THE NUCLEUS

March 1996 *Of the Northeastern Section of the American Chemical Society* *Vol. LXXIV, No. 7*

Monthly Meeting

Richards Medal to JoAnne Stubbe

1996 NESACS Candidates

Slate of NESACS officers

Future of Science Publishing

ACS Report

Electronic Job Search

ACS Workforce Report

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Contents

Cover: *JoAnne Stubbe, the 1996 Richards Medal Recipient*

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THE NUCLEUS

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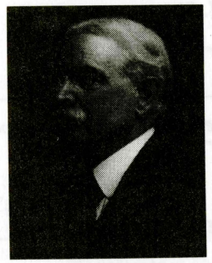
Who Was Theodore William Richards?

by M. S. Simon



"True fame...lives on, not merely to perpetuate the name of the individual and his accomplishments, but rather, to inspire and encourage others who are serving similar ends."

The presentation of the Theodore William Richards Medal to Prof. JoAnne Stubbe this month recognizes conspicuous achievement in the advancement of chemistry, and we can take pride not only in the choice this year, but also in the many distinguished chemists who have won this honor in past years. But as we honor JoAnne Stubbe, we are also honoring the memory of Richards himself. Who was this man?

The first award of what at that time was known as the Theodore William Richards Gold Medal (the medal is still gold, with a silver replica for informal display) was made to Arthur Amos Noyes in 1932. The Section Chairman, William Ryan, introduced the occasion with the following quotation by Henry Watterson:

A mound of earth a little higher graded,
Perhaps upon a stone a chiselled name,
A daub of printer's ink soon blurred and faded
And then—oblivion. That—that is fame.

Ryan went on to point out that Watterson, as an observer in national politics, had developed a cynical attitude toward self-seeking politicians, and Ryan contrasted the impermanence of reputation of such with the seekers of truth for truth's sake for whom true fame is imperishable. With reference to Richards he said,

But in our age, when only "fifteen minutes" of fame is allowed, it behooves us to keep alive the names and accomplishments of our predecessors in chemistry. The Northeastern Section has many great chemists, but the earliest of the internationally renowned was Theodore William Richards. His Nobel Prize in Chemistry, awarded in 1915, was the first given to an American chemist.

He was born in Germantown, Penn. in 1868, was educated at home by his mother, a poet, and his father, a marine artist, and became interested in science at the age of six when he was shown the rings of Saturn through a four inch telescope by professor Josiah Parsons Cooke, Jr. of Harvard while the family was at Newport, R.I. At ten he was making Pharaoh's Serpents with mercuric thiocyanate and coloring flames with various salts. He obtained money to set up a chemistry laboratory when he was 13 by printing on a hand press, copy writing and selling an edition of his mother's sonnets. He was allowed to attend chemistry lectures at the University of Pennsylvania, and at 14 entered and studied chemistry at Haverford. He received the Bachelor of Science at 17. He went to Harvard to study under Cooke and received a Bachelor of Arts and, at 20, after a year of very difficult research in which he demonstrated exceptional experimental skills in determining the atomic weight ratio of oxygen to hydrogen in water, earned the Ph.D. degree. A year in Europe on a Harvard Fellowship gave him the opportunity of studying analytical techniques at Göttingen and visiting important laboratories in Germany, France, England and Switzerland. He returned to Harvard in 1889 as an assistant and remained there for the rest of his years. When Cooke died in 1892, Richards, already an assistant professor, was sent to Ostwald at Leipzig and Nernst at Göttingen to prepare himself to become the instructor in physical chemistry. His rise to full professorship at Harvard in 1901 came quickly when Göttingen attempted to recruit him.

His early work centered on what at the time was one of the major scientific problems, that of determining the exact atomic weights. He explained his choice,

continued on page 7

Monthly Meeting

The 778th Meeting of the Northeastern Section of the American Chemical Society, Theodore William Richards Meeting

Thursday, March 14, 1996

5:30 Social Hour, *Harvard University, Faculty Club*

6:15 Dinner

8:15 **Award Ceremony**, *Harvard University Science Center, Lecture Hall B*
Reflections on T.W. Richards – Dr. Dudley R. Herschbach, Harvard University
Introduction of the Award Recipient – Dr. Stephen J. Lippard, Mass. Institute of Technology
Presentation of the Medal to Professor Stubbe – Dr. Patricia L. Samuel, Chairman, Northeastern Section
Richards Medal Address – *Radicals: Bane or Boon?* – Dr. JoAnne Stubbe, Mass. Institute of Technology

Refreshments will be served after the program

Dinner reservations should be made no later than noon, March 7, 1996. Please call or fax Marilou Cashman at (800) 872-2054. 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. Free Parking available at the Felton St. Garage (3rd. level or higher).

