

Periodic Tabloid

Chemistry and Chemical Engineering Division at Caltech

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William N. Lipscomb, Jr. - An Appreciation

Douglas C. Rees, Professor of Chemistry at Caltech and Investigator at Howard Hughes Medical Institute, remembers his graduate advisor, William N. Lipscomb, Jr., who passed away on April 14th, 2011 at the age of 91.



William N. Lipscomb, Jr., Caltech Chemistry PhD 1946, Abbott and James Lawrence Professor of Chemistry Emeritus at Harvard University, and recipient of the 1976 Nobel Prize in Chemistry, passed away on 14 April at the age of 91. Lipscomb was one of the least recognized giants of 20th century chemistry who, like his advisor Linus Pauling, developed a deep understanding of chemical bonding and x-ray crystallography to make fundamental contributions in disparate fields ranging from boron hydrides to protein structure. A one man chemistry department,

Lipscomb's impact is evident in physical chemistry (structure and bonding), inorganic chemistry (boranes), biochemistry (protein structure) and even organic chemistry, through his work with then graduate student Roald Hoffmann that provided the theoretical underpinnings for the Woodward-Hoffmann rules. In addition to Hoffmann, Lipscomb's academic progeny include a second former graduate student to win a Nobel Prize, Tom Steitz, and 8 members of the US National Academy of Sciences, reinforcing his principle that research and teaching are inseparable.

Although born in Cleveland, Lipscomb grew in Lexington, Kentucky. Throughout his life, he was proud of his Kentucky roots, sporting a string tie (apparently the only Nobel laureate with a youtube video on how to tie one on) and known as "The Colonel" to his students (1). Lipscomb attended the University of Kentucky on a music scholarship and he maintained a life long passion for the clarinet and music. Fortunately for many of us, though, he also had an early passion for chemistry and physics that ultimately prevailed.

In the fall of 1941, Lipscomb hitchhiked from Kentucky to Caltech to start graduate school in physics, but he came under the spell of Linus Pauling and switched to chemistry. In this way, he became the first of a surprising number of Caltech chemists with Kentucky roots. His thesis research

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Peter B. Dervan appointed VP for Development and Institute Relations

Peter B. Dervan, Bren Professor of Chemistry, has graciously accepted to serve the Office of Development and Institute Relations as a search is conducted for a new Vice President. Professor Dervan was chair of Chemistry and Chemical Engineering from 1994 to 1999. He will now "assume leadership of programs that facilitate the Institute's fund-raising, communications, marketing, and our relationships with Alumni, the Associates, and other key constituencies," wrote Jean-Lou Chameau, President of Caltech, as he announced Professor Dervan's appointment to this post on May 4, 2011.

Continued from Page 1 (Lipscomb)

focused on molecular structure, using both electron diffraction (with Verner Schomaker) and x-ray diffraction (methylammonium chloride, with Eddie Hughes (2)). The latter structure was of significance as it was the second x-ray structure solved using least squares refinement (the first being Hughes' structure of melamine) and provided Pauling with a reliable C-N single bond distance for his analysis of resonance stabilization of peptide bonds.

Lipscomb's graduate period coincided with World War II and while he was not in the military, he conducted war related research as part of a National Defense Research Council program at Caltech, as did many Chemistry graduate students at that time. A fascinating account of this period may be found in the book "A Bridge Not Attacked: Chemical Warfare Civilian Research During World War II" by Harold Johnston (3), a fellow chemistry graduate student at Caltech. Lipscomb worked on several projects, including finding ways to optimally obscure Los Angeles with smoke against aerial attacks (he subsequently commented that this project was "no longer needed") and working with nitroglycerin-nitrocellulose propellants (when later asked how he carried around beakers of nitroglycerin, Lipscomb would reply "carefully"). One consequence of these activities was that two chapters of Lipscomb's thesis (4) were classified (although presumably now declassified, I have yet to find them; of interest to current students, several of his propositions were also classified).

