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THE NUCLEUS

March 2000 *Vol. LXXVIII, No. 7*

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Summer issue: June 9

THE NUCLEUS

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Who was Theodore William Richards

by M.S. Simon

Adapted from The NUCLEUS, 1996 (3) 4 ff

The presentation of the Theodore William Richards Medal to M.A. El-Sayed 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. [See the listing in *THE NUCLEUS,* **1998** (2) 24]. But as we honor Prof. El-Sayed, 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 to point out that Watterson, as an observer in national politics, had developed a cynical attitude toward self-seeking politicians, and Ryan contrasts 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, "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."

But in our age, when only "fifteen minutes" of fame are 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 1914, was the first given an American chemist.

He was born in Germantown in 1868, was educated at home by his mother, a poet, and his father a marine artist. He 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, copyrighting, 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 exact atomic weights. He explained his choice, "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 the 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

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Monthly Meeting

The 814th Meeting of the Northeastern Section of the American Chemical Society

Richards Medal Award Meeting

Thursday, March 16, 2000

Harvard University, Cambridge, MA, Faculty Club, Quincy St.

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

6:15 Dinner

8:15 **Award Meeting.** *Harvard University Science Center, 1 Oxford St., Lecture Hall B.* Dr. Doris Lewis, NESACS Chair, presiding

Reflections on T. W. Richards—Dr. David M. Lemal, Chair, Richards Medal Award Committee

Introduction of the Award Recipient—Dr. Dudley R. Herschbach

Presentation of the Medal to Prof. El-Sayed—Dr. Doris Lewis

Some Interesting Properties of Material Confined in Time and Space of Different Shapes—Dr. Mostafa A. El-Sayed, Georgia Institute of Technology

Dinner reservations should be made no later than noon, March 9. Please call or fax Marilou Cashman at (800) 872-2054. Reservations not cancelled at least 24 hours in advance must be paid. Members, $30.00; Non-members, $35.00; Retirees, $20.00; Students, $ 8.00. THE PUBLIC IS INVITED.

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

Next Meeting: *April 13, 2000. Gustavus J. Esselen Award to William A. Pryor (Louisiana State University). 5:30, Reception and dinner(Harvard Faculty Club), 8:15 Award Meeting, (Harvard Science Center, 1 Oxford St.)*

Biography

Mostafa A. El-Sayed received an undergraduate degree from Ain Shams University in Cairo, Egypt (1953) and a Ph.D. from Florida State University with Mike Kasha in 1959. After he spent postdoctoral years at Yale (with R. Wolfgang), Harvard (with M. Kasha) and Cal Tech (with W. Robinson), he joined the UCLA faculty in 1961. From1961, he was an Assistant, Associate and Full Professor at UCLA before joining the faculty at Georgia Institute of Technology as the Julius Brown Professor in 1994. Since 1980, Dr. El-Sayed has been the Editor-in-Chief of *The Journal of Physical Chemistry.*

His research interests are in ultrafast electron-hole dynamics in semiconductor nanoparticles; shape control synthesis and stability of metallic nanoparticles; and dependence of catalytic efficiency on metallic nanoparticle shapes. He is also interested in the mechanism of the solar to electric energy conversion by the natural photosynthetic systems of bacteriorhodopsin. Recently, he began working on the kinetics and mechanism of its protein melting,

Among the many honors, he was elected to the US National Academy of Sciences, to the Third World Academy of Sciences and to the Academy of Arts and Sciences. He was the recipient of the UCLA Distinguished Teaching Award, the McCoy Research Award, the Harris Award and of several of the ACS Section Awards; e.g. the Gold Medal of the California Section, the Tolman Award of the Southern California Section and last year, the 1999 Florida Section Award. He also received the 1990 King Faisal International Prize in Science (Chemistry) and an honorary doctor degree from Hebrew University in 1993. ◇

Abstract

Some Interesting Properties of Material Confined in Time and Space of Different Shapes

The type of electronic motion in matter determines its properties thus its uses in our everyday life. This motion itself is determined by the forces acting on the electrons as well as the space in which they are allowed to move. In atoms, electronic motion is highly confined giving rise to highly quantized motion with large difference in the values of the energy of their allowed motions. Isolated atoms are thus insulators. As we assemble a large number of them together to make a metal, or conjugated conductive polymers, their motion becomes delocalized over large space and one gets electric conductivity. If the solid is made of molecules having atoms of different electronegativity e.g. CdS, the electronic motion is not as delocalized as that in metals and the solid becomes a semiconductor. If the motion remains localized on each of the building blocks (molecules, atoms, or ions), the solid becomes an insulator (e.g. silicate, NaCl...).

Over the years, macroscopic materials such as metals, semiconductors or insulators have been used in various applications as their properties have been carefully determined, so are those of the individual building blocks. There is however, new material in which the number of the building blocks is not large enough to observe the bulk properties but sufficiently larger than the atomic or molecular size to begin observing properties pre-

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Member News

NESACS Awardees

Awards presented at the National ACS Meeting in San Francisco, CA on March 28, 2000

Jerry A. Bell, ACS (well, we still consider him one of ours) Pimentel Award in Chemical Education, sponsored by the Union Carbide Corp.

David E. Evans, Harvard University, Arthur C. Cope Award.

Daniel S. Kemp, MIT, Ralph F. Hirschmann Award in Peptide Chemistry sponsored by Merck Research Labs.

Stuart L. Schreiber, Harvard University, Alfred Bader Award in Bioinorgani or Bioorganic Chemistry.

Timothy M. Swager, MIT, Arthur C. Cope Scholar Award. ◇

Abstract

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sent in neither the building blocks nor in the macroscopic solid itself, In this nanometer size scale, the properties of the material become sensitive not only to the size but also to the shape of these nanoparticles.

In this talk, a summary of the properties and potential uses of material on this nanometer scale will be given. We will then present new properties observed for some of these nanomaterials. Using femtosecond lasers, we were able to study the dynamics of the electrons and their photoseparated positive charges (holes) in semiconductor nanoparticles as their separation becomes comparable to, or smaller than, the particle size. In this size regime, the number of atoms on the surface becomes a sizeable fraction of the total number of atoms in the nanoparticle. The surface thus becomes very important in determining the dynamic properties and the fate of these charge carriers. For metal nanoparticles, the shape dependence of properties such as, catalytic, optical (luminescence and absorption) and thermal properties (e.g. photothermal shape changes and melting) will also be demonstrated. ◇

Book Review

Applied Statistics and Probability for Engineers, Second Edition, Douglas C. Montgomery and George C. Runger, John Wiley & Sons, 1998, 922 pp, $95.95 hardcover.

Reviewed by John T. Fourkas, Department of chemistry, Boston College.

A good introduction to statistics and probability should be an essential element in the training of any experimental scientist. Yet the ever-growing chemistry curriculum in most schools spares less and less time for a proper training in this important area. In a sense, computer software has further compounded this problem, given the relative ease of performing an uninformed statistical analysis with even the simplest of spread-sheet programs.

