
The Reception of Gibbsian Thermodynamics in Early Physical Chemistry. Part 1.p. 5

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**October
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PERIODICAL



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Southwest Retort

FIFTY-EIGHTH YEAR

October 2005

THE RECEPTION OF GIBBSIAN THERMODYNAMICS IN EARLY PHYSICAL CHEMISTRY PART 1.

By James C. Melrose

Editor's Foreword. In April, 2005, the U.S. Postal Service finally honored some outstanding U.S. scientists with a postage stamp. Those recognized were biologist Barbara McClintock, mathematician John von Neumann (Hungarian born but living in the U.S. at the time of his death), physicist Richard Feynmann, and chemist Josiah Willard Gibbs. Although Gibbs was formally a mathematical physicist, in view of his contributions to physical chemistry we chemists have every right to claim him.

Because of this long overdue honor to Gibbs, I thought it right to ask Jim Melrose to contribute an article on Gibbs in this, the year of his finally being honored with a stamp. Jim is a retired Senior Research Associate from Mobil in Dallas, a past winner of the D-FW Section's Doherty Award, and an expert on Gibbs.

The work of J. Willard Gibbs¹ in thermodynamics was published in the period 1873-1878. In this work Gibbs had formulated by 1876 the concept of the chemical potential. He had thereby established for the first time the conditions for both physical and chemical equilibrium. This develop-

ment was, however, expressed in terms which were regarded at the time as highly abstract and mathematical. Hence, with few exceptions (Maxwell², Duhem³) the Gibbsian formulation of chemical thermodynamics was not adopted. Maxwell's untimely death⁴ and Duheim's politics⁵ seem to

have negated their efforts to promote the use of the Gibbsian approach. Translations of Gibbs' work into German (Ostwald⁶, 1892) and French (Le Chatelier⁷, 1899) also seem not to have had the effect intended. Only in the Netherlands (Roozeboom⁸, 1887) was an interest in, and appreciation of, Gibbs' work adopted and then maintained. Thus, in the period 1890-1930 Gibbs was known mostly among chemists only as the discoverer of the phase rule⁹ and the co-discoverer of the Gibbs-Helmholtz equation¹⁰. During this period major applications of Gibbsian thermodynamics were gradually discovered by others, often without clear attribution to Gibbs. Only after the publication of the books by De Donder¹¹, MacDougall¹², and Guggenheim¹³ (1920-33) was the full scope of Gibbs' work widely appreciated.

For readers who are unfamiliar with thermodynamics or with the contributions that Gibbs made to the subject, the above comments may seem strange or even bizarre. The bibliographic record, however, is extensive and reliable. In fact, there exist three book-length biographies: those by Muriel Rukeyser¹⁴ (1942), L. P. Wheeler¹⁵ (1952), and R. J. Seeger¹⁶ (1974). Very roughly speaking, these three books focus on the personality, the family and career, and the scientific work of Gibbs, respectively. Whereas Wheeler's book is an "authorized" biography, that of Rukeyser, who is described by the publisher as a "gifted young poet," is not. This book is therefore of more interest, in many ways, than the others.

As listed by Wheeler, there had been at least 67 shorter biographical memoirs published by the time his book appeared in 1952. Many of these were written by distinguished scientists, as well as by students and colleagues who had known Gibbs personally before he died in 1903. On the other hand, none of these writers about Gibbs, nor indeed any of the three biographers cited above, were among the many authors who wrote treatises or textbooks on the subject of thermodynamics during the period from 1892 to 1920. Notable among this latter group (with the dates appropriate to their publications on thermodynamics) are the following: Poincare¹⁷ (1892), Planck¹⁸ (1897), van't Hoff¹⁹ (1898), Nernst²⁰ (1907), Haber²¹ (1908), Arrhenius²² (1912), and Ostwald²³ (1920). All of these authors except for Poincare received Nobel prizes: Planck in physics; the rest in chemistry. Also notable is that each author among this group, while somehow reluctantly admitting the priority of the early contributions of Gibbs, failed to recognize the importance of Gibbs' work in establishing both the fundamental nature and the logical structure of thermodynamics as a whole.

