccaro

Artificially produced symbiosis is presented as a disease therapy model. Symbiontics is pursuing the application of genetically modified human protozoa for the production and delivery of therapeutic proteins. Approximately thirty species of protozoa

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Abstracts

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naturally live in a variety of human tissues, both intracellularly and extracellularly. Many of these species do not cause disease in the human host. *Leishmania*, one species of human protozoa, has been genetically altered for conditional auxotrophy. No pathology as a result of administering this genetically altered *Leishmania* has been observed in both mouse and non-human primate safety tests. Several species of protozoa have been transfected with a variety of genes and have successfully manufactured active foreign proteins. Protozoa have biochemical mechanisms to glycosylate proteins. Human protozoa have evolved sophisticated mechanisms for evading immune rejection and can sometimes persist for the lifetime of the host. Symbiosis therapy does not involve genetic alteration of the host and is potentially fully reversible. Symbiontics is focusing on lysosomal storage diseases, a group of over 40 genetic diseases, which result from defects in lysosomal enzymes primarily in macrophages. *Leishmania* specifically targets the lysosomal compartment of the macrophage and therefore may be the optimal vector for treatment of many of these diseases. Symbiontics has demonstrated that *Leishmania* can both manufacture and secrete several lysosomal storage disease gene proteins. Foreign protein production has been demonstrated in the form of *Leishmania* that occurs in the human body. Production of these proteins has been increased many fold through an optimization program. Technology to target these therapeutic proteins to lysosomes has been developed.

Systemic and CNS-Directed Gene Therapy for Mucopolysaccharidosis Type VII

Mark S. Sands

Mucopolysaccharidosis type VII (MPS VII) is a lysosomal storage disease caused by a deficiency in ß-glucuronidase activity and results in visual defects, hearing impairment, cognitive deficits, skeletal dysplasia and a shortened life span. We previously demonstrated that bone marrow transplantation (BMT) and enzyme replacement (ERT) effectively prevent the accumulation of undegraded substrates in the murine model of MPS VII. However, BMT and ERT approaches are limited by the severity of the procedure and the transient nature of the therapy, respectively. Therefore, we attempted a gene replacement therapy approach using recombinant adeno-associated virus (AAV) vectors. A single intravenous injection of an AAV vector encoding human ß-glucuronidase into newborn MPS VII mice resulted in persistent (≥ 1.5 yr) expression that was sufficient to prevent the accumulation of lysosomal storage material in many tissues. The distribution and level of activity normalized retinal function as assessed by electroretinography and significantly improved hearing as measured by auditory-evoked brain stem responses. In addition, the bone lengths were nearly normal and the life span was dramatically increased. Due to the difficulty in delivering therapeutic amounts of enzyme to the brain, we injected a separate cohort of animals intracranially with a similar AAV vector. Although the enzyme activity was localized near the injection sites (4 injection sites/mouse) there was a widespread reduction of lysosomal storage throughout most of the brain. This activity and reduction of storage correlated with a normalization of cognitive functions as measured in the Morris Water Maze spatial learning test. These data suggest that AAV-mediated gene therapy may be a viable approach for the treatment of MPS VII and perhaps other lysosomal storage diseases. ◇

Biographies

Seng H. Cheng received B.Sc. (1979) and Ph.D. (1983) degrees in Biochemistry from the University of London, U.K. He trained as a postdoctoral fellow at the National Institute for Medical Research in London, U.K. (1983-1985) and at Integrated Genetics Inc. (1985-1987) where he investigated the molecular basis of tumorigenesis by viral oncogenes and cellular proto-oncogenes. He was a Staff Scientist at Integrated Genetics (1987-1989) and joined Genzyme Corporation in 1989 to work on the structure and function of the cystic fibrosis transmembrane conductance regulator. Since 1993, he has managed the efforts at Genzyme Corporation to develop synthetic gene delivery vectors for therapy of cystic fibrosis and other genetic diseases. Presently, Dr. Cheng is Vice President of Genetic Diseases Science with overall responsibilities for managing the research and development of therapies for lysosomal storage disorders. These therapies include not only enzyme replacement but also gene augmentation and substrate inhibition therapy.

Dennis Vaccaro, received a Ph.D. in human physiology from Harvard University studying the cellular biology of neurotransmitters, peptides and steroid hormones in the brain. He then was in research management at DuPont where he developed monoclonal antibodies for use in *in vitro* and *in vivo* clinical diagnostics. Following that he was president of a company that developed immunodiagnostics for hormonal compounds and novel magnetic particle separation technologies. He has written numerous articles and reports on new technologies for drug discovery and development. Dr. Vaccaro has helped found several companies. Symbiontics is an outgrowth of a MS degree Dr. Vaccaro earned while studying developmental biochemistry in a free living protozoa.

Mark Sands is Associate Professor in Internal Medicine and Genetics at Washington University School of Med-

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Book Review

Emergency Preparedness Planning. A Primer for Chemists, by Timothy L. Pasquarelli And Frankie K. Wood-Black (Oxford University Press with Copyright by ACS,1999), 126 pp., ISBN 0841235791; $29.95 (hardcover)

Reviewed by Robert Litman, Principal Chemist, Seabrook Station, Nuclear Power Plant, Seabrook, NH

A chemist's domain at one time was confined to the laboratory. Specifically, what occurred inside a reaction vessel, and the theoretical basis for that reaction, were the life's blood of the profession. Laboratory safety and spill clean up were important topics, but treated as a routine part of laboratory management. They, too, were confined to the laboratory and generally were on a small scale (grams to a few kilograms at most). Training for these activities was not a perennial requirement, but a "once you are taught, now you know", belief.