Next meeting on April 18 (note, this is the third Thursday!), 1996, Esselen Award to be presented to Dr. Roy Gordon, Harvard University, who will speak about materials for energy conservation (title to be announced). Reception and dinner at 5:30, Harvard Faculty Club. Award Ceremony 8:15, Harvard Science Center, Lecture Hall B.

There will be an ***Esselen Forum*** *on Monday, April 22 (Earth Day), 7:45 p.m. at the Harvard Science Center, Lecture Hall C.*

Abstract

Radicals: Bane or Boon?

Although the reactivity of free radicals has often been associated with mutagenesis and molecular degradation, sophisticated methods have evolved to harness this reactivity to effect difficult reactions with remarkable selectivity. The past few years have witnessed a renaissance in the detection of protein-derived radicals that have been proposed to play essential roles in metabolism, from DNA biosynthesis and repair to prostaglandin biosynthesis and acetylcoenzyme A production. Additionally, a variety of natural products use radical-based chemistries to sequence specifically, degrade DNA and thus have proven effective as chemotherapeutics. These systems share in common, novel chemistries, both organic and inorganic. Our studies over the years have focused on elucidation of the mechanisms of these radical-based, catalytic systems and a brief overview of our efforts will be presented. ◇

Biographical Sketch

Prepared by JoAnne Stubbe,
John C. Sheehan
Professor of Chemistry and Biology, Chemistry Dept., M.I.T.

Both my high school teacher, Mr. McQue at Classical High in Worcester, Mass. and my college NSF research experience with Edward Trachtenberg at Clark University and Edward Thornton played a major role in my becoming excited about chemistry. Both of my parents encouraged me to pursue whatever I was excited about and my quantitative approach to problem solving was strongly influenced by my dad who was a mathematician. I majored in chemistry at the U. of Pennsylvania, graduating in 1968 and received my Ph.D. from the U. of California at Berkeley in organic chemistry with George Kenyon in 1971. I spent a brief postdoctoral period at U. of California at Los Angeles with Jules Rebek, working on the total synthesis of LSD starting from tryptophan. I started my career at Williams College. I was a faculty member there for five years, two in absentia. I realized that I really wanted to do research and therefore spent two years in the laboratory of Robert Abeles at Brandeis where I fell in love with enzymology. I had a wonderful time during that period, being surrounded by gifted scientists who loved to talk about science. I decided not to return to Williams, but took another assistant professorship at Yale University in the Pharmacology Department. There I met my good friends and collaborators Kozarich and Gerlt. We had a good time in spite of Yale!!! I left Yale in 1981 to become, yet again, an assistant professor in the Biochemistry Department at Wisconsin, Madison. I had a wonderful time there. Wisconsin was and still is the Mecca of enzymology. I loved Wisconsin, but my family all lived on the East coast and I wanted to see my nieces and nephews grow up. In 1987, I therefore moved to the Chemistry Department at Massachusetts Institute of Technology. While MIT is a tough place, it is intellectually the most stimulating environment I have experi-

continued on page 6

Nominations

The James Flack Norris and Theodore William Richards Undergraduate Summer Research Scholarships

The Northeastern Section established the James Flack Norris and Theodore William Richards Undergraduate Summer Scholarships to honor the memories of Professors Norris and Richards by promoting research interactions between undergraduate students and faculty.

Research awards of $3,000 will be given for the Summer of 1996. The student stipend is $2,500 (for a minimum commitment of ten weeks of full-time research work). The remaining $500 of the award can be spent on supplies, travel, faculty support, and other items related to the student project.

Institutions whose student/faculty team receive a Norris/Richards Undergraduate Summer Research Scholarship are expected to contribute toward the support of the faculty members and to waive student fees for summer research. Academic credit may be granted to the students at the discretion of the institutions.

Award winners are required to submit a report (~5-7 double spaced pages, including figures, tables, and bibliography) of their summer projects to the Education Committee by November 1, 1996, for publication in the *NUCLEUS*. They are also expected to participate in the NESACS College Research Symposium in April, 1997.

Eligibility: Applications will be accepted from student/faculty teams from colleges and universities within the Northeastern Section. The undergraduate student must be a chemistry, biochemistry, chemical engineering, or molecular biology major in good standing, and have completed at least two full years of college-level chemistry by Summer, 1996.