The recent (1990) book by J. W. Servos²⁴, *Physical Chemistry from Ostwald to Pauling*, discusses the development of thermodynamics during the period in question, 1892-1920. As Servos notes (page 256, note 38) with regard to Gibbs, "There is a difference between being honored and being understood." Thus, the title that E. A. Guggenheim adopted for his 1933 treatise, *Modern Thermodynam-*

ics by the Methods of Willard Gibbs, emphasizes a significant historical conclusion. That is to say, Guggenheim's title indicates that the period after 1920 represents a distinct rediscovery of the basic structure first established by Gibbs in 1876. This discussion of the reception of Gibbsian thermodynamics presented so far has emphasized the period from 1890 to 1930. What remains to be explored in some detail is the earlier period, from 1873 to 1890. Gibbs' fame, if

not based on a widespread understanding of his work, was, without doubt, established during this time. It is planned that this interesting stage of the development of physical chemistry will be the subject of further comments in *The Southwest Retort*.

Editor's Afterword. Dr. Melrose's series on the reception of Gibbs' ideas in physical chemistry will continue next month.

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****Continued on page 2****

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Gremlins

As most of you will have noted, gremlins struck again in the September issue of *The Retort*. The Table of Contents showed the October D-FW meeting notice to be on page 24 (the back page) of the magazine. If you turned there, you just found page 23 repeated. The previous article was good but not that good! Minuteman Press was struck by gremlins who printed page 23 twice. The missing page 24 was mailed by postcard to all subscribers, so everyone should have received the October meeting information on time. Indeed, in some cases the postcards probably beat the magazine to the mailbox. I am not sure what to do about gremlins, but I think involving a second proofreader might get rid of those pests. We'll see if this issue is gremlin free.

An additional error in the September issue was not caused by a gremlin. Texas Tech award winner Satomi Niwayama was referred to as a male in the piece about her winning the Japanese Society for Process Chemistry 2005 Award for Excellence. Dr. Niwayama is a woman. This can be attributed to Editor Tom

Strom's unconscious sexism in thinking that, when gender is not noted, the person described surely must be a male.

Peck, Price Win Southwest Awards

The 2005 Southwest Regional Award has been given to **Dr. M. Larry Peck** of Texas A&M University. Dr. Peck is a renowned chemical educator. He will receive his \$1500 award at the 2005 Southeast/Southwest Regional ACS Meeting to be held in Memphis Nov 1-4 at the Peabody Hotel and Convention Center. The \$1500 Southwest Regional Award for High School Chemistry Teachers was given to **Paul Price** from Trinity Valley School in Fort Worth. Mr. Price won the D-FW Section's Werner Schulz Award last year. His classes have an unprecedented record of obtaining high scores on AP placement exams. Paul will receive his award in Memphis.

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CHEM GEMS & JOULES

SWEET AS SUGAR?

by Jane Smith, R. L. Turner High School, E-mail
SmithJ@cfbisd.edu

After such an abysmally hot August and September, the arrival of fall is beckoning. With fall comes State Fair funnel cakes, buckets of Halloween gummy goblins, Thanksgiving pecan pie, and more treats than I can name for Christmas. So what's sweeter than cool, crisp days with a rain of golden leaves? Why sweeteners, of course!

We can't deny what nature has made for us- built in receptors on our tongues to detect what is salty, sour, bitter, and sweet. That's right- we're just doing what comes naturally when we pop a couple of sour nite-crawlers or a handful of trail mix with peanuts and M & M's. The first sweeteners on a large scale came from sugarcane from which can be extracted sugar, brown sugar, and molasses. But cutting down sugarcane is hard work, and when the British blockaded Napoleon's navy and cut off colonial supplies, Napoleon demanded another sweet source be found. The answer came in the form of sugar beets, which were much more suited to the European climes as well as the labor pool.

In Western societies, each person consumes about 100 grams (that's about 1/4 of a pound!) of refined sugar a day. We are surrounded by sugars- far more than what rests in that bowl by the cereal box: there is sugar in fruits (fructose) and milk (lactose)

and our body/s primary raw material (glucose). In this day of "waisting away", we may be calorie conscious, but our bodies outsmart us when we overdo. If we end up with more glucose in our blood than we need, our bodies cleverly turn it into glycogen, an energy storage material. The average person has about 350 grams of glycogen stored, which can provide him/her with 1400 calories should the need arise. Of course, if we really overdo it all the time, the glucose is converted to fat rather than glycogen. Drats!