Pauling's influence on Lipscomb was profound, particularly through his interest in structure and bonding. Curiously, although Pauling was Lipscomb's advisor, they never co-authored any papers, which apparently reflected how Pauling operated his group with a number of research associates having responsibility for the day-to-day research supervision of students, such as Hughes (described by Lipscomb as his first teacher of crystallography).

I heard a variety of stories over the years about the Colonel's time at Caltech, but two made a particular impression:

(i) Lipscomb learned from Pauling that publishing something wrong was not the worst thing that could happen to a scientist, but rather the worst thing would be to publish something uninteresting. Consequently, when Lipscomb discussed his plans to work on boron hydrides with Pauling and was told that this was not very interesting, it could be reasonably interpreted as a criticism. I believe Pauling's reaction still bothered the Colonel years later (despite winning the Nobel Prize for this work). It should also be noted that Lipscomb did find it "distressing to be proven wrong" (admittedly a rare occurrence).

(ii) The graduate school accomplishment for which Lipscomb was arguably most proud was making an unassisted triple play



Prospective graduate students in Chemistry are brought in for a weekend visit with dinners, outings, and poster sessions.

Two weekends were designated for Chemistry Department's admitted prospective graduate students to visit the Caltech campus, so that they can get to know the campus, faculty, and students. Students who were admitted made arrangements to attend either the March 3-5 weekend, or the March 24-26 weekend.

The Visit Weekends ran from Thursday evening to Saturday afternoon. Prospective students arrived on Thursday to join Chemistry students and other prospective students for dinner in Pasadena. Friday was the day for main events where they attended lab tours, met with individual faculty, had lunch with Chemistry students, attended poster sessions, which were followed by happy hour and dinner with faculty and graduate students. Agnes Tong, who is responsible for Chemistry Graduate Program, arranged for the events. Friday Poster sessions were held at Dabney Garden, where a big tent was set up for the posters to be displayed. The first weekend poster session was followed by dinner at Schlinger Building courtyard and the second weekend's dinner was held in Dabney Garden. The Saturday schedule was relatively informal, with activities such as hiking, visits to the Huntington Library and to the beach, which allowed the students to see the Los Angeles area. There was great participation, and the visit weekends were a success! 38 students attended the first weekend, and 56 students attended the second. 42 Chemistry graduate students will be joining us in Fall 2011!

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Faculty Updates

Ahmed H. Zewail, Linus Pauling Chair Professor of Chemistry and Professor of Physics, and the 1999 Chemistry Nobel Laureate, was presented with the Priestly medal at the American Chemical Society meeting in Anaheim, California, in recognition of "his development of revolutionary methods for the study of ultrafast processes in chemistry, biology, and materials science." Caltech faculty, students, post-docs, and staff were present at the dinner honoring Professor Zewail. There was also a book-signing opportunity for guests. Pictured above is Professor Zewail, seated next to Caltech President Jean-Lou Chameau, surrounded by his family, research group, and staff.



Frances Arnold, Dick and Barbara Dickinson Professor of Chemical Engineering, Bioengineering and Biochemistry, has been named co-recipient of the Charles Stark Draper Prize by the National Academy of Engineering. Arnold was awarded the \$500,000 prize—the engineering profession's highest honor—for a method called directed evolution, used worldwide to guide the creation of certain properties in proteins and cells, allowing the engineering of novel enzymes and biocatalytic processes for pharmaceutical and chemical products.

Dennis A. Dougherty, George Grant Hoag Professor of Chemistry, was awarded the Tolman Award by the Southern California Section of the ACS in recognition of outstanding contributions to chemistry in Southern California. He was honored by a dinner at the Athenaeum, where he spoke about "Chemistry on the Brain: Understanding the Nicotine Receptor" on April 25, 2011. Pictured on the right is Professor Dennis Dougherty and his research group.