Application: Application forms are available from departmental chairs and the NESACS office. Completed applications with two photocopies should be submitted no later than **March 25, 1996** to the Chairman of the Selection Committee:

Prof. Edwin Jahngen
Department of Chemistry
University of Massachusetts-Lowell
Lowell, MA 01854

Notification: Winners will be notified by April 22, 1996. ◇

Biographical Sketch

continued from page 5

enced. It is full of people who love science as much as I do and I think that I have been able to do experiments here that I never would have done otherwise. Thus, while I followed an unconventional path, being an assistant professor for 12 years, I think it is safe to say, that I have been privileged to work in environments in which I enjoyed, and enjoy going to work. I have been, and continue to be extremely fortunate. ◇

Richards

continued from page 4

> "...not merely because I felt more competent in that direction than in any other, but also because atomic weights seemed to be one of the primal mysteries of the universe. They are values which no man by taking thought can change. They seem to be independent of place and time. They are silent witnesses of the very beginnings of the universe, and half-hidden, half-disclosed symmetry of the periodic system of the elements only enhances one's curiosity about them. Moreover, among the many properties possessed by an element, the atomic weight seems one of the most definite and precise. Hence, in trying to satisfy a desire which had as its object the discovery of more knowledge concerning the fundamental nature of things, one naturally assigns to the atomic weights an important place."

In the following years Richards and his students (if we include the independent work of Baxter and Hönigschmid, who had been trained by him) determined the atomic weights of 55 elements, in many cases in parts per ten thousand, in some, parts per hundred thousand. All atomic weights of the elements which were the basis for determining the atomic weights of other elements were determined before the use of mass spectrometry. His work on lead from uranium and from non-radioactive sources advanced acceptance of the theory of isotopes, the only conclusive evidence until the development of the mass spectrograph.

He was always respectful to those on whose shoulders he was standing, J.J. Berzelius and J.S. Stas, pioneers in atomic weight determination, but when his superior methods showed that the Stas values had to be revised, he took the mantle on his own shoulders. A modest man, only after searching diligently for his own possible errors would he conclude that the Stas work had to be superseded.

He was guided to success by "his ability to foresee all sources of error and possible calamities which the average

continued on page 8

Richards

continued from page 7

investigator would have overlooked completely," reported his son-in-law, J.B. Conant. Richards put it thus,

> "Every substance must be assumed to be impure, every reaction must be assumed to be incomplete, every method of measurement must be assumed to contain some constant error, until proof to the contrary can be obtained. As little as possible must be taken for granted."

It is illuminating to consider that much of his work was conducted in Boylston Hall, where his laboratory had been a stockroom, where the iron sashes of the fume hood rained rust, and a flood on the floor above caused the ceiling to collapse on him; where fumes from elsewhere in the building could ruin his experiments. Finally the Wolcott Gibbs Memorial Laboratory, a gift of Dr. Morris Loeb, was built in 1912 and Richards had the facilities his work deserved.

The concentration on atomic weights suggest that Richards was solely an analytical chemist. Indeed, he was a superb analytical experimentalist, but his work in other areas of physical chemistry formed an important part of the total picture. His work began at the period when physical chemistry was aborning: van't Hoff, Arrhenius, Ostwald, Nernst were the new names and the *Zeitschrift für Physikalische Chemie* was founded in 1887. Richards' first student in physical chemistry was G.N. Lewis, to whom he assigned the study of the electrochemistry and thermodynamics of amalgam cells. Richards, rejecting the belief of that day that atoms were incompressible, developed evidence that atomic volumes change, and, according to Lewis, very nearly discovered the third law of thermodynamics in his studies of the relationship of changes in free energy and total energy accompanying a reaction. His invention (with G.S. Forbes and L.J. Henderson) of an adiabatic calorimeter led to studies of specific heats of acids, bases, salts, heats of solution and dilution, heats of neutralization and the thermochemistry of organic compounds.

His laboratory attracted students from many other countries to learn the methods of the Harvard school. His ability to devise methods which could give superb results in the hands of students led to volumes of published research. The list of his students includes many of the most capable physical chemists of the first half of the twentieth century.

NESACS News

Committee Chairmen Update

Additional Committee Chairman appointments:

Awards: Arno Heyn

Constitution and Bylaws: Truman S. Light

Membership: Iclal S. Hartman

Hospitality: again vacant (any volunteers?) ◇

Student Affiliate Chapters Honored

The student affiliate chapters at Boston University and Merrimack College have been cited by ACS for their programs and activities in the 1994-95 academic year. The BU chapter, which is advised by Professors Patricia Samuel and Warren Giering, has received a Commendable citation; this is the fourth year in a row that it has been designated as Outstanding or Commendable. The chapter at Merrimack College, which is advised by Prof. Cynthia McGowan, has received an Honorary Mention.