It was thus with great anticipation that I set out to review this book, which describes itself as "an introductory textbook for a first course in applied statistics and probability for undergraduate students in engineering and the physical or chemical sciences." I should start out by saying that the latter part of this statement is largely wishful thinking, as the book seems to me to be geared primarily towards process engineers. As the authors also admit in the introduction, all of the examples and exercises are engineering-based, and as such at least some of my initial enthusiasm was dampened by worries about whether this book can hold the interest of an undergraduate chemistry major.

The book covers enough material for a year-long course, although the authors suggest chapters that might be selected if one wishes instead to design a one-semester course around the book. The first few chapters give a basic introduction to probability and statistics, their application in engineering and science, and the display of data. Subsequent chapters introduce discrete, continuous, and then joint probability distributions. The remaining chapters are largely devoted to general applications of probability and statistics, including parameter estimation, statistical inference, regression analysis, and the design and analysis of experiments.

One of the features of the book that struck me almost immediately was that the authors have put a tremendous amount of effort into making a user-friendly and versatile text. In particular, each new concept that is introduced is accompanied by several well-thought-out, real-life examples that help to make the application of the concept clear. These examples are followed by equally well-planned exercises, including special sections of "mind-expanding" exercises that encourage the student to apply newly-learned concepts beyond the bounds of the examples that have been discussed explicitly.

Another strength of the book is that the use of graphical representations of data is strongly encouraged. A considerable amount of space is devoted to the discussion of different methods of graphical depiction of data. In addition, the authors have worked hard to include the use of computer statistical packages in the text, without singling out any particular package for use by the reader. Most chapters include exercises that are computer-based and that can be performed with practically any statistical package.

One of the things that frustrated me most about this book is that all of its strengths also end up being weaknesses. In places the book relies so heavily on the use of examples that the flow of information is broken up to an extent that I found aggravating. For instance, the first section of Chapter 4 consists of a single perfunctory introductory sentence followed immediately by three examples and then some exercises. Without a serious introduction, it is hard to glean what points this section is attempting to make until one is well into reading the examples.

By the same token, while it is entirely laudable to encourage students to represent data graphically, there are many graphs in the book that I hope my students would not emulate. I am a great fan of Edward R. Tufte's *The Visual Display of Quantitative Information,* which I think is a must-read for all chemists. Tufte is a strong advocate for simple, uncluttered graphics that reveal as much information as possible upon a quick visual inspection. The majority of the graphs presented by Montgomery and Runger fail to meet this standard. In the first few chapters the authors present a number of histograms and related graphs that are intended to provide a simple visual picture of the variance of a particular quantity that has been measured multiple times. In each case the minimum value along the abscissa of the graphs is not zero, but rather corresponds to the smallest measured value. This forces the viewer to put a conscious effort into figuring out whether or not the variance in the data is at all significant in comparison to the mean value of the data. Other graphs are unnecessarily cluttered by multiple ordinates on the same side of the graph or by the incorporation of uninformative numerical data along the ordinate. Joint and marginal probability distributions are represented by two-dimensional graphs that make the data more difficult to interpret than would have been the case had it been represented in tabular form (although three-dimensional graphs would provide a considerable improvement over tables in this case). If tables are easier to read, what is the point of making a graph?

This book is well-intentioned and thorough, but on balance, I feel that its negative aspects outweigh its positive aspects. Given the further consideration that it is aimed primarily at an engineering audience despite the claims of the introduction, I cannot recommend its adoption in chemistry courses, as much as a better introduction to the topics that this book covers might be needed. ◇

Norris/Richards Summer Research

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http://people.ne.mediaone.net/obermayer/nesacs ◇

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Summer Scholar Report

trans-[Ru^{III} $(NH_3)_4Py$] as a Possible DNA Cleaving Agent

Suzanne Muggeo and Kathleen J. LaChance-Galang, Department of Chemistry, Regis College, Weston, Massachusetts

Introduction

In examining the role of metal complexes in DNA strand cleavage, *trans*-[Ru^{III} $(NH_3)_4Py$] was bound predominantly to the N-7 of guanine in calf thymus DNA. It had been previously shown that the model complex *trans*-[$Ru^{III}(NH_3)_4(Py)(Guo)]Cl_3$ undergoes a disproportionation to Ru^{II} and Ru^{IV} in basic media[1]. Subsequently, the glycosidic bond was cleaved. This cleavage was attributed to the Ru^{IV}. Experiments on the Ru-DNA complex involved varying the Ru/DNA ratio, the pH, and the Ru-DNA concentration. These were monitored by UV-Vis spectroscopy to observe if the same mechanism occurred on DNA as in the model complex, which could promote DNA strand scission.

Experimental

Abbreviations: Py is used to designate pyridine; Guo, guanosine; Ado, adenosine; CT-DNA, calf thymus DNA; Tris, tris(hydroxymethyl)aminomethane.

Synthesis:

CT-DNA. Calf thymus DNA, previously prepared[2], was diluted by a factor of 1/25, and checked for purity by taking the ratio of the absorbances at λ = 260nm and λ = 280nm. A ratio of 1.8 to 2.0 is considered pure. A ratio of 1.95 was obtained. The absorbance at λ = 260nm was found to be 0.425, and the concentration was calculated to be 6.44E-05M, using $\varepsilon = 6600 M^{-1}cm^{-1}$. The dilution factor was then applied to find the concentration of the stock solution, which was determined to be 1 .6lE-03M.

Zinc amalgam. Mossy zinc was immersed in 1 M HC1 until bubbles appeared. It was washed with distilled water three times. After washing, it was reacted with saturated $HgC1_2$ in 0.01 N H_2SO_4 for 15 minutes, at which point it appeared shiny. It was again washed three times with distilled water.

***trans*-[$Ru(NH_3)_4C1(SO_2)$]C1.** About 2.0 grams of $[Ru(NH_3)_5Cl]C1_2$ was dissolved with stirring in 50 mL distilled water, maintained at a temperature of 75-85 °C. After dissolving, 2.83 grams of $NaHSO_3$ was added. The solution was purged with SO_2 for about one hour. After an hour the solution was removed from the heat, and bubbling with SO_2 was continued until it cooled to room temperature. A pale yellow precipitate was formed. The solution was vacuum filtered and washed with distilled water and methanol, and dried for 24 hours. The precipitate was dissolved in 200 mL of 6 M HC1 by heating at the boiling point for 15 minutes. The hot solution was filtered, redissolved, and allowed to cool overnight. It was vacuum filtered and washed with 6 M HC1 and methanol and then dried.[3]

***trans*-[$Ru(NH_3)_4(SO_4)(Py)$]Cl**

Approximately 200 mg of *trans*-$[Ru(NH_3)_4C1(SO_2)]$Cl was dissolved in 50 mL of distilled water over low heat. Pyridine was added in a molar excess of 5:1, which turned the solution from rust to green. After stirring for 30 minutes, the solution was acidified with 2 mL concentrated HC1. The acidified solution turned to a deep pinkish-red. Acetone was added to induce precipitation, and the solution was placed in the freezer to maximize precipitation. The precipitate was collected by vacuum filtration and redissolved in 1 M HC1. The solution was oxidized by dropwise addition of 30% H_2O_2. About 7 drops were added, 1 every 5 minutes, until the solution turned a pale yellow. 2 mL concentrated HC1 were added, followed by acetone to induce precipitation. The solution was filtered, and the precipitate dissolved in distilled water. It was