In the past 15-20 years, the laboratory walls have been removed as the traditional boundary, and now the new reaction vessel has moved into the public's environment. The word, *chemical*, now raises a specter whenever it is used in a public statement. The public wants to know:

"Why is this chemical here?"

"Where do I go if this chemical spills?"

"Who knows how to protect us from the dangers of this chemical?"

"How will I know if there is a spill or I am exposed to this chemical"

"Are we prepared to deal with the release of this chemical, on the scale that it is used in our community?".

The public has the right and the need to know the answers to these questions and many more. It is the responsibility of the facility that has the chemical to ensure that the facility design is suitable for the presence of the chemical. It must also ensure that the treatment, use, and disposal of the chemical addresses all the relevant issues associated with it.

Emergency preparedness planning encompasses these issues and many others.

These questions regarding facility design, reactivity and health protection as they relate to chemicals are very frequently directed to chemists, because who knows more about chemicals than chemists? The mnemonic that freshman chemistry students are presented with, "Do as you oughter, add acid to water", doesn't give the educated individual a clue to how to proceed if 55 gallons of concentrated sulfuric acid just spilled. This is not to say that hazards are only of a chemical nature. But the promise of the title would lead one to believe that in this book pragmatic items such as these might be covered.

Emergency Preparedness Planning: A Primer for Chemists attempts to integrate the managerial aspect of emergency preparedness with hazard planning. In this respect the authors have been somewhat successful in identifying the Big Picture.

"The purpose of this book is to provide an introduction and a resource tool for those persons who are not emergency management professionals, but who are interested in the emergency preparedness and management process, or who may have just been given additional responsibilities that include emergency response plans."

The authors use two very disparate examples throughout the book to try to amplify the concepts of emergency preparedness and planning. A kitchen fire and a model town are used for the purposes of demonstrating the concepts needed in response planning. The model town has a refinery, a small college, and the county seat government building. They refer to these examples throughout the chapters. However, the generic correlations provided by the authors leave the reader with little substantive material to relate the concepts to the application.

Chapter 3, "Risk Assessment", provides a very good basis for how to develop an idea of what the risks are in the facility. The risk matrix diagram shows the type of logic to use for assessment of each risk. The chapter ends rather abruptly however with a list of bulleted items labeled 'Practical Application'. In this respect, the chapter falls short of its promise in the title of being 'A Primer'. Many of the concepts of emergency preparedness are abstract for the beginner. This would have been the perfect spot for a bridge to the knowledge base of the chemist. For example, the following topics should have been discussed, but were not:

Establishment of chemical storage locations within the laboratory/refinery and how they are situated to provide adequate access and egress.

The smallest quantities of chemicals that should be stored in the lab/processing areas to minimize the potential of small spills becoming reaction hazards.

The dual locations of MSDS's for the chemicals on hand, so that response personnel know where to find them for the experiment/production flow at that time.

How to locate the eyewash/shower stations in the laboratory/refinery, and how often they are verified as operable.

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Biography

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icine. He received the Ph.D. at the State University of New York at Stony Brook, Department of Molecular and Cellular Pharmacology. Following completion of his graduate studies he pursued studies at The Jackson Laboratory, Bar Harbor, and the University of Pennsylvania School of Veterinary Medicine. He is an author of over 50 original scientific publications covering a diverse range of topics including particulate CT contrast agents, assessment of local blood-brain barrier penetration, and treatment of diseases of genetic origin. ◇

Book Review

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The required safety equipment - does it change with each experiment/ production line?

These specific ideas should then have been developed in the subsequent chapters, and provide the clear "how to" function as it relates to the rest of the community. The material covered in subsequent chapters follows the glib pattern of Chapter 3.

The appendices provide a general format for an Integrated Contingency Plan and a Basic Response Plan Outline. Attachment 2 is a tabular compendium of specific references to the Code of Federal Regulations chapters and sections. Although somewhat useful, these referenced sections can change with time, and with changes in the law.

There was much reference throughout the book to legal requirements, management buy-in, and financial investments in such plans. These do not ensure a successful plan. The counterpoint is that a knowledge of

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Board of Directors

Notes of Meeting of September 13, 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: The meeting started with a moment of silence in memory of those who died in the September 11 World Trade Center attack.

T. Frigo announced that John Neumeyer has been elected as the Chair-Elect of the Section for 2002 and the usual sequence of Chair and Immediate Past Chair for 2003 and 2004, respectively.

The Section had been nominated for five ChemLuminary Awards at the Chicago Meeting and was the winner in two of the categories: For a Career Event and the YCC-Jungchemiker event on May 3.

The October meeting will celebrate the 125th Anniversary of the ACS, with President-Elect Eli Pearce as the evening speaker, following recognition of 50-year members and presentation of the Henry A. Hill Award to Dr. Myron Simon.