This recognition is based on material that the chapters have provided in their annual reports. A total of 290 annual reports were received; 18 outstanding, 44 commendable and 41 honorary mention citations were made. The awards will be presented at the ACS national meeting in New Orleans on Sunday, March 24. ◇

continued on page 13

1996 NESACS Candidates for Election

Chairman-Elect *(one to be elected)*
Michael J. Hearn *(Wellesley College)*;
Ruth E. Tanner *(U.Mass.-Lowell)*

Treasurer *(one to be elected)*
James U. Piper *(Simmons College)*

Auditor *(one to be elected for a 1-year term)*
Anthony L. Rosner *(Grant management)*

Trustee *(one to be elected)*
Charles E. Kolb *(Aerodyne Research)*;
Michael E. Strem *(Strem Chemicals)*

Councilor/Alternate Councilor *(3 Councilors and 3 Alternate Councilors to be elected for 3-year terms, also 2 Alternate Councilors for a 1-year term)*
Charles J. Bardsley *(retired)*; Charles A. Blank *(retired)*; Mary T. Burgess; Michaeline F. Chen *(U.S. Army Res. Lab.)*; Michael J. Dube *(Wellesley College)*; Patrick M. Gordon *(Polaroid)*; Richard P. Johnson *(Univ of New Hampshire)*; Doris I. Lewis *(Suffolk University)*; Truman S. Light *(retired)*; John L. Neumeyer *(Research Biochemicals)*

Directors-at-Large *(Six to be elected, 2 each serving for 3, 2 and 1-year terms)*
Anthony C. Bevilacqua *(Thornton Assoc.)*; Leisa Corbett *(Houghton Chemicals)*; Yigong Gao *(Research Biochemicals)*; James A. Kaufman *(Curry College)*; John O'Gara (Waters Assoc.); Mary Anne Solstad *(Consultant)*

Nominating Committee *(two to be elected)*
Henry Brown *(retired)*; Catherine E. Costello *(Boston Univ. Med. School)*; Arabinda Dey *(retired)*; James A. Golen *(U. Mass.-Dartmouth)*

Norris Award Committee *(two to be elected)*
Saul G. Cohen *(retired)*; Cynthis B. McGowan *(Merrimack College)*; Patricia L. Samuel *(Boston University)*; Robert S. Umans *(Boston College)*

Petition Candidates: In accordance with the Northeastern Section Constitution, Article VIII, Sec. 3,

> *"Any group comprising 2 percent or more of the membership of the Northeastern Section may nominate candidates for any elective office provided that such nomination (accompanied by the signatures of the nominating group) shall be presented in writing to the Chairman of the Nominating Committee not more than ten days following the March meeting of the Northeastern Section."*

Accordingly, such petitions are due March 24, 1996 and are to be sent to Marilou Cashman, 23 Cottage St., Natick, MA 01760, att.: Valerie Wilcox. At least 100 valid signatures are required. Preferably, the petition should be sent by certified mail.

Nominating Commitee: Valerie R. Wilcox (chairman), Arno Heyn, Edwin G.E. Jahngen, Donald O. Rickter, Debra J. Saez. ◇

Will Science Publishing Perish?

From a booklet by the ACS Division of Publications.

Different scenarios of the future of science publishing can be seen: With advances of the Information Age, where all knowledge can be accessed instantly perhaps, in the future even by direct interaction with brain impulses; or an age when all research results flow directly to collecting centers, unfiltered and untested, without scientific review —- these might be views of the future, not mutually exclusive, but is this where we want to go?

The problems imposed by the Information age can be summarized as follows: while direct rapid communication between scientist, which bypasses the publication step, may result in more rapid communication and thus appear to advance progress, it leaves out the essential step of peer review, which acts as the filter, separating the quality material from the dross, and in many cases improving the product by having the author think about the work as seen from another, i.e. the reviewer's, perspective.

Specialization in all fields, especially in the sciences, has multiplied both the number of journals and the number of pages published dramatically: In 1900 the ACS published 135 pages of research in but one journal, by 1995 there were over 125,000 pages of research published in 24 journals. In addition, there were 80,000 pages of supporting information available.

From another perspective, the Chemical Abstracts Service (CAS, a division of the ACS) covered about one million articles in its first 30 years (i.e. 1907-1936). In 1995 alone, however, CAS covered 500,000 articles.

Yet, while both the number of journals and the number of pages published grow each year, journal subscriptions are declining, largely because of increasing costs to companies and institutions which are the subscribers. (Personal subscriptions constitute a minor share of the market, especially since personal subscriptions often are at significantly reduced rates, ed.)

The obvious result is that subscription rates rise steadily, and as more subscribers drop out, rates have to rise higher still.

In publishing, the cost of the first copy is a very large part of the total cost, so that cutting the number of copies decreases costs only slightly but increases per copy costs significantly since the large first-page cost is spread over fewer copies.

continued on page 10

Science Publishing

continued from page 9

Ordinary publications, which are governed by the rules of the market place sink or swim, depending on the economics of the situation. Science journals, on the other hand, are not governed by the rules of the market place: all quality science which has been cleared by the reviewers and is in the field covered by the publication is likely to be published. In its introduction the booklet concludes:

"Journal editors do not select articles on the basis of their marketability among current practitioners.

So this, in the final analysis, is the crux of the science publisher's conundrum. Scientific research is expanding at the same time that financial support for the archives of published research is shrinking. The result: if science journals fail, a vital archival resource may be lost and valid science will not be peer-reviewed and entered into the public record.