So, with all of the "natural" sweeteners around, why search for sugar substitutes? One reason might be the sweetness factor of bulk sweeteners. Scientists rate how sweet a material is by making a 10% solution in water and seeing if a panel can detect the sweetness. Then the solution is diluted over and over again until finally the threshold of sweetness is crossed. While fructose has a sweetness factor of 120% compared to sucrose, lactose is only 40% as sweet. Artificial sweeteners require much smaller quantities to achieve the same sweetness. Aspartame's (NutraSweet) sweetness factor is 200%; saccharin's is 300%; and sucralose's (Splenda) 600%. Artificial sweeteners are nothing new. The Romans never had enough honey to meet their sweet needs, and

they discovered that boiling down grape juice or souring wine in a lead pot produced sapa, which enhanced the flavors of their wines. Unfortunately the lead acetate that made the sapa taste sweet wasn't so healthy for the Romans or their Empire.

Scientists are still working on exactly why some substances taste sweet to us, but the clue seems to lie in the molecular structure. To trigger the sweetness receptors on the tongue, a molecule must have three groups at very specific distances.

So, how sweet is it? Well, it all depends upon the structure, and, as any good biologist will tell you, structure determines function. I say, where's my Bit-o'Honey?

The major reference I used for this article is John Emsley's The Consumer's Good Chemical Guide 1994. He also wrote an article on sweeteners for ChemMatters.

National Chemistry Week at The Science Place. Summer Smith, Science Place Director of Visitor Experience, has informed us of the many events that will take place there this month to celebrate National Chemistry Week (NCW). NCW will be celebrated for two weeks in Dallas, not just the official Oct. 16-22 time frame. The extra week is added on after the cessation of the State Fair, because students then can more easily come on field trips.

The NCW theme is "The Joy of Toys," and from 10 a.m. until 2 p.m. on weekdays during that time period (except for Oct. 24, when the museum is closed) the Inquiry Zone will be alive with the joy of toys, with a different toy-making or experiment-

showing experience each day of the week. Oct. 17 features Magic Sand, which is a hydrophobic sand. The Oct. 18 and 25 theme is Switcheroo, how do toys change color? This trick is done with uv light, and students can take home a uv bracelet of their own. Oct. 19 and 26 involve Glowing Stuff, while Oct. 20 and 27 feature Silly Putty. Bubbles are the theme on Oct. 21 and 28, and Slime is the headliner on Oct. 22 and 29.

Sunday, Oct. 23, Mole Day, features the return of ACS President Bill Carroll from his 13,000 mile trek and the UNT Mean Green Demo Team. Show times in the Auditorium are 1 and 3 p.m. The Denton crew will give classic chem demos such as Exploding Balloons, Fire in the Jug, Great Balls of Fire, Bowling for Density and many others. Oct. 30 is Spooky Science! Visitors can take part in a "Spooky Scavenger Hunt" and attend the "Adventures of a Mad Scientist Show." These are just a few of the Spooky Science activities.

These are fun activities for kids, to be sure, but adults might enjoy them also. If you are in Fair Park during this time period, drop in and check things out!

Send material for this column to Editor Tom Strom or to Managing Editor Mary Teasdale at the addresses shown on page 3 of this issue.

[Place Kelly Scientific Ad here]

Around-the-Area

University of Arkansas

This summer the University participated in the first ever NSF funded summer exchange with Moscow University and the Academy of Fine Chemical Technology of Moscow. U of A undergraduate **Ioana Peret** was one of three students from the U.S. participating and two Moscow students, **Vitaly Vostrikov** and **Evguenia Akhmetova**, spent seven weeks at U of A this summer.