Chair-Elect: M. Hoffman announced the following line-up of future meetings:

October 11, 2001: Hill Award at Henderson House;

November 8: Norris Award at the Newton Holiday Inn

December 6: Joint meeting with the Medicinal Chemistry Group at the MIT Faculty Club

January 10, 2002: Also at the MIT Faculty Club

February 14, 2002: At the Brookline Holiday Inn, joint meeting with YCC and NOBCChe

March 14, 2002: Richards Medal Meeting at Harvard

April 18, 2002: Esselen Award Meeting at Harvard University

May 9, 2002: Education Night at Boston University

September 12, 2002: Joint meeting with the Maine Section at the University of New Hampshire at Durham, NH.

Treasurer: T. Frigo reported for J. Piper on the Section's finances for May-August, 2001. The report was ACCEPTED.

Standing Committees:

Bd. Of Publications: P. Gordon reported for M. Schwartz that a telephone membership survey was planned to be completed by mid-October, but that assistance from 5-7 Board Members was needed for making calls, with a target of a total of 75 responses. Advertising revenue is on budget for 2001. The Board has discussed a new Section Officers' Handbook and offers to help producing it. It was MOVED and PASSED to have Karen Piper prepare such an updated handbook with help from officers and Board of Director members.

Chemistry Education: M. Hoffman reported for R. Tanner that the deadline

Board of Directors

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for Grants-in-Aid to Undergraduate students to attend the Orlando, FL ACS Meeting in April 2002 is November 1. The second "Connections" program will be sponsored by NESACS on October 17 at Burlington High School.

Esselen Award: T. Frigo reported for J. Koob that the call for nominations for the 2002 Esselen Award appeared in the August 27 *C&ENews*, also in the September *NUCLEUS,* and was announced to selected universities in the US. Because of overruns in expenses for the 2001 Award and reduced income, travel reimbursements will be limited to the awardee, spouse and one nominator to introduce the awardee.

Other Committees:

Younger Chemists: M. Hoffman reported for A. Tapper that the YCC is planning a return visit of NESACS students to Germany for March 11, 2002, to be hosted by the Jungchemikerforum of the German Chemical Society (GDCh).

Government Affairs : M. Hearn asked NESACS to help with a State House event in 2001-2002. The event originally scheduled for the past winter had to be cancelled because of a snow emergency. The focus for the event will be Green Chemistry and the EPA.

International Committee: T. Frigo reported on discussion held at the ACS International Committee meeting at the Chicago Meeting: Environmental program in Senegal.

M. Chen volunteered to be the local host of International Committee activities at the local level.

Old Business: The amendments to the Constitution and Bylaws of the Section to establish the Phyllis A. Brauner Memorial Book Award, Lecture, and Fund were read, to be discussed and approved at a later meeting.

For the ACS "Salute to Excellence" Award, Carl Selavka (Mass. State Police Laboratory) was proposed as a nominee. This Award is to be given by the National ACS to a community person whose work or accomplishments have "made a difference" in matters of concern for the ACS.

It was MOVED and VOTED to approve making this nomination to the ACS.

New Business: It was announced that the Phyllis A. Brauner Memorial Committee will meet September 23 with D. Lewis hosting and chairing the meeting.

From the notes taken by D. Phillips ◇

Green Chemistry Challenge

The Presidential Green Chemistry Challenge Awards Program for 2002

As in past years, this program "was established to recognize and promote fundamental innovative chemical methods that accomplish pollution prevention through source reduction and that have broad applicability in industry."

"The Green Chemistry program is open to all individuals, groups, and organizations, both nonprofit and for profit, including academia, government and industry.

The nominated green chemistry technology must have reached a significant milestone within the past 5 years in the United States (e.g., been researched, demonstrated, implemented, applied, patented, etc.)"

Entries must be postmarked no later than December 31, 2001, and must be no longer than 8 pages.

Awards will be presented in spring or summer 2002 in Washington, DC.

The Nomination package can be obtained from the U.S. Environmental Protection Agency (7406), Washington, DC 20460, as EPA744-K-01-001 or: www.epa.gov/greenchemistry

(Note: At the time of writing, the EPA website's last update was April 1, 2001 and did not contain information about the 2002 Awards) ◇

Amino Acid Tales

A Novel Method For Presenting The Amino Acids In An Introductory Biochemistry Course

By LeRoy Kuehl, Department of Biochemistry
University of Utah College of Medicine
Salt Lake City, Utah 84112

Reprinted by permission from J.Chem.Ed, **1978,** *55* (11) 1711-1713.

An "oldie" that was recently brought to our attention:

At the University of Utah, freshmen medical students are required to take a three-quarter course in biochemistry. The organization of this course follows traditional lines: the structure and properties of biomolecules are covered first; metabolic pathways are dealt with second; a section on molecular biology is presented next; and finally, various special topics such as nutrition and endocrinology are discussed. Maintaining the students' interest during the first part of the course has proven particularly difficult since the initial lectures are, for the most part, little more than a tabulation of the structures and properties of various biologically important molecules. This year a novel teaching was employed during the presentation of one portion of the introductory material; namely, that dealing with the amino acids. This approach, which will be described below, appeared quite effective in stimulating the students' interest in a topic which they usually find quite tedious.