An Archival Mandate: It is generally held in the scientific community that research is incomplete until it has been reviewed by experts in the field and published in a journal of recognized standing. Only then does it enter the archive as a part of the permanent, scientific record.

Science journals, therefore, receive editorial 'supply' that is entirely independent of consumer 'demand'.

Maintenance of a current and uncorrupted archive is critical to the pursuit of science, which is cumulative in its nature. Each progressive research project builds on all those that have preceded it.

The publication process, while not inexpensive, costs only a fraction of the scientific research it validates. And by creating a permanent record, it advances the progress of science while helping to eliminate unnecessary duplication of research."

The booklet gives details of the publication process from manuscript to the printed page.

The total cost of the first copy constitutes between 70-80 percent of the operating cost of a science journal (average between 1,000 and 10,000 subscribers).

At one time, not-for-profit publishers asked authors (i.e. in reality their institutions) for "page charges" to help paying for the "first page" costs. However, commercial science journals, while often having a higher subscription rate, did not ask for page charges, forcing not-for-profit publications to either lower or drop page charges in order to remain competitive.

The Race for Cyber-Space

Will there be a future where most science communication is via the Information Highway? As pointed out above, distribution of scientific results without a review process would result in the proliferation of the bad along with the good and will not serve progress well.

If journals continue their current role, but leave the distribution process to Cyberspace, this would not result in any significant savings; however, it would make searching for information much more effective with the excellent computer tools now available. In addition, there would be a considerable saving of time since printing and mailing of hard copy would be bypassed. However, the publisher – whether a society, or a commercial publisher, would still have to be paid in some form or other – either by payment for the time the user is connected to the data base, a monthly payment for use by anyone in a subscriber organization, or some similar method.

Electronic distribution is especially suitable for accessing source data which are referenced, but too voluminous to include in the printed or otherwise distributed original research publication. For some years such additional material has been noted in research papers, and the extra material had to be ordered from the publisher, or more recently, accessed on-line.

This section concludes:

"However, while digital files may replace ink on paper, there is no technology that can ever replace the human peer-review and editing process necessary to maintain a reliable science archive for future generations."

Meeting the Millenium (quoted in full):

"In spite of the dynamic changes visited on the pursuit of science and journal publishing in the 20th century, it seems safe to conclude that science publishing will not perish, although some attrition is likely to occur.

The net result of the trend in market forces combined with the emergence of electronic information technology is more likely to be a reassessment of where the archival responsibility must ultimately rest.

Historically, the cost of maintaining the science archive was shared within the discipline. During the 20th century, costs traditionally borne by authors' institutions were shifted to science libraries and information centers within these institutions.

The hope that journal costs might be absorbed into cyber-space is more a representation of the desire to reduce the burden on subscribers than it is a realistic scenario for the future of the publishing process.

Alternately, the practice of subscribers paying only for the specific articles they download or receive by fax — two delivery methods currently offered through on-line services such as STN — will not by themselves adequately address the true cost of publishing all of the articles in quality journals, particularly in areas where market interest is small or non-existent.

Whatever new system may ultimately replace the current subscription-revenue base for journal publications is a matter for speculation. However, for scientific society publishers such as the American Chemical Society the mandate remains clear: the archives of science must contain all the quality research within the discipline that is validated for the record by peer-review and publication."

Some thoughts by the editor: Think back: what word processing system did you use 10 years ago - can you still access your material of ten years ago with your current computer and software? Remember, even in the seventies, when you loaded computer files via IBM punch-cards? Who still has even the equipment available to read such cards and put the information into current computers? What will the state of the art be in 50, 100 years? How will scientists then access information which is buried in obsolete magnetic or optical digital media in a format that is no longer supported?

continued on page 13

ACS Workforce Report

Conducting an Electronic Job Search

From a report by Corinne A. Marasco, Dept. of Career Services, ACS

With the introduction of computers into the workplace, even the process of applying for jobs is making use of the new technology.

The report examines how technology has changed the ways employment is sought or candidates for employment are located.

The Internet as a Job Search Tool

There are few books available on this subject; the author recommends *Electronic Job Search Revolution* by Joyce Lain Kennedy and Thomas J, Morrow, New York, John Wiley & Sons, 1994. This book discusses how job seekers can use electronic resources for job searches. Résumé databases, employer databases and on-line job ads are discussed.

As the author explains in a footnote, the Internet is the world-wide network of computer networks. The World Wide Web is a network based on hypertext and hyperlinks within the Internet. Special "browsers", such as Netscape and Mosaic are used to search wanted sites on the Web.

The World Wide Web has two resources useful for those who want to know more about electronic job searching: *Employment Opportunities and Job Resources on the Internet* by Margaret Riley (Worcester Polytechnical Institute) and *Job Search and Employment Opportunities: Best Bets from the Net* by Philip Ray and Bradley Taylor (University of Michigan).