Professor Harry B. Gray's 75th birthday is celebrated with a dinner-dance at the Athenaeum

On Saturday, March 26th, 2011 we celebrated Professor Harry Gray's 75th birthday. Held at the Caltech Athenaeum, approximately 275 guests gathered from all corners of the world to honor Harry's life and work in

Chemists celebrating birthdays in ways which only chemists do

This research group has a baking committee which never runs out of ideas: ACGT petits fours, representing one aspect of their advisor's research, connected into strands by lines of frosting. It is up to the reader to guess whose birthday is being lovingly celebrated in the group's own break room on May 6, 2011, the Friday before her birthday (May 7).



the most fitting way: with drinking, toasting, dancing and reuniting with old friends. Former students from almost every year attended the event, including a few from his time at Columbia before he joined the Caltech faculty in the late 1960's. Representatives from each decade gave personal speeches during the dinner, followed by group photos with Harry. At the conclusion of the program, Harry was presented with an art piece created by former post-doc, Professor Matthew Hartings, titled "The Publications of Harry B. Gray by Color", where each of his publications are represented by a tile matching the color of the major compound/protein reported. Accompanied by his wife, Shirley, their kids and their grandkids, Harry had a wonderful time and reminded us all that he "...hasn't peaked yet!!!"

Harry has served our department and the chemistry community at large with over 50 years of groundbreaking science, mentorship and his greater vision for our future. To read more about Harry's colorful life and see the artwork described above, please visit <http://sciencegeist.net/http://sciencegeist.net/a-career-in-colors/>

Happy Birthday, Harry!

—Gretchen Keller

on the chemistry baseball team (he apparently even made a fourth out on the play).

There was another story from this period that I never heard from Lipscomb and only learned about this past year. While reading Eddie Hughes' oral history in the Caltech archives (5), I was struck by the concluding paragraph, which involved a discussion of safety issues in the Division. On September 23, 1943, Elizabeth Swingle, the stockroom keeper in Crellin, died after the cap blew off the bottle of ethylchlorocarbonate she was carrying, spraying her with the liquid (6). Hughes reported "The first man who got to her was Bill Lipscomb who was a graduate student then --now a Nobel Laureate at Harvard. He was the first one there. Why he didn't get it, too, I don't know. Because he hauled her off and put her under a shower. He was my first graduate student and I was very proud of him." Possible lung damage from this event may have contributed to Lipscomb's well known sensitivity to smoke. I tried to find more about this event from Lipscomb earlier this year, but in hindsight his health was declining and he was unable to provide any additional information.

As an advisor, the Colonel had a remarkable ability to inspire students to take "intellectual ownership" of their project - I remember vividly the experience, when as a new graduate student I reported to him that the x-ray generator didn't work. When I left his office, I clearly understood that fixing the x-ray generator was my problem, although he never said that explicitly. Through the lens of time, I am now even more impressed with the trust he had in our results; at least at the time I was in his group, we never went over any original data, looked at electron density maps together, etc., but he knew how to ask the right questions to make sure things were on track.

At regular intervals over the past 25 years, former group members would get together for a birthday symposium honoring Lipscomb. The presentations would range from bonding theory and computational chemistry, to inorganic chemistry, to protein structure - an incredible breadth that reflected Lipscomb's scientific interests - as Tom Steitz once summarized (paraphrased) "The only person who understood every talk was the Colonel". William Lipscomb exemplified the best traditions of Caltech chemistry and his scientific legacy continues to inspire us - thank you, Colonel.

CCE Faculty members with new babies



Zoë Hsieh Wilson was born to Linda Hsieh-Wilson, Professor of Chemistry and Investigator, Howard Hughes Medical Institute. The baby girl

was born on Wednesday, February 9, 2011 at 7:56 am. She was 8 lbs 3 oz and 21 inches long. Bella is super excited to be a big sister.

Oskar Winston Clemons was born to Bil Clemons, a faculty member of CCE, at 6:57 pm on Sunday April 24, 2011. He was 7 lb 6 oz and 21 inches. In the picture, he is held by his big brother, "Kuba."