Two 50-minute periods were devoted to the amino acids. During the first 25 minutes, general information about the amino acids and their role in protein structure was presented during standard lecture format. The last half of the first period was devoted to a reading of the poem, "Amino Acid Tales," which is reproduced below. This poem, written in the style of Chaucer's "Canterbury Tales," includes a description of the structure and principal physical and chemical properties of each amino acid along with additional information for those amino acids which play a particularly important or unique role in protein structure or in metabolism. Slides illustrating the material described in the poem were shown at appropriate points during the reading. During the second period, the verses were reread. This time the reading was interrupted at intervals to discuss in greater depth important concepts which are presented only superficially in the poem.

The initial reading of the poem was made as dramatic as possible. The students were not informed in advance that the lectures on amino acids would be different from any others. But before the verses were read, the class was told that they could dispense with note taking since they would be supplied with a complete copy of the material which was to follow. Advanced planning assured that the slide changing

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Amino Acid Tales

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would occur at the proper times and with no interruption of the presentation. The poem was read slowly and with considerably more dramatic emphasis than is customary in a biochemistry lecture.

During the reading of the prologue the mood of the class was jocular and somewhat boisterous. When the verses dealing with the individual amino acids were read, however, the students became very quiet, giving the impression that they were concentrating intently on the material being presented. At the conclusion of the poem, the class responded with a round of sustained and vigorous applause and afterwards a number of students made positive comments about the use of the poem for teaching the amino acids. Thus, one obtained the impression that the presentation as described above had succeeded in stimulating the students' interest and holding their attention. This impression was reinforced by the results of an anonymous questionnaire given about a week afterwards in which the students were asked: "As compared with a well-prepared traditional lecture, how stimulating did you find the presentation based on the poem?" Of 91 students who responded, 79 found the presentation "much more stimulating than a traditional lecture;" 11 found it "somewhat more stimulating," and one found it "about the same." No one found it somewhat or much less stimulating. The same questionnaire indicated that most students (64%) spent 50% or more of their preparation time studying the poem and that they considered it a more effective learning device than standard lecture notes.

The poem, "Amino Acid Tales," is reproduced below together with a few representative examples of the illustrations which accompanied the text.

Amino Acid Tales

with apologies to G. Chaucer

Prologue

When fall hath come, and days grow short and cool,
Then eager students hasten back to school;
And freshmen who would gladly doctors be
Begin to study biochemistry,
And memorize a host of useless structures
Because they know that pleases their instructors,
But also so that they their boards might pass,
And go to practice medicine at last;
For they would fain restore the sick to health,
And also would win fame, respect, and wealth.
As first to teach in biochemistry,
The section treating structures falls to me.
With the amino acids we begin,
The building blocks of muscle, enzymes, skin.

Glycine

For R-group glycine has an H, that's all.
It boasts no isomers and is so small;

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Amino Acid Tales

Continued from page 11

But when in protein structure space is tight.
Than glycine's chosen because it is slight:
And this, dear students, is the reason why
In collagen the glycine content's high.

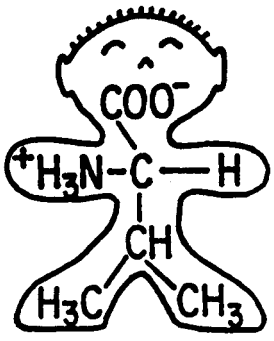
Alanine
Draw glycine, then with pen a methyl add.
And alanine will be there on your pad.
The methyl group, apolar as you know,
Gives alanine a hydrophobic glow.
If alanine you now should modify
And to its methyl various groups apply,
All the amino acids we will learn
Can quickly be produced. each in its turn.

Valine
To valine learn, imagine, if you can.
A structure with the outline of a man.
He's hydrophobic from the waist on down.
And hydrophilic is from waist to crown.

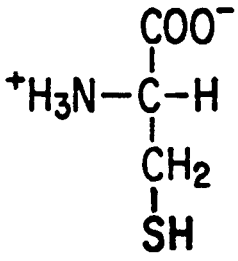
Leucine and Isoleucine
To valine's leg affix one carbon more.
And isoleucine joins the growing corps.
In valine's trunk instead a C insert,
And valine then to leucine does convert.
Their R-groups are like little drops of oil;
From water they with loathing do recoil.
At isoleucine look now carefully;
Two asymmetric carbons you will see.

Proline
Five carbon atoms fastened end to end,
Just look, my students. notice how they bend
Until, in sooth, the circle is perfected.
And the last C is to the N connected
To form a hydrophobic little ring,
And the amino a substituent bring.
Amino acid proline's truly not,
For an *i*mino group instead it's got.
Now polypeptide chains coil often round.
In many proteins are such spirals found.
As alpha helices by scientists known,
These coils are by H-bonds together sewn.
But should the chain with proline be corrupted,
Then is the alpha helix interrupted.

Serine and Threonine
To alanine an OH group append.
And serine's what you're left with in the end;
And if you add a methyl group as well
Then you have threonine, so chemists tell—
Indeed, a very hydrophilic pair,
Because of the hydroxyls that they bear.
Check threonine most carefully and you'll see



Valine



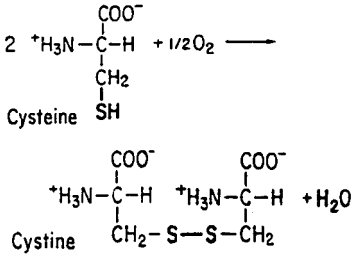
Cysteine

A second center of asymmetry.
Now serine oft is cleaved within the cell
To glycine and a smaller piece as well.
The latter's then to synthesis remanded
When a one-carbon fragment is demanded.