To locate anything on the Internet one has to have access, either through the computer network of an employer or institution, or through a commercial service, such as America On Line or Compuserve (or many others).

Once on the Web, the Riley guide can be accessed with: **http://www.wpi.edu/~mfriley/jobguide.html.**

The Ray and Taylor "Best Bets" is accessed with: **http://www.lib.umich.edu/chdocs/employment/.**

Both these guides are updated as new information becomes available. Corinne Marasco gives the following reasons for including the Internet in a job search:

- As the Internet grows and expands, so do the participants listing jobs.
- The Internet is available around the clock, 7 days a week.
- After you pay for access, there are myriad listings and resources available at no additional cost.
- With Internet you can search locally, or as far as you wish, without leaving the computer.
- By learning to use the Internet you are adding another job skill. Your knowledge of the Internet and your ability to use it may set you apart from other candidates.
- You can use keywords to find jobs more easily and make the search more effective.
- On-line job listings can provide a clue whether a company is increasing staffing. Many companies have home pages on the Web where you can scan job listings, learn about the company, and identify people to contact. This is especially useful in preparing for an interview.
- There are databases and newsgroups where you can post your résumé at no additional cost. Recruiters and employers look at these databases regularly.

Remember, however, that Internet is entirely public: If you are looking for a better position, your current employer could well become aware of your job search which could be detrimental to your position. Be careful what you post on-line.

Also, most successful résumés will emphasize those experiences or qualifications which fit a particular employer. This would not be possible by a generalized Internet résumé posting.

Some employers still want to document the hiring process on paper and will require submission of a written résumé to satisfy company policy or affirmative action requirements.

Preparing the Résumé

If you need help in preparing a résumé, books are available on this topic, including one available free of charge from the ACS Dept. of Career Services: *Tips on Résumé Preparation.* Ask experienced Internet users to help you find posted résumés for examples of those by others. Be sure there are no spelling or grammar errors – a colleague may find errors you missed. Print out a copy and save it on your computer both as a formatted file and as plain text (known as an ASCII file). Using a text editor, edit the ASCII file so it looks like the printed résumé and save this copy. In ASCII, underlining, boldfacing or italics cannot be used. You can use asterisks for bullets and capital, letters in lieu of boldface. Send a friend or colleague your résumé electronically to see whether it comes through correctly. Save both copies of the files on a diskette so you can edit, print, or e-mail it as needed.

Newsgroups and On-Line Advertisements

Usenet newsgroups are groups dedicated to specific subject areas and are used to establish networking contacts, to follow industry trends, and be alerted to job listings. Many of such newsgroups have "jobs" in their names. Some of these newsgroups are for specific geographic areas, even single cities, such as **tx.jobs** (jobs in Texas) or **ba.jobs** (jobs in the San Francisco Bay area). There are also newsgroups devoted to specific disciplines, such as **sci.chem** for chemists and **bionet.neuroscience** for neurobiologists.

Newsgroups will post job search ads free of charge, in contrast to such ads in professional journals or trade magazines which charge a fairly high fee (note that C&EN and also the *NUCLEUS* provide limited free job search ads for *unemployed* ACS members; ed.). A disadvantage is, that most jobs posted may be primarily for sales jobs or entry-level jobs.

continued on page 12

Workforce Report

continued from page 11

To find job openings listed on the many scattered Internet sites is very tedious. "Metalists" have been established which provide collections of links to shorten the search. The Riley Guide lists metalists organized by topics, also lists recruiters and other organizations posting job announcements. While *The Chronicle of Higher Education* is a very good source for academic openings, it is difficult to search through the long lists. *Academe This Week* is the on-line version of these listings, being put on line every Tuesday afternoon. The listings are not cumulative, therefore should be searched each week. The ACS has introduced an on-line job databank, the *ACS Job Bank*. This service is unique in that it lists jobs and also provides links to other on-line career assistance programs and corporate home pages. To access the *ACS Job Bank*, access **http://www.pubs@acs.org**. For more information about ACS Career Services, see the ACS Home Page: **http://www.acs.org**. There are metalists for federal job openings **http://www.fedworld.gov/**, for industrial employment recruiters: Career Mosaic: **http://www.career-mosaic.com/cm/** which contains job listings searchable by keyword or by company name.

Whether you make contact on line, or otherwise, the hoped for result will be an interview. Here your interpersonal skills and experience will decide whether you obtain the job. Even with on-line networking, you should still do extensive personal networking – the best way to find a position.

The Electronic Résumé and Résumé Scanning

Because of downsizing, restructuring and a tight market, employers are being flooded by applications, yet at the same time fewer personnel is available to manage the hiring process. It is an employer's market, resulting in employers being very specific in their criteria. Automated search and retrieval systems are used by employers to scan the thousands of résumés received and to narrow the search. Using these electronic means makes the search less prone to error (such as by oversight), but imposes the need for the job-seeker to have two résumés available: One suitable for computer scanning and one in the traditional hard-copy format.