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Summer Scholar

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then chromatographed on a SP-sephadex column. The *trans*-$[Ru(NH_3)_4(SO_4)(Py)]Cl$ eluted first, with 0.1 M HC1, followed by the *trans*-$[Ru(NH_3)_4(Cl)(Py)]C1_2$ with 0.3 M HCI.[4]

***trans*-$[Ru^{III}Py(NH_3)_4]_n$-DNA.** The appropriate amount of $RuPy(NH_3)_4SO_4$ was determined by the desired Ru/DNA ratio and dissolved in a minimal amount of distilled water in a bubble flask. The zinc amalgam was added, and the solution was purged with argon for 1 hour. In a second bubble flask, sealed with a serum cap and vented through a syringe, 10 or 20 mL of DNA stock solution was purged of air for 1 hour. After an hour, the DNA solution was added to the $RuPy(NH_3)_4SO_4$ solution, and the combined solution was purged with argon for an additional 3 hours, resulting in a yellow solution. The pH of the solution was lowered to between 4 and 6 with dilute HC1, and the solution was left to air oxidize overnight. Oxidation was determined to be complete when the solution was blue.[5]

Purification of *trans*-$[Ru^{III}Py(NH_3)_4]$n-DNA. Three identical rinses were done as follows. A 10% volume of 20% sodium acetate and 3 volumes absolute ethanol were added. The solution was placed in a $CaCl_2$ ice bath in the freezer to maximize precipitation. The supernatant was decanted off and spun in a micro-centrifuge for 10-15 minutes to maximize collection. The supernatant was again decanted off, and the remaining precipitate was added to the original. The total precipitate was then completely dissolved in Tris Buffer A.[6]

Instrumentation

The pH of the solutions was determined using an Orion 420A pH meter. The samples were centrifuged at 14,000g in a Brinkmann 5414 Micro-Centrifuge. UV-Vis spectra were obtained using a computer-interfaced Perkin-Elmer Lambda 3A Spectrophotometer. A scan speed of 120 nm/mm was used, with a scan interval of 750-200 nm. Repetitive scans were run for 2-3 hours, with individual scans collected every 300 or 600 seconds.

Results

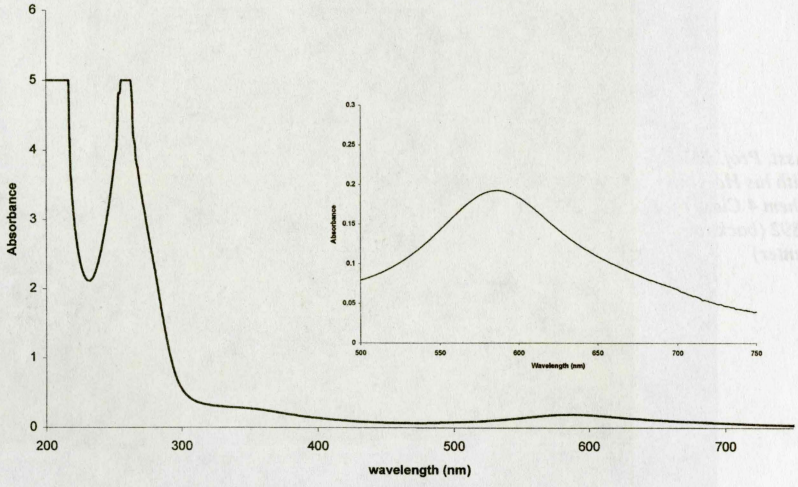
Solutions of *trans*-$[Ru^{III}(Py)(NH_3)_4]_n$-*DNA* were first synthesized in ratios given in Table I. The ruthenated DNA was purified of unreacted ruthenium and redissolved in Tris Buffer A. The 5:1 Ru-DNA complex did not dissolve. This is because the positive charge of the ruthenium is equal to the negative charge of the DNA; therefore, solubility is at a minimum. Each of the solutions with ratios 1:1-4:1 were diluted with phosphate buffers varying in pH from 10-12. Upon dilution to the desired pH, the blue color of the solutions was barely distinguishable. Based on the model complex study, at pH's greater than 7 the Ru^{III} was expected to disproportionate, which could be mon-

itored by visible spectroscopy, since there was a color change from blue to yellow associated with the reaction[7]. There was no indication of the disproportionation reaction from the repetitive scans. In order to increase the absorbance readings, the Ru-DNA complexes were resynthesized using undiluted DNA stock solution in order to obtain more concentrated Ru-DNA solutions. These solutions produced similar results, so a final set of Ru-DNA complexes was synthesized using 20 mL of the concentrated DNA stock solution. These syntheses produced very concentrated blue solutions. In order to maintain the deep blue color, the pH of the solution was raised directly with addition of dilute NaOH, as opposed to being diluted with the phosphate buffer. Again, the disproportionation was not observed.

Table I: Amounts of DNA Solution and *trans*-$[Ru(NH_3)_4(SO_4)(Py)]Cl$ Used

DNA used (mL)	[Ru]/[DNA]	Ru used (g)
10.00	1/1	0.0061
10.00	2/1	0.0122
10.00	3/1	0.0183
10.00	4/1	0.0245
10.00	5/1	0.0306
20.00	1/1	0.0122
20.00	2/1	0.0245
20.00	3/1	0.0367
20.00	4/1	0.0489

Figure 1. trans-$[Ru^{III}(Py)(NH_3)_4]_n$-DNA Absorbance Spectrum



Discussion and Conclusion

In previous studies[8], the ligand to metal charge transfer (LMCT) of the complex $[Ru^{III}(NH_3)_5Guo]$ was at 567 nm. The LMCT of the model complex *trans*-$[Ru^{III}(NH_3)_4(Py)Guo]$ was at 620 nm[9]. This increase of ca. 50 nm is attributed to the substitution of pyridine for an amine in the ruthenium coordination sphere. Based on this observation, since $[Ru^{III}(NH_3)_5Ado]$ absorbs at 500 nm, with pyridine in the coordination sphere the LMCT band should shift to ca. 550 nm. As seen in Figure 1, the *trans*-$[Ru^{III}(Py)(NH_3)_4]_n$-DNA absorbs at 580 nm. This apparent shift in the LMCT could be attributed to an overlap of the LMCT bands of $[Ru^{III}(NH_3)_4(Py)Guo]$ and ruthenium complex bound to adenosine, since 580 nm is the average of the two LMCT bands. Therefore, the ruthenium is probably also bound to adenine sites, as well as the N-7 of guanine in the DNA.

It can be postulated that pyridine was not displaced from the ruthenium moiety or else the LMCT band would have shifted to even lower energy ca. 560 nm if H_2O or OH^- occupied the pyridine site, based on the $[Ru^{III}(NH_3)_5Guo]$ maximum.

One possibility of why the disproportionation was not observed on the DNA was that the Ru^{III}s on the N-7 of the guanine sites are not in close enough proximity to undergo the electron transfer. In conclusion, the *trans*-$[Ru^{III}(NH_3)_4(Py)Guo]Cl_3$ was not an ideal model complex to mimic the *trans*-$[Ru^{III}(Py)(NH_3)_4]_n$-DNA system.