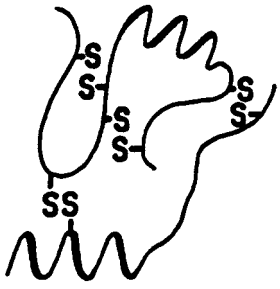
Methionine
To alanine an extra carbon lend,
And next attach a sulfur to the end,
Then finally if you methylate the S
Methionine is what you will possess.
Examine now the R-group carefully,
It's truly hydrophobic, as you'll see.
Reactions which in living cells transpire
Quite often do a methyl group require;
And usually does the cell such units glean
From the S-methyl of methionine.

Cysteine
Just add an SH group to alanine:
The compound that is formed is cysteine.
Its SH can a proton liberate.
The *pK* of this group being close to eight.
But more important, you should realize.
That the sulfhydryl group can oxidize,
And that, thereby, two cysteines are joined
(For such a pair the name cystine is coined).
If cysteines are linked, it's surely true,
The peptide chains they're part of are joined, too.
Thus protein structures, full of folds and kinks,
Are held together by cystine cross-links.

Phenylalanine and Tyrosine
We now consider phenylalanine,
Whose name alone the structure does convene.
And tyrosine, in structure close related,
Just phenylalanine hydroxylated.
When phenyl group has a hydroxyl gained
Then are its properties substantially changed:
Decreased is its hydrophobicity;
More strongly it absorbs in the uv.
And should the pH over ten arise,
Then does this new hydroxyl ionize.



Oxidation of cysteine



Disulfide cross-link in a protein

In proteins this OH is wont to form
H-bonds, and these, and others, do transform
A random polypeptide, as a rule,
To a precisely folded molecule.
An enzyme found within each living cell
Performs this same hydroxylation well:
But should there in this enzyme lie a fault,
Phenylketonuria is the result.

Tryptophan
Let alanine an indole function gain,
And from the two arises tryptophan.
(The indole group, in case you don't remember,
Has benzene ring and pyrrole fused together.
And pyrrole—is it hard remembering?
Has four carbons and an N joined in a ring.)
Now indole is a planar residue;
Aside from this, it's hydrophobic, too.
The indole group so strongly resonates
That it impinging photons captivates—
To an absorption spectrum this gives rise
Which is presented for you to apprise.

Aspartic and Glutamic Acids
Now aspartate has carbon atoms four,
And glutamate has these and then one more.
Carboxyl groups at each extremity
Make these compounds acidic, you'll agree.
Alpha carboxyls have *pK*'s near two.
So it may come as a surprise to you,
That *pK* values close to four attend
Carboxyl groups placed at the other end.
And now about an enzyme I'll relate
Which the amino cleaves from glutamate
To yield ammonia, there inside the cell,
And alpha ketoglutarate as well.
A second enzyme then the latter takes,
And from it glutamate regenerates.
For this amino groups are now required,
And from amino acids they're acquired.
Thus using glutamate, as you can see,
The cell has this broad capability:
Diverse amino acids can it take,
And every one of them deaminate.
And residues which then are left behind,
To metabolic pathways are consigned.

Asparagine and Glutamine
Aspartate's amide is asparagine,
And glutamate's is known as glutamine.
The two are neutral—amides have no charge,
But polar still with dipole moments large.

Arginine
If alanine's two carbons more extended,
And a guanido's to the end appended,
A compound's formed which arginine we call—
Most base amino acid of them all;
For the guanido group has *pK* high;
At nearly 12.5 it's known to lie.
(Now the guanido group, my freshmen friends,
Is but a C surrounded by three N's.)
A liver enzyme, arginase by name,
Does act on arginine and cleaves the same
By hydrolysis, for water comes between,
To yield urea and also ornithine.
The latter converts back to arginine
By a complex, but key, reaction scheme
In which excess ammonia is consumed.
Except for this the cell were surely doomed.
Thus arginine—you should remember this—
Is source of the urea in your piss.

Lysine
This unbranched basic molecule is lysine.
It has four carbons more than are in glycine,
And an amino group on its tail end
Which has a *pK* value over ten.

Histidine
The residue which histidine we call
Is alanine with an imidazole.
The latter is—now listen closely, please—
A pentagon with two N's and three C's.
To histidine a proton can affix;
Its R-group has a *pK* close to six.
Dear students, this is, as you know full well,
Not far from the pH within the cell.
And since the *pK* of a group may change
Influenced by other groups lying at close range
So histidine within a protein structure
Shows sometimes one ion form, sometimes the other.