Kennedy and Morrow in their book *Electronic Résumé Revolution* (New York, John Wiley & Sons 1984) address the changes brought about by this new technology. Old rules about résumés no longer apply and different rules govern electronic résumés: Use of nouns, not verbs (which will not be found by the key-word oriented scanning programs), use of jargon specific to the field (which was to be shunned in old-style résumés which would get their first going-over by non-technical personnel).

Marasco continues to explain the detailed process by which résumés are scanned, read by OCR (optical character recognition) programs, finding of key-words which are used to place the résumé into the different applicable categories, and the retrieval process by which résumés on file are searched for compatibility with the requirements of the open position.

Both in reviewing résumés and in interviews, the employer wants answers to three questions:

- Can you do the job?
- Will you do the job?
- Will you fit into the organization?

Computer scanning can only answer the first question. Therefore interviews will be necessary to answer the other two questions and obtain certainty on the first one.

Obviously, if your résumé is not set up in a way to answer the first question by an electronic scan, you won't have a chance to get an interview. How do you make sure your résumé will be selected by the computer?

How to be Seen by the Computer

Joel Shulman of Procter & Gamble in a recent article in *Today's Chemist At Work* **1995**, *4*, 43-46 discusses the details of making résumés computer-friendly. Kennedy and Morrow also address this question (pp. 74-79):

1. Standard font (Times New Roman, Helvetica, Courier 10-14 points size).
2. No italics, script, underlining. Avoid horizontal or vertical lines, such as brackets around telephone area codes. Avoid graphics or shading.
3. Use a high-quality printer. Laser printer, although a good 24-pin printer might be acceptable. Use black ink on light-colored paper, 8½" x 11", printed on one side only.
4. Send an original or high-quality copy of the résumé together with the cover letter, unfolded, by mail, UPS or such – do not fax.
5. Maximize the use of standard jargon, such as HPLC, GC, FTIR, NMR, etc.
6. Use a traditional résumé structure since computers tend to read continuous line layouts.

Marasco continues with a detailed discussion of the search strategies used by retrieval systems to which résumés are likely to be subjected and how to make sure that the appropriate key-words are used. The résumé should be scanned by you visually, highlighting the keywords a computer might select. Do these present the picture you wish presented? Shulman's article contains a list of keywords for several chemical specialties.

Marasco concludes:

> "People should be aware of how technology is affecting the job search process. More and more employers are turning to the Internet to post job openings because of world-wide reach and no-cost recruiting;...Technology has... transformed the job search process into a two-tiered process, one for humans and one for computers. Furthermore, technology is opportunity: by learning how to incorporate computers into a job search, people can enhance their value to a potential employer by adding yet another skill to their skill base."

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Science Publishing

continued from page 10

> *We worry about the knowledge accumulated by our civilization decaying as the paper which constitutes that record decays — there we are worrying about decay which takes 100 years or longer; what about decay of magnetic media or other media of the computer age? Even if methods of reading the information remain available, the magnetic "image" certainly is likely to have a much shorter half-life than that of good quality journal paper.*

Copies of "Will Science Publishing Perish" may be ordered from the
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In addition, the ACS solicits thoughts or comments to contribute to this discussion. Fax written comments to the ACS at (202) 872-6005. ◇

Richards

continued from page 8

At his death in 1928 the Northeastern Section appealed for funds to set up a memorial and, with "gratifying response," raised a sum of ten thousand dollars in a few months (which since then has grown to about $150,000). The Theodore William Richards Gold Medal was designed by Cyrus Dallin, a distinguished sculptor, and a friend of Richards.

A more complete account of the career of Richards may be found in a lecture delivered by Sir Harold Hartley and recorded in the *Journal of the Chemical Society (London)*, **1930**, 1930-1968, from which much of this article was taken. Other sources include the *Encyclopedia Britannica* and the *NUCLEUS. The Scientific Work of Theodore William Richards* is the title of a Ph.D. dissertation of Sheldon J. Kopperl, Univ. of Wisconsin, Madison, **1970**, 333-359. ◇

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Calendar

continued from page 16

March 18

Prof Johnathan Ellman
(Univ. California, Berkeley)
"Design, Synthesis and Evaluation of Small Molecule Libraries"
Harvard University
12 Oxford St., Mb-23, at 4:15 pm

March 20

Dr. David Richardson
(Dept. of Chemistry, Williams College)
"Termiticidal Compounds from Southeastern Asia Trees"
UMass Dartmouth
Sci. & Eng. Bldg., Rm 305, at 4:00 pm