Derek Sears and the Space Center Group went to Enid, OK Aug. 26-27. Sears and graduate student **Melissa Franzen** traveled to Pasadena, CA Aug. 31-Sept. 2 for collaborative research. Sears and graduate students **Julie Chittendon** and **Melissa Franzen** attended the American Astronomical Society meeting at the University of Cambridge Sept. 4-8, where they made three presentations.

Josh Sakon is attending a crystallography meeting in Florence, Italy Aug. 21-Sept. 5. **Ryan Tian** gave an invited talk at the annual meeting of the American Academy of Nanomedicine Aug. 15-16 at Johns Hopkins. **Richard Fleming**, who once worked for Dr. Charles Wilkins, is back on campus in charge of 43 lab sections in Chemistry I, Chemistry II, and Organic Chemistry I.

East Texas

The September section meeting was held on Sept. 21 at the Devall Student Center at Kilgore College.

The speaker was **Dr. L. H. Sperling** of Lehigh University speaking on "Why Does a Rubber Band Snap Back?" The next meeting will be Oct. 17th at Texarkana College featuring **Dr. Al Hazari** on the topic "Chemistry in the Comics."

Of the 32 Student Affiliate ACS chapters that ACS rated as outstanding for the 2004-2005 academic year, the East Texas section has three! Congratulations to the following chapters: Northeast Texas Community College, Chapter President and Report Writer, **Brandon Riley** and **Ashly Perryman**, Sponsors **James Archer** and **Lawrence Brough**; Texarkana College, President **Kristin Williams**, Sponsors **Mike Buttram** and **Patti Harmon**; UT-Tyler, President **Scott Brown**, Sponsors **Brian Taylor** and **Neil Gray**. These chapters will receive their awards at the ACS Atlanta Meeting next March.

UT-Tyler. Two chemistry faculty members received the highest UT-Tyler faculty recognitions at the Fall Convocation. Associate Professor **H. Neil Gray** received the President's Scholarly Achievement Award, and Associate Professor **Brian Taylor** received the UT-System Chancellor's Council Teaching Award. Dr. Gray is serving as president of the Faculty Senate for 2005-2006.

Dr. Jason Smee has joined the chemistry faculty as assistant professor. He is an inorganic chemist

who received his Ph.D. at Texas A&M University in 2000. From 2000-2005 he was a postdoctoral fellow at Colorado State. Senior chemistry major **Dean Stuart** received second place in the 15-paper poster session at the UT-System LSAMP Research Conference held in Dallas. His research advisor was Dr. Tanya Shtoyko. The outstanding award for the UT-Tyler ACS student affiliate chapter (see above) marks the seventh consecutive year the chapter has been nationally recognized by the ACS.

Heart o' Texas

Baylor University. Dr. Gouri S. Jas has joined the faculty as associate professor. He comes to Baylor from the Higuchi Biosciences Center at the University of Kansas. He received his Ph.D. in biophysical chemistry from Kansas in 1995 and has also worked at the Laboratory of Chemical Physics at NIH.

Graduate students **Graciela Miranda** and **Madhavi Sriram** from Dr. Pinney's group made poster presentations at the National Organic Symposium in Salt Lake City, June 12-16. The following students defended their research and graduated with a Ph.D. in August: **Francisco J. Gonzalez Velazquez**, mentor **Mary Lynn Trawick**; **Craig J. Moehnke**, mentor **Carlos E. Manzanares**, and **Franklin R. Beckles**, mentor **Kevin K. Klausmeyer**.

Dr. Mary Lynn Trawick and graduate students **Milenka Arispe**, **Sam Chen**, and **Maryuri Roca** attended the annual Texas Protein Folders Meeting held last summer in

Navasota. **Dr. Kevin Pinney** attended a conference in Oxford, UK and gave a research presentation. His coauthors were **Madhavi Sriram**, **Beverly Herrington**, **Nathan Grohmann**, and **Ankar Gupta**.

Nine new graduate student enrolled in the department this fall. A special seminar was given Sept. 22nd by **Dr. Pradig K. Mascharak**, UC-Santa Cruz. Colloquium speakers were Sept. 2, **Mike Richmond**, UNT; Sept. 9, **Gouri Jas**, Baylor; Sept. 23, **Ralph Mason**, UT-Southwestern Medical Center; Sept. 30, **George E. Davis**, Texas A&M Health Sciences Center.