Epilogue
With the amino acids we are through.
The learning of them now is up to you.
Do not despair, but work industriously;
And you will have them mastered presently;
And think, when it is late and you grow bored,
Of the M.D. that will be your reward. ◇

Comment

Don't follow the Crowd

By A. Heyn

In my travels, I recall two occasions when *not* following the crowd was the best thing to do; both dealt with unanticipated situations:

When I was a student at Michigan, two years after I had left my maternal home in Dresden, Germany to rejoin my father in the USA, I had planned a summer visit to Germany to see family and former school-mates, particularly one, a girl I was fond of. The time was the summer of 1939 and other students wondered, whether travel to Europe that year was a smart thing to do. Being unconcerned, but keeping the US Consulates informed of my itinerary, I had made reservations to cross the ocean by freighter both ways. My eastbound trip had been very pleasant, from Montreal to Hull on a British freighter, carrying about 6 passengers. The return trip was to be on a Dutch freighter out of Rotterdam in early September for the start of the fall semester

My summer visit was very pleasant, I found my family in good health, reasonably happy — by now they had become accustomed to living under the Nazi regime – and I was winding up my stay with a visit to my mother's apartment in a suburb of Berlin, where she was working. It was Saturday, August 26, 1939 and my mother and I had just made an excursion to Potsdam by ship. When we were walking around in Potsdam to visit the Sanssouci Palace, we noticed soldiers everywhere leading horses away. We thought there were some maneuvers, and only in retrospect did I realize that this was mobilization for the planned attack on Poland. When we returned to her apartment in the late afternoon, we found a form-letter addressed to me from the American Chargé d'Affairs, "to depart from this country with a view to proceeding to the United States."

Actually, I had expected to leave Germany the following week. We still

Comment

Continued from page 14

had tickets that night to attend "Fidelio" in the Charlottenburg opera, which we didn't want to pass up. I stayed to see the opera. After packing my few things I made ready to leave the next forenoon on a train leaving for Rotterdam. As we went to the platform, there were hundreds of others who also wanted to leave on this train and stormed the train, even climbing in through the windows to beat the others. I couldn't see the point of fighting my way onto that train and quickly found out that another train was leaving an hour later which was only first and second class (in those days, normal people, like myself, traveled third class). I quickly upgraded my ticket, paying the additional fee out of my rather slim funds, and when the later train arrived I found it not even fully occupied: In the compartment of six seats which I chose there were only 4 of us.

The train worked its way across northern Germany, and at larger stations we bought newspapers which gave accounts of the mobilization, impending war with Poland, and things started looking more and more serious. In Rotterdam I found a small hotel near the center of town which was in my price range, and the next morning I went to the office of the freighter line for which I had the return ticket, only to find out that the Dutch government had suspended all shipping schedules because of the mobilization. I received my passage money of $80 back on the spot.

Meanwhile, back in town I saw the long lines in front of the American Express office, all people who wanted to get back to USA. I heard that at least one German passenger ship which had departed Germany and was on the way to England, full of returning Americans, had been ordered back to Germany and the travelers were given a piece of paper which was "valid for travel back to the USA" by other transatlantic lines. With the threat of war, other lines, such as the Holland-America Line didn't honor these letters and wanted hard cash.

Being the main westward travel season, ships were fully booked. In fact, the Dutch lines had taken luxury ships out of their East-Asia service to take Americans back to USA (at luxury ship rates!). I looked at these lines of people and couldn't see myself fighting for a space, and certainly didn't have the money for possibly available luxury travel. In the phone-book I saw that the main office of the Holland-America Lines was in the harbor district, so I took a bus the next morning and was there shortly before they opened at 9 a.m. Only one other person was also waiting, another young American with the same idea.

When the office opened, we were told, "yes we expect a lot of cancellations because of the international situation, and we get these at 10 a.m., so you'll probably have a choice of dates and ships." Indeed, at 10 quite a few cancellations came in and I chose to take a place on a one-class ship of the Black Star line, coming out of Antwerp and calling at Hoek van Holland on the evening, August 31. There was just one hitch: My funds were pretty well depleted, and the $80 refund didn't cover the passage, which was $130. I cabled my father for the extra money and hoped to have it back by the following morning, which was OK with the office. So, indeed, my father came through and cabled the extra money (plus enough to get me back from New York to Detroit), and I picked up my ticket on the morning of the 30th. A small ferry-ship took the boarding passengers from Rotterdam to Hoek van Holland in the afternoon of the 31st, and in the evening we boarded the SS. Westerland. To hold the maximum number of passengers, cabins were segregated: each cabin had 3 males or 3 females, respectively, instead of just couples. Before we called at Boulogne s.M. in France we heard that war had been declared. The rest of the trip had lots of interesting incidents: – mined harbor at Southampton – no fresh food taken on at Southampton – strike of the boiler-room crew for wartime pay – encounter with a German U-boat

Continued on page 16

NERM 2004 Contest

Northeast Regional Meeting
Rochester, New York

October 15-17, 2004

We are looking for a great logo and theme for this meeting.

All ACS members from the Northeast Region are invited to submit a logo and/or theme idea.

The winner in each category will receive a free registration to the 2004 NERM!

Please submit all entries to:

D. Richard Cobb
15-C Greenleaf Meadows
Rochester, NY 14612
e-mail: d.richard.cobb@kodak.com

Contest Deadline Is Midnight, December 31st, 2001

Comment

Continued from page 15

(which asked us to paint the neutral flag at the bridge twice as large), a meandering crossing of the Atlantic which took 12 days, instead of the usual 7-8, and general uneasiness, with some passengers sleeping fully dressed, in case we were torpedoed – but all that is another story.