Acknowledgements

We would like to thank Dr. M. J. Clarke of Boston College Chemistry Department for donating the calf thymus DNA and ruthenium starting material and Mr. Dominic Frasca for preparing and purifying the DNA stock solution. This research was supported by a James Flack Norris and Theodore William Richards Summer Research Scholarship.

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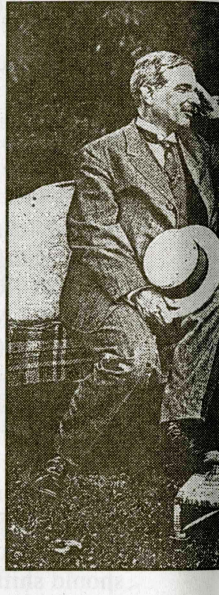
Pictures of T.W. Richards

from Harvard University Archives

T.W.R. in 1888

T.W.R. in 1907

Asst. Prof. T.W.R. with his Harvard Chem 4 Class in 1892 (back row, center)



T.W.R. in Manchester, England with H.B. Dixon in 1911

Who was T. W. R.

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and his students (if we include independent work of Baxter and Hönigschmid, who had been trained by him) determined the atomic weight of 55 of the 92 known elements, in many cases in parts per ten thousand, in some, parts per hundred thousand. All of the elements whose atomic weights were the basis for determining the atomic weights of other elements were determined. 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

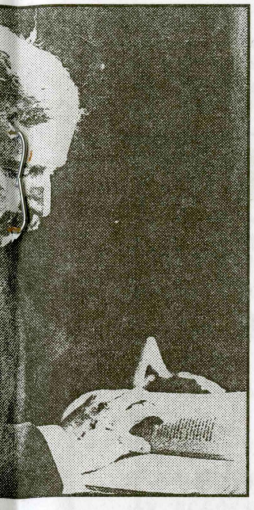
"his ability to foresee all sources of error and possible calamities which the average investigator would have overlooked completely", reported his son-in-law, James B. Conant.

Richards put it thus,

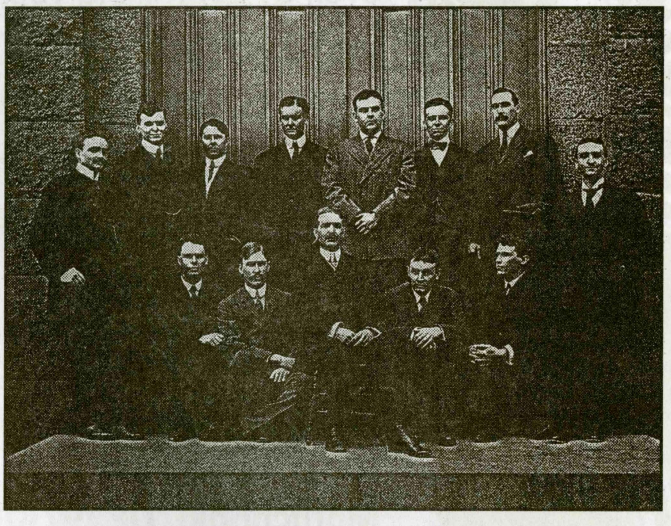
"Every substance must be assumed to be impure, every reaction must be assumed to be incomplete, every method of measurement must be assumed to contain some constant error, until proof to the contrary can be obtained. As little as possible must be taken for granted."

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 suggests that Richards was solely an ana-



T.W.R. in 1920 (age 52)

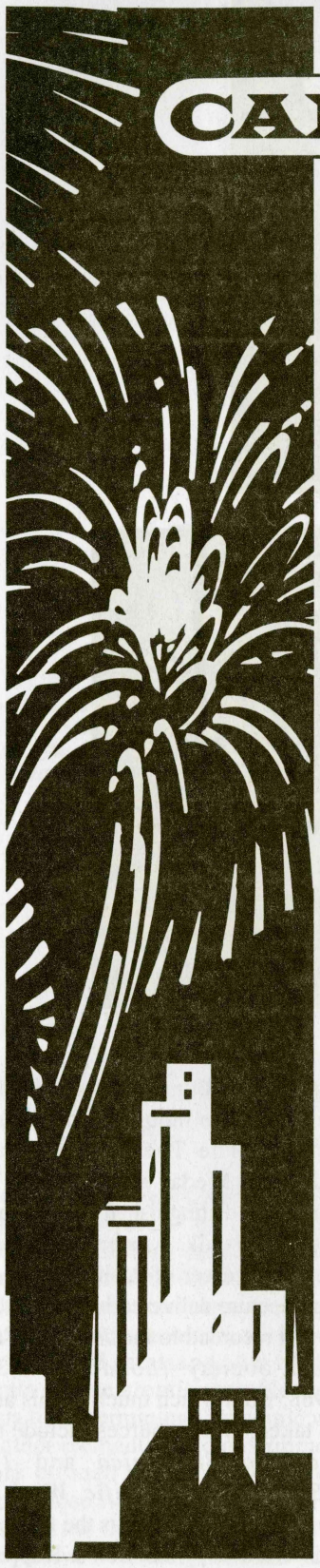


Harvard Research Group of T.W.R. in 1905
Front row: (L to R): H.H. Willard, F.G. Jackson, T.W.R., Burgess, Grinnel Jones;
Back row: Delbrück, Carrol-Thomas, Matthews, Coffin, Frevert, J.H. Wilson, Rowe, Mabes
(the names are in indistinct hand-writing! Corrections invited)

lytical 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 *Zeitschrlft 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 thermochemistry of amalgam cells. Richards rejected 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 and 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.

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. The Theodore William Richards Gold Medal was designed by Cyrus Dallin, a distinguished sculptor and 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 by Sheldon J. Kopperl, U. Wisconsin, Madison, **1970**, 333-359. ◇



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NESACS Web Page

Did You Know the Northeastern Section has a Web Page?

The Northeastern Section has had a web page, kindly administered and hosted by Arthur Obermayer, for three years. It's located at http://people.ne.mediaone.net/obermayer/nesacs/index.htm, or can be easily accessed via the ACS pages (http://www.acs.org, then click on "Local Sections"). and includes a wealth of information ranging from history to NESACS Board of Directors and committee member information to meeting reports to virtually every article published in the Nucleus.

Why are we writing about it now? Because we need your help! Upkeep on a web page such as ours is a major task, and the Board of Publications is calling for volunteers. We're looking for a group of energetic and reasonably web-savvy people, to form a Web Oversight Committee. So, if you're interested in helping to maintain and update our web page, if you have ideas on how to make it better, and especially if you have experience in web authoring, please contact the Committee Chair, Joe Billo at joseph.billo@bc.edu (617-552-3619) or Marietta Schwartz at marietta.schwartz@umb.edu (617-287-6146). Our goal us to have much of the Section business and reports available on the web page in addition to the current information.