Dallas-Fort Worth Section

UT-Arlington. Dr. Carl Lovely gave seminars at West Virginia University on Sept. 14 and at the University of Pittsburgh on Sept. 15 on "New Methods for Imidazole Functionalization: Application to the Total Synthesis of the Oroidin Alkaloids."

TCU. Jeff Coffey gave an invited presentation, "Nano and Microcrystalline Silicon as a Diverse Biomaterial Platform", for the Biotechnology Track at the 2005 IEEE MetroCon Conference, Arlington, TX, Sept. 14th. Graduate students **Ji Wu**, **Vladimir Seregin**, and **Dongmei Fan**, and undergraduate **Scott Dunkle**, each presented posters at this conference.

Manfred Reinecke has been named to the editorial board of the new international journal, *Natural Product Communications*. The journal will be launched in January 2006

and will cover all aspects of natural products. Further information for potential authors and subscribers can be found on Reinecke's web site at <http://www.chm.tcu.edu/reinecke.htm>

UNT. The UNT Chemistry Department welcomes Dr. **Stephen Cooke**, Assistant Professor of Physical Chemistry. Dr. Cooke received his Ph.D. at the University of Exeter, and arrives from a postdoctoral stint at the University of British Columbia.

Dr. **James Marshall** and his wife were featured in a recent article in *NATURE* describing the success of their "Rediscovery" project internationally. Dr. Marshall was featured in a recent *C&EN* book review outlining the history of the Periodic Table. They presented a seminar on the ACS Tour circuit at Shawnee (Oklahoma Section, ACS). Seminars to be presented in the Lone Star Circuit of the ACS Tour program October 10-13 at Waco, San Angelo, Lubbock, and Amarillo.

Dr. **Wes Borden**, Welch Chair at UNT, received a Cope Scholar Award, and he gave invited lectures at the Gordon Conference on Physical-Organic Chemistry, the International Symposium on Reactive Intermediates and Interesting Molecules, and an Award Address at the Symposium for Cope Scholars at the ACS National Meeting in D.C. Dr. Borden is currently on sabbatical for the fall semester at the University of Melbourne on a Wilshire Fellowship.

Drs. **Tom Cundari** and **Angela Wilson** won a grant for \$310K from the United States Department of Education, which is designed to set up a regional Center for Advanced Scien-

tific Computing and Modeling (CASCaM). CASCaM establishes a state-of-the-art facility for advanced scientific computing with an overall goal to address scientific problems of immediate interest to the nation, and provide the scientifically-trained computational work force needed in the region and the nation.

Dr. **Angela Wilson** was chosen as one of six associate members (only two from the US) of the governance committee of the Division of Physical and Biophysical Chemistry of IUPAC. Dr. Wilson recently gave the following papers: "Truncation of the Correlation Consistent Basis Sets: A Means to Reduce the Computational Scaling of Ab Initio Methods?" (with **Benjamin Mintz**) American Conference on Theoretical Chemistry, July 16-21th, UCLA; "Computational Study of Heavier Dihalogen-M-Di-chalcogenides: The FOOF Analogs", (with **Brian Prascher**); same conference; "Keys to Quantitative Modeling of Extended Chemical Systems: Effective Computational Cost Reduction", 2005 IUPAC Congress, August 14th-19th, Beijing, China; "Transition Metal Chemistry: Towards Accurate Energetic Description", with **John Determan**, **Scott Yockel**, **Pankaj Sinha**, **Mohammad A. Omary**, and **Paul S. Bagus**, National Meeting of the American Chemical Society, Aug 28th-Sept. 1st, Washington D.C.; "New Krypton-Bonded Molecules: A Theoretical Study", with Scott Yockel; same meeting; "An Analysis of the Basis Set Requirements for Accurate Description of Ionic Mole-

cules: The Importance of the Anion Polarizability”, with Benjamin Mintz and Paul S. Bagus, same meeting; “Reduction of Computational Requirements and Trends for High Accuracy Description of Molecular Properties”, with Benjamin Mintz, same meeting.