I later found out that many of those waiting in line at the American Express office didn't get out of Europe for months. I met another student at Ann Arbor who was in France at the time and didn't get back to the States until mid-January, after escaping first to southern France, then into Spain, and finally hitching a ride back on a freighter (I think he had to work his way back as a stable-hand on the freighter which carried hundreds of cattle).

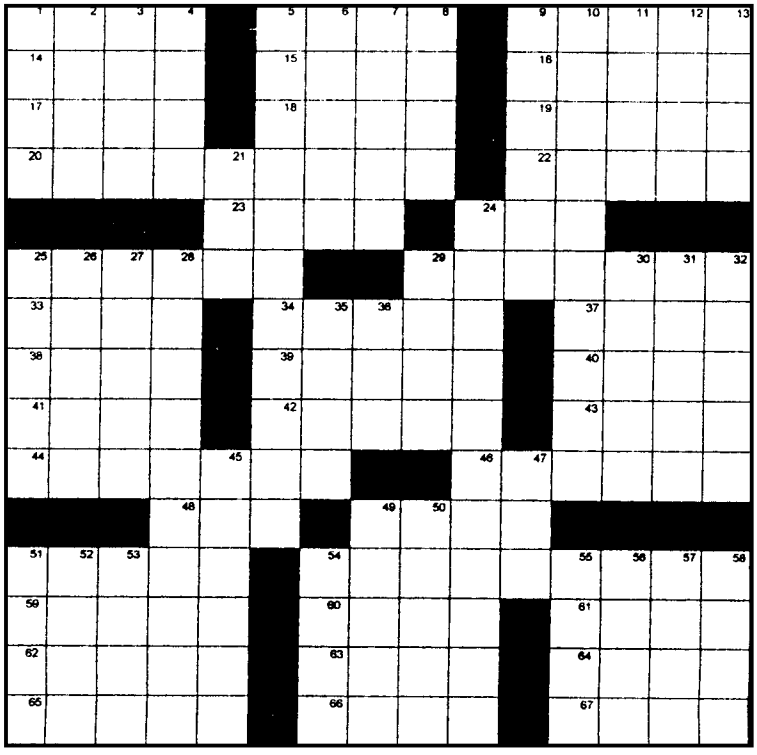
The second event was a bit more prosaic: At the 1979 spring ACS meeting in Honolulu, a colleague of mine who was attending the crystallographic society meeting, which was held the week before the ACS meeting, his wife, and I had planned to fly over to Hilo on the Saturday between the two meetings, rent a car, and tour Volcanic National Park. This we did, and after a full day of sight-seeing, and after returning the car, we wondered why there were such long lines at the Hilo airport in front of the United Airlines desk. We found out that United Airlines was strikebound! Our flight back to Honolulu had no problems since this was not a United flight. Back in Honolulu we started to appreciate the seriousness of the situation. Many of those who wanted to attend the ACS meeting and had not gotten there by Saturday were stuck back on the mainland. With United Airlines being the main carrier of passengers to Hawaii, they had a hard time getting to the meeting. I heard that some had to fly to Hawaii via Manila (however their tickets were honored, so it just cost them extra time and trouble). Back in Honolulu, again I saw long lines in front of the United Airlines office that were moving so slowly that it would take hours to get to the front of the line.

So again, I looked for alternatives. Knowing that most people were looking for flights from Honolulu via Los Angeles or San Francisco, I discovered in my pocket Airline Guide, which I fortuitously had along, that Braniff Airlines had flights from Honolulu either to Seattle or to Texas, so I went to the Braniff office, where there were only one or two others ahead of me, and I managed to get my United Airlines return ticket exchanged for a Braniff ticket via Seattle and Minneapolis to Boston (with several-hour layovers in each of these stops in the middle of the night). So, having made my return travel arrangements, I happily attended to meeting business, the Council, committees and a few papers, with a luau thrown in, and was able to fly back, actually a day earlier than I had originally planned, but had long, tired hours of waiting at the stop-over points. I found out later, that others didn't get back to the mainland for several days.

Again, doing the opposite of what most of the others were doing paid off. ◇

Puzzle Column

Nucleic Acids *by Colleen M. Parriot* Reprinted by permission from the June 2001 *Indicator* of the New York and North Jersey Sections.



Across

1. Deal with difficulties
5. Place
9. Electrical device
14. Former Israel leader
15. Great Barrier island
16. Entertain
17. Loan
18. Yearn
19. Religious ceremonies
20. Egg white enzymes with extensively studied genetic code
22. Like argon or neon
23. Church area
24. Batman and Robin
25. Rice in India, for example
29. Non-germ cell
33. Hyperbolic function
34. French common soldier
37. Water-to-wine city
38. Unto
39. Pulsate
40. Mideast country
41. Eisenhower and others
42. Push forward
43. Finished
44. Protein capsules which contain viral nucleic acids
46. Spring holiday
48. Garden tool
49. Alps wind
51. Lieu
54. Area that studies crime scene nucleic acids
59. West Indies republic
60. Ending for poet, log or tact
61. Verbal
62. With pimples
63. Caste
64. Unconscious state
65. Canadian birds
66. Holly
67. Was aware of