CCE Staff members with new babies



Emily Kay Guerrero was born to Karen Baumgartner, Assistant to the Executive Officer in Chemical Engineering, on March 3, 2011. She was 8 lb 6.4 oz and 20 inches. Xavier is happy to have a little sister.

Milan Zi-Wen Torres was the first baby born to Alvin Torres, a Grants Manager in the CCE Fiscal Office, arrived 6:58 pm, Sunday March 20, 2011. She was 8 lbs 15 oz and 20 1/2 inches.



New staff member joins CCE



Paula Higdon has joined CCE to provide administrative oversight of personnel aspects for the Southern California facility of the Joint Center for Artificial Photosynthesis. She will be principally involved with structuring processes for, and facilitating, the addition of staff, postdoctoral scholars, visitors, visiting graduate and other students, visiting faculty, et al, and for the ongoing personnel administration for JCAP.

Paula was already very familiar with CCE before joining our Division. She was the lead records specialist in Caltech Human Resources, supervising the others in that department, and had been responsible for all employee records matters for CCE since 2002. She was the "go to" person for CCE to resolve informational and transactional issues. So, it was a fabulous coup for CCE to be able to hire Paula and to involve her in the ramping up of the JCAP project. She is expert in the Human Resources records database and related Oracle applications, and is expected to help CCE make great strides in streamlining information processing.

Before joining Caltech in 2002, Paula had spent much of her career in the entertainment industry, primarily at the Walt Disney Company. She managed and consulted on human resources functions including payroll, staffing, union issues, I-9 compliance, record-keeping and general operations for their Television Animation division. Her employment background also includes records and human resource systems in the banking industry.

Paula has a degree in Social and Behavioral Sciences, and has completed additional coursework in Business Management with an emphasis in Human Resources.

Paula also has a variety of interests outside of work. She became very knowledgeable in landscaping and horticulture while working at the Armstrong Garden Center in Pasadena and ran her own landscape design and consulting business for a short time. Paula's other passion is wine and she works part-time at California Wine and Cheese in Monrovia. In addition, she enjoys music, hiking, going to the horse races, biking, LA Kings Hockey, bowling, reading, yoga, art, home decorating and photography. Paula is also very involved with her family and has an identical twin sister.

Congratulations to the CCE staff who will receive Service Awards in 2011!

10 Years

Ying (Shirley) Feng
Suria Nurtjahja
Anne Penney
Mona Shahgholi
Jamil Tahir-Kheli

15 Years

Arleen (Lynne) Martinez

20 Years

Angelo DiBilio
Margot Hoyt

25 Years

Silva Virgil

35 Years

Kathleen Bubash

40 Years

Cece Manoochchri

References for Lipscomb article:

1. Biographical information on William Lipscomb may be found in the website <http://wllipscomb.tripod.com/index.html> established by his son James Lipscomb, and the autobiographical sketch in the preface of ACS Symposium Series 827 "Structures and Mechanisms: From Ashes to Enzymes" G.R. Eaton, D.C. Wiley and O. Jardetzky, editors. Space limitations preclude a more complete biography, including his work at the University of Minnesota and Harvard University, or a discussion of Lipscomb's sense of humor, which manifested itself in a variety of ways, often in publications, and more recently through his active participation in the Ig Nobel Prizes.
2. E.W. Hughes and W.N. Lipscomb "The Structure of Methylammonium Chloride", J. Amer. Chem. Soc. 68, 1970 (1946).
3. H. Johnston "A Bridge Not Attacked: Chemical Warfare Civilian Research During World War II" World Scientific (2003).
4. W.N. Lipscomb, Ph.D. Thesis, California Institute of Technology (1946).
5. Interview with Edward W. Hughes, Caltech Archives (1984).
6. Letter from Linus Pauling to Eastman Kodak in the Oregon State University Pauling Collection, <http://osulibrary.oregonstate.edu/specialcollections/coll/pauling/war/corr/corr111.1-lp-eastmankodak-19431001.html>

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