We hope to have the first meeting of the Web Oversight Committee some time in the spring, so don't delay, call us now and join the team. ◇

Puzzle Answer

Answer to the February Puzzle "Crossing Over the Bridge"

A&B cross, 2 min.; A returns, 1; C&D, 10; B returns, 2; A&B, 2. Total: 17. ◇

ACS News

Inside Washington:Landmark Patent Reform Becomes Law

From "The Capitol Connection", published by the ACS Office of Legislative and Government Affairs

After years of debate, major patent reform legislation was signed into law by President Clinton on November 29. The bill, which was folded into the end-of-session omnibus-spending bill (H.R. 3194, PL. 106113), will significantly impact the U.S. patent system and bring it more in line with that of other countries. Largely supported by ACS, patent reform legislation has been evolving in the Congress since 1996 but the specific issues contained therein have been debated far longer. ACS adopted positions on many of the provisions of the omnibus bill in a 1997 public policy statement. The statement was drafted by the Committee on Patents and Related Matters and approved by the Board of Directors. As the legislation was debated and rewritten in Congress, many of the Society's original recommendations were adopted so that the final language is very closely aligned with the ACS position.

ACS called for an end to the diversion of Patent and Trademark Office (PTO) user fees to the general treasury. This was accomplished. In addition, the new U.S. law requires publication at 18 months for applications that will also be filed abroad. In other industrial nations, patent applications may be published before the patents are issued in the native language of the country. As requested in the ACS statement, U.S. inventors are now entitled to receive reasonable royalties from parties wanting to use inventions during the period between publication of the applications and issue dates of patents. Patent terms will also be extended for applications that are delayed by the PTO.

Perhaps most significant was the final outcome of the debate over prior domestic user rights. Early drafts of the patent reform legislation included broad protection for prior domestic users. A prior domestic user is one who, at the time that a patent application is filed, is already using or has made substantial investment to use the invention as a trade secret without the benefit of patent protection. ACS opposed this allowance, which promotes the benefit of maintaining trade secrets until another inventor is willing to pay for patent protection, not the free exchange of new technology and exclusive rights to the inventor. Fortunately, in the final language of the patent reform legislation, prior user rights were substantially limited to apply only to the prior use of business methods, not all inventions. The text of the ACS public policy statement on patent reform (97-007) is available at http://www.acs.org/government/ under "Issues." ◇

Candidates for 2001

Chair-elect: Morton Z. Hoffman

Treasurer: James U. Piper

Auditor: Anthony L. Rosner

Trustee (3 year term)**:** Joseph A. Lima

Councilor/Alternate Councilor (3-year terms, 4 Councilors, 4 Alt. Councilors):
Catherine A. Costello, Wallace J. Gleekman, Iclal S. Hartman, Arno H.A. Heyn, Esther A.H. Hopkins, William Klemperer, Truman S. Light, Howard R. Mayne, Dorothy J. Phillips, Socorro M. Ramos, Alfred Viola, Derk A. Wierda

Directors-at-Large (3 year terms, 2 to be elected): Henry T. Brown, Dudley R. Herschbach, Valerie R. Wilcox

Nominating Committee: (2 to be elected): Mark R. Froimowitz, James A. Kaufman, Amy Tapper, Dean E. Wilcox

Norris Award Committee: (3-year terms, 2 to be elected): Roy G. Gordon, Frederick D. Greene, Michael J. Henchman, Robert S. Umans

Don Rickter, Chair, Nominating Committee

Note: *Candidates may be nominated by petition, accompanied by signatures of 110 members, to be submitted to the NESACS office by March 26, 2000.*

EPA Laboratory Rules

New England Universities Laboratories

The following is a verbatim copy of the introductory section of "Project XL" as given on the web-site issued by the U.S. Environmental Protection Agency:
http://yosemite.epa.gov/xl/xl-home.nsf/all/nelabs.html

The full text of the regulation was published in *The Federal Register* **1999,** *64* (187), September 28, 1999, 52380-52396.

Summary of the New England Universities Laboratories Project — Existing Federal and state hazardous waste regulations were designed primarily for industrial settings and are, in certain aspects, difficult to apply to academic teaching and research laboratories. The challenge for these academic laboratories is that they typically use a small amount of a large variety of chemicals on a sporadic basis. The prescriptive approach found in the existing Federal and state regulations governing hazardous wastes may overlay existing Occupational Safety and Health Administration (OSHA) requirements and fire codes, may require extensive administrative resources, and may affect the ability to effectively institute waste minimization programs.

The project sponsor proposes to implement flexible performance-based standards for managing hazardous wastes in laboratories. The participants include three New England academic institutions, including: Boston College, University of Massachusetts - Boston, and the University of Vermont. In general, this Project XL proposal has been designed to develop a more effective scheme for regulating university laboratories, to develop programs to enhance laboratory safety, and to illustrate better systems to manage laboratory environmental impacts. The participants are not seeking regulatory relief from

compliance with RCRA in other areas beyond university laboratories. RCRA requirements will be fully applicable at the institutional level.

This proposal involves three academic institutions (Boston College, University of Massachusetts -Boston, and the University of Vermont), and seeks to test the development and implementation of an Environmental Management Plan designed to minimize and more effectively manage hazardous laboratory wastes.

Superior environmental performance — This Project XL proposal would result in performance-based regulations applicable to laboratories (e.g., small quantities of chemicals used, high variability and/or numbers of chemicals used, and frequent process changes). In addition, this proposal would result in a system for managing hazardous wastes associated with laboratory activities that is consistent and integrated with other legal requirements that govern the safe management of hazardous chemicals in laboratories. The participants propose to identify and develop management goals to evaluate and validate the effectiveness of the alternative environmental management system in achieving better environmental performance, improving environmental education and training and utilizing resources more efficiently.

The Participants propose to collect data to measure improved environmental performance with respect to the minimization of unused or virgin hazardous chemicals that when disposed are currently required to be disposed as hazardous waste; to monitor the reuse or recycling of hazardous chemicals formerly managed as hazardous waste; to conduct environmental awareness and training; and to monitor environmental management system effectiveness.

Regulatory flexibility — The participants maintain that an overlap exists between the environmental regulations promulgated by the U.S. EPA and implemented by state agencies to manage hazardous waste (RCRA), laboratory health and safety regulations (for chemicals that are not wastes), and the reality of laboratory work. They believe that this results in significant confusion for laboratory workers, health and safety professionals, and the regulators with regard to how regulations should clearly and consistently be applied to laboratories. Participants are proposing that the development and implementation of a performance-based Environmental Management Plan, which parallels OSHA's Chemical Hygiene Plan for laboratories, within the laboratory.

The participants request that the current RCRA regulations not apply within the laboratory. Instead, an Environmental Management Plan would be in effect for activities within the laboratory. The full RCRA regulations would apply to hazardous wastes upon exiting the laboratory, at the institution level.

Stakeholder involvement — According to the project sponsor, there appears to be significant stakeholder support in this area. The participants report that several groups, such as the National Research Council, **American Chemical Society Laboratory Waste Management Task Force** *[our emphasis, ed.]*, and Government-University-Industry Research Roundtable, have advocated for regulatory change in this arena for years. In addition, the project sponsor has indicated that efforts are underway in several states such as California, North Carolina, and Colorado to amend or clarify the hazardous waste regulations as they apply to laboratories.