Dr. Wilson served as an invited session chair at the 2005 IUPAC Congress, and as a 2005 IUPAC/ U.S. National Academy of Sciences Young Observer to the 2005 IUPAC General Assembly in Beijing, China, August 12-19th. Benjamin Mintz was one of 20 outstanding graduate students selected by the ACS Division of Computers in Chemistry for the CCG Excellence Award.

Dr. **Diana Mason** won this year's UNT Community Award. This award is presented to the person at UNT showing exemplary out-side activities on behalf of the university. She was particularly singled out for her chemistry demonstrations around the country, the Mean Green Demonstration Machine, and for the establishment of a new peer tutoring system for introductory chemistry. Dr. Mason has been successful in bringing ChemEd07, the International Chemistry Education Conference to UNT in the summer of 2007. Dr. Diana Mason received 1 of 16 NSF DUE grants for \$499,992: “UNT Science and Mathematics Robert Noyce Scholarships” for secondary science and mathematics pre-service teachers. The Mean Green Chemistry Demo Team performed Chautaugua in Waxahachie, September 24th and will perform Mole Day, Oct 23rd, at The Science Place, Fair Park, Dallas.

Regional ACS Meeting Features POGIL Workshop

Friday, November 4th Andy Bressette and Marty Petty host a half-day symposium on Process-Oriented-Inquiry Learning at the 2005 Southeast/ Southwest Regional ACS Meeting. This workshop will focus on guided-inquiry approaches to teaching and learning in the classroom and laboratory throughout the chemistry curriculum. A guided inquiry symposium will be held November 3rd.

For additional information on the combined regional meeting to be held Nov 1st – 4th in Memphis go to: http://www.chem.memphis.edu/acs/rm_prog.html#Exam

NOVEMBER METROPLEX SEMINAR SCHEDULE

Seminars are sometimes postponed or cancelled, so readers are urged to call the departments or check departmental web sites before attending.

UT-Arlington, Nov. 4, Stefan K. Estreicher, Texas Tech, “The Surprising Physics and Chemistry of Defects in Semiconductors.” **Nov. 11**, Trent Selby, UNT, “Organometallic Redox Arrays for Control of Spin Alignment.” **Nov. 18**, John W. Sibert, UT-Dallas, “Wurster’s Crowns: Structure-Property Rela-

tionships within a New Class of Redox-Active Macrocycles.” Seminars are normally at 2:30 p.m. in Room 113, Baker Chemistry Research Building.

UT-Dallas. Nov. 2, Thomas Kodadek, UT-Southwestern, “Chemical Tools for Proteomics Research.” **Nov. 16**, Paul Russo, LSU, “New Optical Methods to Characterize Macromolecules.” Seminars are normally held at 12 p.m. in Room 2.106, Founders North Building.

University of North Texas. Nov. 11, John Bevan, Texas A&M, “Sub-millimeter/Terahertz Co-Axially Configured Supersonic Jet Spectroscopy.” **Nov. 18**, Hua Ling, SMU, “Mining Genome Sequences for Novel Biocatalysts and Applications to Asymmetric Organic Synthesis.” Seminars are normally at 3:30 p.m. in Room 324, Masters Hall.

Texas Christian University. Nov. 3, Louisa Hope-Weeks, TBA. Seminars are normally at 11 a.m. in Lecture Hall 3, Sid Richardson Science Bldg.

UT-Southwestern Biochemistry. Nov. 3, Dorothy Kern, Brandeis University, “Proteins in Action: Dynamics During Catalysis and Signaling.” **Nov. 17**, Wah Chiu, Baylor College of Medicine, “Electron Cryomicroscopy of Biological Machines.” Seminars are normally at 12 noon in Room L4.176, Biochemistry.

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******The Chemist’s Bookshelf –
Continued from page 20 ******

glance this arrangement may seem complex, but it works! By the end of the book, the reader has garnered an overview of scientific life in Europe during and after World War II and made the acquaintance of 19 Nobel prize winners, some other, little-known, but significant scientists, and, best of all, the articulate, cultured author.