DOWN

1. Where a nucleic acid resides
2. Do what they tell you
3. Pots partners
4. Type of nuclease or skeleton
5. A string of triplet codons codes for this
6. Element's smallest components
7. *Walk Away* ____ (song)
8. Touches the base runner out
9. ____ sulfate: used for GI series
10. Triplet codons code for what?
11. Stringed musical instrument
12. ____ friendly
13. Bird house
21. Rustam's father
24. Nucleic add structure
25. Unemotional one
26. Japanese poem
27. Pays to play
28. In nucleic acids, these connect base sugars to each other
29. Berry for flavoring gin
30. Fortune telling card
31. Pointless
32. One who fixes chairs
35. Units for electrical resistance
36. _nstitute for _esearch on _overty
45. Potassium ____ : Table sale additive
47. ___ Arbor, Michigan
49. Pertaining to a central point
50. Speak publicly
51. Type of carpet or hairdo
52. Armor skirt
53. One: German
54. Pacific archipelago
55. ____ hop (dance)
56. Hemoglobin's metal
57. Arrived
58. Cabbage salad

Solution in next month's issue

October Meeting Pictures

Amy Tapper, YCC Chair with Eli M. Pearce, ACS Pres.-Elect at dinner

Rose and Myron Simon (Henry A. Hill Awardee) at dinner (photos by M.Z. Hoffman)

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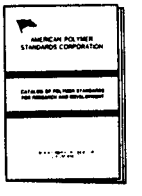
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Note also the MIT Chemistry Department Webpage calendar: http://web.mit.edu/chemistry/www/temp/seminars/pchemseminars.html and the Harvard Chemistry web site for updates: http://www.chem.harvard.edu/events/Physical_Seminars.html (which includes the Harvard/MIT joint seminars).

December 3

Dr. Richard Bellows, (HydrogenSource LLC United Technologies Company/International Fuel Cells)
"Fuel for Electric Vehicles PEM Fuel Cells"
Tufts Univ. DEPT. OF CHEMICAL & BIOLOGICAL ENGINEERING
4 Colby Street, Science & Technology Center, Room 136, 11:30 am

Prof. Brian Coppola (Univ. of Michigan)
"Faculty 2.0: Broadening the Responsibility for Future Faculty Education to Match the Obligations of the Job"
Boston Univ., Science Center Auditorium, SCI 107, 4:00 pm

Prof. J. Martin Bollinger (Penn State Univ.)
Biochemistry Seminar Series: "Probing the Structural and Mechanistic Bases for the Divergent Control of Oxygen Activation by the Diiron-carboxylate Proteins"
MIT, Room 6-120, 4 pm

Prof. Milan Mrksich (Univ. of Chicago)
Organic seminar: tba
Harvard Univ., MB-23 Pfizer Lecture Hall, 4:15pm

December 4

Prof. Charles Michael Drain (Hunter College of CUNY)
"Self-assembly of Nanoscaled Photonic Materials"
Tufts Univ., Pearson Chem. Building, 62 Talbot Ave., Medford, Room 106, 4:30 pm

Mr. Weng-Feng Lo (Univ. Mass. Boston)
Literature Seminar: "Dyeing Crystals"
Univ. Mass. Boston, Science Building, Room 089, 4:30 pm

December 5

Parisa Mehrkhodavandi (Schrock Group, MIT)
Inorganic Chemistry Seminar: tba
MIT, Room 6-120, 4 pm

Prof. Karen Erickson (Clark Univ.)
"New Peptide and Macrolide Metabolites from the Marine Sponge *Myriastra clavosa*"
UMass Dartmouth, Science & Engineering Building (Group II), Room 115, 4:00 pm

December 6

Prof. Paul Barbara (Univ. of Texas, Center for Nano- and Molecular Science & Technology)
Harvard Physical and HU/MIT Combined Physical Chemistry Seminar
"Energy Funneling and Exciton Structure and Dynamics in Isolated Organic Nano-particles"
Harvard Univ., Room MB23 Pfizer Lecture Hall,12 Oxford St., Cambridge, 5 pm

December 12

Mr. Frank Cochran (MIT, Schrock Group)
Inorganic Chemistry Seminar: tba
MIT, Room 6-120, 4 pm

December 13

Prof. SonBinh T. Nguyen (Northwestern Univ.)
Seminar in Organic Chemistry: tba
MIT, Room 6-120, 4 pm

December 17

Prof. Cecile Pickart (Johns Hopkins Univ.)
T.Y. Shen Lecture; Biological Seminar; tba
MIT, Room 6-120, 4 pm

December 18

Prof. Cecile Pickart (Johns Hopkins Univ.)
T.Y. Shen Lecture; Biological Seminar; tba
MIT, Room 6-120, 4 pm

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Book Review

Continued from page 8

chemicals alone is insufficient to ensure, should an accident or emergency arise, that the proper actions will be taken to preserve life, property and the environment. Together, these concepts are managerial and logistical problems that, until recently, have fallen outside the pedagogical and theoretical realm of the chemist.

Emergency preparedness planning needs to focus on how to make an organization ready to ward off and. deal with emergencies. A primer should provide coordination of these two functions at the ground level in exemplary fashion. In that respect this book misses its mark. ◇

November Puzzle Solution

Solution to the November 01 puzzles

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3. Frances, Georgia, Jill, Ida and Harriet
4. SACRAMENTO, DETROIT, FORT WAYNE
5. POOR, BOOR, BOOK, ROOK, ROCK, RICK, RICH ◇