The project sponsor reports that the environmental community has been generally empathetic to the regulatory challenges faced by laboratories and supportive of piloting a performance-based regulatory model with appropriate measurements to evaluate and quantify environmental performance improvements. The participants have received preliminary support to explore an alternative approach to managing hazardous wastes in laboratories from the Massachusetts Executive Office of Environmental Affairs, the Massachusetts Department of Environmental Protection, and the Vermont Department of Environmental Conservation. In addition, potential stakeholders may include Tellus Institute, Environmental Defense Fund, Partnership for

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EPA Laboratory Rules

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Environmental Technology Education, the Natural Resources Defense Council, and Ecologia.

At the local level, each participant (e.g., academic institution) has identified community stakeholders. The participants have received preliminary support to further explore development of the proposal from the University of Vermont Chemical and Biological Safety Committee, University of Massachusetts - Amherst Solid Waste Committee chair, and Boston College Dean of Arts and Sciences. The participants will use a stakeholder checklist to guide their actions in soliciting and involving local stakeholders in the development of this Project XL.

- Approaches to be Tested -. Will the use of Environmental Management Plan performance-based standards provide the same level of environmental protection as existing regulatory requirements in the laboratory setting?
- Will the integration of OSHA-based health and safety requirements for hazardous chemicals with the RCRA generator requirements and elements of ISO 14001 system requirements result in a more consistent and resource efficient scheme for regulating laboratories?
- Will the use of an Environmental Management Plan and protocols for small-scale treatment of hazardous wastes result in the increased implementation of pollution prevention and waste minimization activities and result in more environmentally informed students and researchers?

Project Contacts

Project Sponsor Primary Contact -- Nexus Environmental Partners (consultant)	Thomas Balf 617-951-1181 tpb@rackemann.com
Boston College	Suzanne Howard 617-552-0308 howardsu@bc.edu
University of Massachusetts, Boston	Zehra Schneider-Graham 617-287-5444 zehra@umbsky.ccumb.edu
University of Vermont	Ralph Stuart 802-656-5400 rstuart@esf.uvm.edu

Board of Directors

Notes of Meeting of December 13, 1999

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

From the minutes of M. Singer

Officers' Reports:

Chair: D. Rickter called attention to the article about M. Strem in the December 6 issue of *C&E News*. He reminded committee chairs that the annual reports are due.

Chair-Elect: D. Lewis presented Dr.Rickter with the ACS Past Chairman's pin accompanied by thanks of the Board by acclamation. Among goals for 2000 she solicited the Board for ideas of new initiatives. She will seek to focus on secondary education chemistry teachers and increase involvement of Student Affiliates in Section activities, and work on designating additional National Historical Chemical Landmark sites in the Section.

Secretary: The minutes of the November meeting were APPROVED after minor corrections. M. Singer requested Board approval for posting minutes on the NESACS website. APPROVED. He announced that he would circulate Board meeting drafts by e-mail to members prior to Board meetings.

Treasurer: J. Piper presented the November financial report and the pro-

posed 2000 budget. M. Strem indicated that the ACS reimbursement for councilor travel will increase to $1000. The registration fee at meetings will be a reimbursable expense.

Archivist: M. Simon stated that he had some copies of chemistry-related software for distribution to high schools.

Standing Committees:

Bd. Of Publications:

Editor: A. Heyn reported that the January 2000 issue was at the printer and has a report on the National Historical Chemical Landmark event at the University of New Hampshire.

Public Relations: D. Howell stated that a photographer would be on hand at the evening meeting. The meeting recognizes the Medicinal Chemistry Group's 35th anniversary.

Chemistry Education: R. Tanner reported that the ACS Scholars Program had sent a list of NESACS area candidates for review, however, the only area candidate is no longer a chemistry major. Additional candidates are being reviewed by the committee. The committee will explore mentoring of ACS Scholars by YCC members.

Professional Relations: P. Hamm announced that there will be a joint career program with the Rhode Island Section in February or March at Brown University on the job market, résumé preparation and interview skills. Another program, to be held jointly with the Electrochemical Society on job hunting strategies is also under consideration.

Other Committees:

Project SEED: P. Mabrouk stated that currently 8 students have been nominated for SEED awards. Last year the Section funded 2 awards. The committee requested funds for making awards to eight students, a sum of $ 6,125. The request is to be referred to the Budget Committee as a budget request.

Younger Chemists: D. Simonelli distributed copies of the 1999 annual report to the Board members. The next event is to be in the afternoon prior to the February 10 NESACS meeting.

Medicinal Chemistry: T. Frigo reported that the Afternoon Symposium on this day was well attended.

Old Business: D. Rickter stated that the Board needs to elect a Board member to the Nominating Committee. M. Filosa was nominated and the Board ELECTED him.

New Business: F. Greene, speaking for the Richards Award Committee, spoke about the Richards Medal. The die for casting the gold and silver medals had been lost some years ago when the company which had been making the medal had gone out of business. Since then, a mold had been made from the bronze copy of the medal, resulting in an inferior product. Medallic Art Co. is willing to make a new die, about $3,300, and the medal and copy, depending on the market price of gold and silver, another $3,000. It was MOVED and VOTED that the Board authorize the Trustees to disburse up to $3,500 for the cost of making a die for the medal from Richards Funds and that F. Greene choose the best vendor. ◇

Calendar

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Univ. Mass, Boston
Science Bldg., 1st Fl., Rm. 089, 4:30 PM

Prof. Ken Feldman (Penn State Univ.)
"Organic Synthesis and Natural Products Chemistry"
Univ. Mass, Dartmouth
Sci. & Eng. Bldg., Rm. 305, 4 PM

Mar. 30

Prof. Stephen Marlin (Univ. TX, Austin)
"Recent Advances in the Synthesis of Natural Products"
Boston College
Merkert Chemistry Ctr., Rm.130, 4 PM

Mar. 31

Dr. Nabil El Tayar (Ares Advanced Technology Inc.)
"Protein Mimetic and Privilege Motifs"
Boston Univ.
R. B. Hariri Bldg., Rm. 220, 2 PM

Notices for the Nucleus Calendar should be sent to:
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HISTORICAL NOTES

by Edward R. Atkinson, Amherst, Mass.

Even a casual examination of general chemical literature published during the last decade leads one to conclude that stereochemistry is a major topic for study today. Certainly this is true in medicinal chemistry where the importance of configuration was first recognized over 150 years ago but was not emphasized until much more recent times. Today we recognize that, when potential drugs are composed of two or more stereoisomers, each isomer may prove to have a desirable activity, be inert, be an antagonist, have a separate desirable type of activity, or be toxic. The emphasis in medicinal chemistry is on what are known as optical isomers, but recently geometrical isomerism has made its public appearance in the plan to label the concentration of trans fats in fatty foods. A good recent summary of the stereochemistry of commercially available drugs is that of J.C. Caldwell in the ACS publication *Modern Drug Discovery* (1999, July/August, p. 51). There are many other similar articles available.

I write the above as an introduction to the work of James Kuhn Senior whose ideas on stereochemistry were published in the *Journal of Chemical Education* in the late 1930's. I developed a lasting interest in such matters when my first independent research involved a rapid synthesis of an optically resolvable diphenic acid whose optical resolution was a necessary feature of proof of structure. During the next 40 years in the laboratory I had the fun of optically resolving several dozens of racemic mixtures and compounds. My last published work in this field involved the preparation of optical isomers that found use in the positron emission tomography of the brain.