March 21

Prof. Tadhg P. Begley (Cornell Univ.)
"The Biosynthesis and Degradation of Thiamin"
Boston College
Merkert Chemistry Center, Rm. 127, at 4:00 pm

Prof. Steve Chu (Stanford Univ.)
Title TBA
Harvard University
12 Oxford St., Mb-23, at 5:00 pm

March 25

Prof. Robert Weber (Yale Univ.)
"Oxidation of Alcohols Catalyzed by Well-Defined Oxide Clusters"
Tufts University
AV Room, STC Bldg., at 2:30 pm

March 26

Prof. Howard Weetal (NIST)
"Optical and Electronic Characterization of Bacteriorhodopsin as a Possible Material for Information Storage and Retrieval"
Tufts University
Rm. 104, Pearson Hall, at 4:30 pm

March 28

Prof. Barry Sharpless (Scripps Institute)
"Oxidative Amination of Olefins"
Boston College
Merkert Chemistry Center, Rm. 127, at 4:00 pm

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February 20

Prof. Brian Bent (Columbia Univ.)
"Atoms and Radicals in Gas-Surface Reactions"
Tufts University
Rm. 104, Pearson Hall, at 4:30 pm

February 21

Prof. Klaus Schulten (Univ. of Illinois)
"Quantum Biology – The Bacteria's Tale"
Harvard University
12 Oxford Street, Mb-23, at 4:00 pm

Dr. Palitha Abeywardena
(Union Camp, Inc.)
"Synthesis and Applications of Water-Soluble Polymers"
UMass Dartmouth
Sci. & Eng. Bldg., Rm. 305, at 4:00 pm

February 22

Prof. Scott Barton (Univ. Mass., Amherst)
"Experimental Studies of Polymer Adsorption"
Boston College
Merkert Chemistry Center, Rm. 127, at 4:00 pm

February 26

Prof. John Katzenellenbogen
(Univ. Illinois at Champaign/Urbana)
"Molecular Probes of Steroid Receptor Structure and Function"
Harvard University
12 Oxford St., Mb-23, at 4:15 pm

Dr. Jens Nielson (Center for Process Biotechnology, Tech. Univ. Denmark)
"Modelling the Growth of Filamentous Microorganisms"
Tufts University
AV Room, STC Bldg., at 2:30 pm

February 27

Dr. Isao Noda (Proctor and Gamble Co.)
"Two-Dimensional Infrared (2D-IR) Spectroscopy"
Tufts University
Rm. 104, Pearson Hall, at 4:30 pm

February 28

Prof. Richard S. Berry (Univ. of Chicago)
"Glass-formers and Structure-seekers: From Interatomic Forces to Controlled Morphologies"
Harvard University
12 Oxford St., Mb-23, at 4:00 pm

Dr. Eugene A. Cioffi (Dept. of Chemisty, Univ. of Rhode Island)
"SUPER Isotopic Labeling of Natural Products"
UMass Dartmouth
Sci. & Eng. Bldg., Rm. 305, at 4:00 pm

February 29

Prof. Karen Wetterhahn
(Dartmouth College)
"Carcinogenicity of Chromium: Reactive Intermediates and DNA Damage"
Boston College
Merkert Chemistry Center, Rm 127, at 4:00 pm

March 4

Prof. Tom Mallouk (Penn. State Univ.)
"A Modular Approach to New Solids and Surfaces"
Harvard University
12 Oxford St., Mb-23, at 4:15 pm

Dr. Ben Bikson (Innovative Membrane Systems, Norwood, MA)
"Current Status of Industrial Membranes for Gas Separations"
Tufts Universtiy
AV Room, STC Bldg., at 2:30 pm

March 6

Dr. Thomas Sharp (Pfizer, Inc., Groton, CT)
"Structure Identification of Drugs"
UMass Dartmouth
Sci. & Eng. Bldg., Rm. 305, at 4:00 pm

March 7

Prof. Charles Angell (Arizona State Univ.)
Title TBA
Mass. Inst. ot Technology
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March 10

Prof. Arthur Ellis
(Univ. of Wisconsin-Madison)
Title TBA
Rm 104, Pearson Hall, at 4:30 pm

March 11

Prof. Arthur Ellis
(Univ. of Wisconsin-Madison
Title TBA
Rm 104, Pearson Hall, at 4:30 pm

March 13

Prof. David Nesbitt (Univ. Colorado)
"Hydrogen Bonding, Atmospheric Radicals and Nonocrystals: A High Resolution Perspective"
Harvard University
12 Oxford St., Mb-23, at 4:00 pm

March 14

Prof. Brett Huff
(Eli Lilly Research Center)
"Asymmetric Synthesis of 6-Substituted Decahydroisoquinolines; Application to the Synthesis of AMPA and NMDA Receptor Antagonists"
Boston College
Merkert Chemistry Center, Rm. 127, at 4:00 pm

continued on page 13

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