Should you buy this book? Yes, immediately! The author’s daughter, Eszter Hargittai, is handling distribution of her father’s book in this country. You can order the book online as described in the review’s heading. If you don’t wish to use this venue, you can mail a check for \$22 made out to Eszter Hargittai at 2240 Campus Drive, Evanston, IL 60208. If you purchase and read this book, I guarantee you won’t be disappointed.

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THIS MONTH IN CHEMICAL HISTORY - PART I

by Harold Goldwhite, California State University, Los Angeles
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Prepared for SCALACS, the Journal of the Southern California, Orange County, and San Gorgonio Sections of the American Chemical Society

I recently acquired through a used book outlet a copy of Volume II of the Extra Series, Numbers 5 and 6, bound with the Second Edition numbers 1 and 2, of the magazine "The New World: A Weekly Journal of Popular Literature, Science, and Music." These issues of "The New World" are dated October 1842 and March 1843 respectively and were edited by Park Benjamin, himself a writer, and published by J. Winchester.

These were enterprising gentlemen. In November 1842 the magazine published the first book of Walt Whitman, a potboiler of a temperance tale entitled "Franklin Evans or the Inebriate. A Tale of the Times". A couple of years later Winchester pirated Charles Dickens' latest novel, "Martin Chuzzlewit" and after publishing it serially in "The New World" issued the first American Edition in book form well before Harpers were able to produce the authorized edition. By now my readers are surely asking what all this has to do with chemical history? Patience, and all will be revealed. These Extra Series numbers of the magazine contain the complete texts, translated into English, of two of Justus Liebig's most important books, namely "Chemistry in its Applications to Agriculture and

Physiology"; and "Animal Chemistry; or Organic Chemistry in its Applications to Physiology and Pathology." This demonstrates, I believe, an interest of the literate public in the science of the day which is strikingly in contrast to the situation in our times. A comparable publication is unimaginable in a modern general interest magazine.

In the early 1840s Liebig was regarded as the most important European chemist. He had been at Giessen for 15 years and had established the best known research school in chemistry. His work with Woehler on the benzoyl radical was already regarded as path-breaking, and his improvements in organic analysis had placed that science on a sound footing. He began to investigate chemical aspects of agriculture and, more generally, biochemical phenomena (as we would now call them) in the 1830s. It was his close friend and colleague Woehler who had discovered in 1828 the remarkable transformation of ammonium cyanate into urea, thus forging a link between inorganic chemistry and the chemistry of living organisms. Liebig decided to follow up this link.

"Chemistry in its Applications to Agriculture and Physiology" was originally presented to the British

Association for the Advancement of Science as a part of a Report by Liebig on the state of organic chemistry. It was translated into English by Lyon Playfair, a distinguished chemist and, later, a noted politician. Liebig states: "I have endeavored to develop ... the laws of Organic Chemistry in particular, in their applications to Agriculture and Physiology; to the causes of fermentation, decay, and putrefaction; to the vinous and acetous fermentations; and to nitrification". Liebig pays tribute to Humphrey Davy's pioneering work on "Agricultural Chemistry" which initiated reforms in farming practices in the early nineteenth century.

Liebig draws attention to the disconnect, so apparent at the time, between the views of chemists on natural phenomena of the kinds mentioned in the previous paragraph, and those of botanists and physiologists. He states: "Physiologists reject the aid of chemistry in their inquiry into the secrets of vitality, although it alone could guide them in the true path." He offers much useful advice to agriculturists, reinforcing with chemical reasoning such practices as alternation of crops, the use of natural and artificial manures. He also points out the value of chemical analysis of soils.

Liebig's views on fermentation

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brought him into conflict with Pasteur some years later. Liebig compared yeast with an inorganic catalyst, and said that in the fermentation of sugar solutions by yeast both the sugar and the yeast underwent decomposition. Pasteur opined that yeast was a living organism which grew during fermentation drawing its nourishment from the sugar, a view which corresponds to our present ideas.

There is much more of interest in the 63 closely printed large format quarto pages that make up Liebig's "Agricultural Chemistry," but space and time do not allow me to give more than this short abstract of its contents. In Part II, I will discuss the second of the Liebig books, that on "Animal Chemistry."