Senior and I corresponded into the 1960's. He sought my help when Norris Rakestraw, editor of the *Journal of Chemical Education*, refused to accept a major contribution from Senior. I did intercede on his behalf but without success. Being unable to find alternative

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Historical Notes

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publication outlets Senior decided to "undergo the disagreeable necessity of publishing at his own expense" a 25-page paperback *Molecular Models. A Non-geometric Approach to Stereochemistry*: Copies could be ordered for 30 cents from the author at the George Herbert Jones Laboratory, University of Chicago. I have a carefully preserved autographed copy of the book. If it raises sufficient interest among readers of this Note I can have copies made and provided at cost.

Senior was born on September 15, 1889 in Cincinnati, Ohio. He received the AB(1911) and AM(1912)from Harvard and the Ph.D.(1917) from the University of Chicago where he was a student of Julius Stieglitz. After employment at the Rockefeller Institute (1914-17, with P.A. Levene and J.W. Northrop) he was an officer in the Chemical Warfare Service (1917-1918). He was employed by Procter & Gamble (1919-1920) and Fries & Fries Co. (1920-1922). He became a research associate in the chemistry department at the University of Chicago (1923-1946) and a member of the Chicago faculty (1946). He retired in 1952 and died on June 16,1976. His publications were in areas of organic and physical chemistry and, after his retirement, mathematical logic.

Senior's ideas were described in the book as the work of an imaginary scientist named Brown. Brown knew that geometrical models, serving as the basis of structure and configuration in chemistry, were a satisfactory explanation for the facts of chemistry. However, he suspected that they were <u>not</u> indispensable. In a sense they were analogous to the convenient use of the slide rule for logarithmic calculations, or to the convenient use of some kinetic arguments by thermodynamicists. Brown decided to develop a new approach to the phenomena of "stereochemistry", taking care to distinguish his nomenclature from the ordinary terminology with which he was already familiar.

Brown treated structure as an expression of adjacency. Structural formulas were topological diagrams having no spatial significance, except that the distances between the atoms must be very small. When isomeric maleic and fumaric acids were found to have the same adjacency relationship he invented the term "fine isomer" to cover the number, properties, and relations of such isomers. Being a physical chemist and much interested in the phase rule he made freezing point diagrams for many binary mixtures drawn from sets of "fine isomers", some of which were found in nature and others of which were synthetic. It soon became apparent that some substances that are called racemic are indeed mixtures.

The development of a complete exposition of all stereoisomerism based on phase rule studies occupies most of the Senior book and I recommend it as a mental exercise. The argument is at times reminiscent of the complexity of the plot in Mozart's "Le Nozze di Figaro". In summary he points out that the phenomena currently treated as 3-dimensional "might well have been observed, described, put into rational order, and, to a certain extent, predicted by a chemist who used no geometrical models because he was ignorant of the findings obtained by crystallographic and polariscopic methods. It follows that the geometric models introduced to account for some of those findings, no matter how convenient they may be, do not, in some parts of stereochemistry, play the essential role usually attributed to them".

Senior admitted that he was not competent to discuss how the results of x-ray and electron diffraction might be interpreted on a non-geometrical basis, but recommended that, until competent critics have considered the problem, an open mind on the subject was advisable. He pointed out that while the idea of a tetrahedral carbon atom facilitated the development of stereochemistry there remained problems associated with what we today refer to as conformation, an idea just becoming important when Senior wrote the book. While organic chemists required the idea of free rotation about single bonds, the hypothetical chemist Brown needed no such doctrine because he had no geometrical notions.

Senior concluded "If the argument here presented is both valid and novel, then about one hundred years has been required to clear some of the unessential picture-writing out of one part of chemistry. What may be accomplished in the next hundred years is an open question."

Following the publication of the book I had no opportunity to discuss it with Senior. I did develop an opinion that the various editors who declined to publish the material never even tried to understand it. Were Senior alive today he certainly would not be promoting his ideas as useful competitors to current structure theory.

While writing this Note I was reminded of my friend Thomas Downs, a fellow instructor at Trinity College in Hartford, Conn. He had just received the Ph.D. in Mathematics from Harvard and was seeking a good research topic. His specialty was topology. I suggested that structure theory in organic chemistry was a good subject to study and loaned him my copy of the J.F. Norris text of elementary organic. World War II came and Tom taught math at Annapolis, then at Washington University in St. Louis until his death. I never recovered my copy of Norris. ◇

Call for Papers

Second Northeast Student Chemistry Research Conference

Sponsored by the Northeastern Section, American Chemical Society, Education Committee,and Northeastern Section Younger Chemists Committee

Saturday, April 29, 2000, 9 - 4 p.m.

Massachusetts Institute of Technology
Lobby 13 and Building 10
Boston, Massachusetts
(hosted by the MIT Club Chem)

Send abstracts on standard ACS forms to:

John Birtles jbirtles@emerald.tufts.edu
Tufts University
Department of Chemistry
62 Talbot Avenue
Medford, MA 02155

Questions?

Tel: (617) 627 - 3046
FAX: (617) 627 - 3443
e-mail: Danielle Simonelli dsimonel@emerald.tufts.edu

Deadline for receipt of abstracts: April 14, 2000 ◇

ACS Information

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The on-line system will give you an ID number and a password for your contribution, which you must use to review, modify, or withdraw your abstract. Please record the ID and password before going any further.

Click the button to indicate the session to which you are contributing your paper. Click to indicate if your paper has been invited by the symposium organizer, or if you are submitting it in response to the call for papers.

Enter the title of your paper. Capitalize only the first letter of the first word of the title of your paper, the first letter of the first word after a colon, and the first letters of proper nouns; the rest of the title must be in lower case. Do not begin the title with the word "The."

Enter the information about all the authors of the paper, including the indication of their membership in the ACS and the division. Be sure to indicate who will be the presenter.

Enter your abstract; copying from word processing programs is very easily accomplished.

For special symbols (subscripts, superscripts, Greek letters, italics, etc.), click on the instructions and imbed the codes into the title and abstract text. The system will show you what your title, authors, and abstract will look like when printed or displayed on the web. If you don't like how it looks, please fix it.

Indicate your desired choice of presentation mode: oral only, oral preferred (but poster acceptable), poster only, poster preferred (but oral acceptable). In that way you will provide the program chair with a clear indication of what you want to do.

Indicate if you do or do not want your paper to be considered for presentation at Sci-Mix.

Indicate clearly any request for special equipment for oral presentations such as video systems, computer projectors, or electrical outlets. Slide and overhead projectors, screens, and pointers are standard for oral presentations, while boards and pushpins will be provided for the posters; it is not necessary to indicate standard items.

Indicate to the session organizers any other special requests such as temporal or disability limitations.

Review your abstract carefully and submit it. You can always get back into your file with the ID and password to make changes up until the deadline date.

In the event that something goes wrong (computer crash, inadvertent exiting, etc.), reenter the system, use the ID and password to search for your paper, and make the desired modifications. Don't start all over again with a new ID and password.

The electronic box will close at 11:59 p.m. Eastern time on the deadline date for the division. ◇

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UMass Dartmouth - (508) 999-8232
UNH, Durham - (603) 862-1550
Check NESACS Homepage for late additions: http://people.ne.mediaone.net/obermayer/nesacs

Feb. 22

Prof. Rosina M. Georgiadis (Boston Univ.)
"Development of Quantitative Surface Plasmon Resonance Spectroscopy of Interfaces: Successes, Applications and New Directions"
Boston University
Metcalf Sci. Ctr. Auditorium, 4 PM

Prof. John Caradonna (Boston Univ.)
"Probing Old Metalloprotein Active Sites with New Proteins: The Same but Better…?"
Tufts University
Pearson Hall, Rm. 106, 4:30 PM

Feb. 23

Prof. Dongwhan Lee (Mass. Inst. Technol.)
"Modeling the Dioxygen-Activating Centers of Non-Heme Diiron Enzymes"
Mass. Inst. of Tech.
Bldg. 6, Rm. 120, 4 PM

Prof. Amir Hoveyda (Boston College)
"Recent Advances in Asymmetric Catalysis"
Univ. Mass, Dartmouth
Sci. & Eng. Bldg., Rm. 305, 4 PM

Feb. 24

Prof. William Roush (Univ. Michigan)
Bristol Myers Squibb Lecture in Organic Synthesis
Mass. Inst. of Tech.
Time and Place TBA

Feb. 25

Dr. Gualberto Ruaño (Genaissance Pharmaceuticals)
"Genomics and Information Technology for Connecting Genetics with Clinical Response"
Boston Univ.
R. B. Hariri Bldg., Rm. 220, 2 PM

Feb. 28

Prof. Pericles Stavropoulos (Boston Univ.)
"Structural and Mechanistic Studies on Hydrocarbon-Oxidizing H_2O_2-Dependent Iron Reagents"
Boston University
Metcalf Sci. Ctr. Auditorium, 4 PM

Feb. 29

Prof. Scott Miller (Boston College)
"Discovery of Minimal Peptides for Asymmetric Catalysis and Organic Synthesis"
Tufts University
Pearson Hall, Rm. 106, 4:30 PM

Prof. Gerald Hammond (UMass, Dartmouth)
"Novel Approaches to the Selective Fluorination of Organic Compounds"
Univ. Mass., Boston
Science Bldg., 1st Fl., Rm. 089, 4:30 PM

Mar. 2

Prof. Thomas Muir (Rockefeller Univ.)
"Probing Micromolecular Interactions Using Protein Semisynthesis"
Mass. Inst. of Tech.
Bldg. 6, Rm. 120, 4 PM

Prof. Julie Leary (Univ. CA, Berkeley)
"Protein Mass Spectrometry"
Northeastern Univ.
Time and Place TBA

Mar. 6, Mar. 7 and Mar. 9

Prof. Carlo Floriani (Inst. Chimie Minerale & Anal., Univ. Lausanne)
A.D. Little Lectures in Inorganic Chemistry
"Dinitrogen Reduction over a Metal-Oxo Surface Modelled by Metalla calix[4]arenes"
"The discovery of Artificial Porphyrins"
"The Porphyrinogen as a Key Macrocycle in Biology and Chemistry"
Mass. Inst. of Tech.
Bldg. 6, Rm. 120, 4:30 PM

Mar. 7

Prof. Smita Patel (Univ. Medicine & Dentistry of NJ)
"Steps Towards Understanding the Mechanism of DNA Unwinding"
Tufts University
Pearson Hall, Rm. 106, 4:30 PM

Mar. 8

Prof. Thomas O'Halloran (Northwestern Univ.)
"Inorganic Cell Biology of Copper and Zinc"
Harvard Univ.
Pfizer Lect. Hall, Mb-23, 5 PM

Mar. 13, Mar. 14 and Mar. 16

Prof. Richard Friend (Cambridge Univ.)
A. D. Little Lectures in Physical Chemistry
Mass. Inst. of Tech.
Bldg. 6, Rm. 120, 5 PM

Mar. 13

Prof. Henry Linschitz (Brandeis Univ.)
"Coupled Electron-Proton Transfer in Redox Reactions of Hydrogen-Bonded Pairs"
Boston University
Metcalf Sci. Ctr. Auditorium, 4 PM

Mar. 16

Prof. Kenneth Karlin (Johns Hopkins Univ.)
"Copper and Heme-Copper Coodination Complex Dioxygen Reactivity: Chemical Models for Dioxygen Processing by Copper Proteins"
Boston College
Merkert Chemistry Ctr., Rm.130, 4 PM

Mar. 17

Dr. Mark A. Murcko (Vertex Pharmaceuticals Inc.)
Part 1. "The Design and Clinical Development of Inhibitors of Interleukin-1 Beta Converting Enzyme (ICE) for the Treatment of Inflammatory Diseases." Part 2. "Novel Approaches to Accelerate the Drug Discovery & Development Process"
Boston Univ.
R. B. Hariri Bldg., Rm. 220, 2 PM

Mar. 18

Mass Spectrometry Symposium
Dr. Michelle Buchanan (Oak Ridge Nat'l Lab)
Prof. Catherine Fenselau (Univ. Maryland)
Prof. Franz Hillenkamp (Univ. Münster, Germany)
Prof. Alan Marshall (NHMFL, Florida State Univ.)
Prof. Paul Vouros (Northeastern Univ.)
Boston Univ. School of Medicine
Hiebert Lounge, Instruct. Bldg. 14th Fl., 12:30-6 PM
Details posted at med-bioph-L5.bu.edu

Mar. 20

Prof. Viresh Rawal (Univ. Chicago)
"New Methods and Strategies for the Synthesis of Complex Natural Products"
Boston University
Metcalf Sci. Ctr. Auditorium, 4 PM

Prof. Eric Toone (Duke Univ.)
Title TBA
Harvard Univ.
Pfizer Lect. Hall, Mb 23, 4:15 PM

Mar. 21

Dr. Ying Wang (Brigham & Women's Hosp.)
"Modern Vaccine Development: A Chemist's View of the Bacterial Cell Surface"
Boston Glycobiology Discussion Group
MIT Faculty Club, 6 PM
Call (781) 642-0025 for dinner reservations

Mar. 22

Prof. Avi Bino (The Hebrew Univ., Jerusalem)
"Models for the Interaction of Carcinogenic Cr(VI) with DNA"
Mass. Inst. of Tech.
Bldg. 6, Rm, 120, 4 PM

Dr. Margaret Hsu (Abbott Laboratories)
"Development of Macrolide Antibiotics — Organic Synthesis in an Industrial Setting"
Univ. Mass, Dartmouth
Sci. & Eng. Bldg., Rm. 305, 4 PM

Mar. 24

Dr. Skip Shimer (Genome Therapeutics Corp.)
"Genomic Approaches for the Identification and Validation of Novel Antimicrobial Targets"
Boston Univ.
R. B. Hariri Bldg., Rm. 220, 2 PM

Mar. 29

Prof. Edward Wong (Univ. New Hampshire)
"Cross-bridged Cyclic Tetramines and their Metal Complexes"

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