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"... the military don't burn books any more: they sell them to the paper manufacturers. The paper companies shred them, pulp them and put them back on the market for consumption. It is not true that Marx, Freud or Piaget are unavailable to the public. In book form they are not. But they are in the form of serviettes." — *Eduardo GALEANO* Uruguayan writer, story-teller, journalist and historian (1940-)

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November, 2005, D-FW ACS Meeting

Southern Methodist University

Thursday, November 17, 2005

Dr. Raj Vempati

President, ChK Group, Inc.

“Use of Nanomaterials in Environmental Chemistry”

The presentation will focus on manufacturing and coating of nanoparticles onto solid substrates for environmental applications. This is pertinent in relationship to arsenic removal from drinking water, to producing an environmentally friendly plant growth to reduce fertilizer and water consumption, and to other activities such as urban horticulture, rooftop gardening, conversion of city compost as a high value-added potting mixture, and providing a substitute sand for golf greens.

About the Speaker: Dr. Vempati received his Ph.D. in soil chemistry and mineralogy from Texas A&M. He is the founder and president of ChK Group, Inc. The company's mission is to manufacture materials using green chemistry for environmental, industrial, food, agricultural, and space applications. This approach has resulted in two commercial technologies.

Time: Dinner 7 p.m. – Student Cafeteria, Umphrey Lee Student Center
Lecture 8 p.m. – Room 124, Fondren Science Building

Dinner: No reservations are necessary. Dinner is a buffet meal with four entrees. The cost is \$6.25, and you pay at the door.

Directions: Take the University Ave. exit off Highway 75 (North Central Expressway) and travel west on University. University will dead end at the Airline Parking Garage. There is a visitor parking lot directly behind the Parking Garage, and SMU is allowing free parking there that evening. Parking in the Parking Garage would be about \$5.00. Fondren Science is immediately west of the Parking Garage across Airline Circle. The Umphrey Lee Student Center is a short walk away at Hillcrest and Dyer, just south of McFarlin Auditorium. The cafeteria is in the basement. You enter at the south door and go down the steps.

THE CHEMIST'S BOOKSHELF

A Book Review by E. Thomas Strom of

OUR LIVES: ENCOUNTERS OF A SCIENTIST

by István Hargittai

Published by Akadémiai Kiadó, Budapest, 2004, Hardbound, 261 pages, ISBN 963-05-8101-9. Price \$22 including postage. Order online using PayPal at (<http://hargittai.com/ourlives/>)

Even though the publisher is Hungarian, readers can be assured that this book is written in excellent English. Chemist Hargittai with his wife Magdolna has written a highly regarded book on *Symmetry through the Eyes of a Chemist*, but more recently he is better known through his published interviews with eminent chemists, physicists, and biologists in a series called *Candid Science*. This current book is hard to characterize, but it is consistently interesting.

Hargittai is a Hungarian Jew, and at age four he barely survived the German occupation of Hungary. He and what remained of his family were on a train bound for Auschwitz when the train changed direction and ended up in Austria. The Russians eventually freed them, and the family returned to Hungary. Consequently, István wound up under Communist rule. He was a bright student, but he was originally denied entrance into a state supported high school on the grounds that he was a "class alien." This was a term to characterize people the regime considered "exploiters and former exploiters of others." His family had enough means before the war that they were considered "class aliens." Furthermore, anti-Semitism, prevalent

in Hungary before the war, was still present. Of course, even "class aliens" were entitled to free high school, but István was so bright officials were afraid he would want to attend college. His mother appealed to officials all the way up the line, eventually reaching a high official in the Ministry of Education, who allowed him to attend any high school in the country, save his local one. He then had to fight to be admitted to the University after high school, but he persevered and won out. He later received a master's degree from the University of Moscow and a Ph.D. from Eötvös University.

Why did I say the book was hard to characterize? The nineteen chapters start out talking about 19 Nobel Laureates whom Hargittai has interviewed in the past. However, the information, probably condensed versions of his previous pieces, is followed by autobiographical material about Hargittai's life and spin off material about related scientists, many of them Hungarian. I was struck by the disproportionate impact Hungarian scientists, in particular Hungarian Jews, have had upon science in general. At first
*****Continued on page 16*****