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THEODORE A. GEISSMAN (1908–1978): AN APPRECIATION

I first met Ted Geissman over twenty-five years ago when I was a young faculty member in his department at the University of California, Los Angeles (UCLA). At this time his research group included Tony Swain, Jeffrey Harborne, Francis Dean, Dervilla Donnelly, Margaret (Gretchen) Seikel, Corny Steelink, Arthur Cho, and Charlotte Davis. I was invited to attend his private seminars which were usually held at his home. These were the days (1954–57) when it was a favorite pastime of organic chemists to speculate on the origin of secondary natural products. At that time there was little danger of being proven wrong by actual experiments with living plants. After I left California, I subsequently met Ted fairly often over the years at scientific meetings, on study sections at the National Institutes of Health, and we kept in touch by correspondence. I admired him as a very honest scientist and as a charming, cultured gentleman. In this account of his life and work, I am indebted to his many friends around the world for their personal reminiscences of Ted. I especially thank his wife, Loraine, for information on his early life.

Ted was born in the Chicago slums on 17 June, 1908. His family were mostly of German extraction, although his maternal grandfather, a Sudeten German who worked in Prague as a janitor, married a French girl from Strasbourg. The bulk of his family who emigrated to the U.S.A. lived in Wisconsin, in or near Milwaukee. His father was a highly skilled engraver who drank, and worked in Chicago, when he worked, and was also supported during the Depression by the Work Project Administration. His parents separated; Ted and his sister moving with their mother, who desired a more regular and stable life, to Milwaukee where she ran a boarding house. His grandfather, who was a baker by this time, also lived with them. Ted's high school teacher was apparently impressed by his aptitude for chemistry and convinced his mother that he should go to college, even though none of his family had ever finished high school. He entered the University of Wisconsin (Madison) in 1925 and obtained a B.S. degree in Chemical Engineering in 1930. He had taken off the 1927–28 academic year to earn money by working for a telephone company. He had become fascinated with radio in his teens and spent most of his spare time fabricating transmitters and receivers. He communicated with other 'ham' operators by Morse code, sometimes signing off with a female pseudonym. His signals were picked up by a person in a nearby town who suggested an exchange of photographs. Ted obliged by sending a photo of a girlfriend, but the game was up when the fellow asked for a date. At Wisconsin he became friends with Fred Koelsch, who was his teaching assistant and a graduate student in the chemistry department, working with S. M. McElvain. According to Fred, Geissman had the highest grade point average of his graduating class. Indeed, the only inferior grade (in those days a C grade was less than 84%!) was in Sociology. However, Ted did not spend all his time studying. He had many interests and activities not directy related to chemistry. His pleasant and witty personality seemed to attract choice feminine companions and he was also usually able to supply a suitable 'date' for a needy fraternity brother. Ted was always interested in language, writing and philology. He loved to bore his friends with puns and limericks which he could produce with facility and originality. An acquaintance passing him on campus said, "How about a pun, Ted?", and he snapped back, "Pun what subject?". As a student, he carried a small notebook in which he recorded ideas that might be of use in writing short stories or even novels. He enjoyed Humphrey Bogart and sometimes adopted his mannerisms.

After graduation he took a job with Standard Oil of Indiana, in Whiting, Indiana for four years. Even though he did some useful work for this company (his first publications are patents relating to a catalytic process and an improvement in motor fuel), he readily accepted the suggestion of Fred Koelsch, who was now an assistant professor at the University of Minnesota, that he return to graduate school to obtain a Ph.D. degree. His total salary as a teaching assistant for the 1934–35 academic year was $300. He was one of Fred's first graduate students. According to one of his contemporaries, Ted was clearly the brightest and the best of the organic graduate students, being a superb experimentalist running several reactions at the same time. His fellow students thought that he was phenomenally lucky because every experiment he tried worked. Actually, his real luck lay in having the insight to try the right thing. This insight, and his love of bench chemistry carried out with his own hands, stayed with him for the rest of his life. Despite his brilliance, it was also obvious to the Chief of the Organic Division, Professor Lee I. Smith, that Ted did not work in the laboratory day and night. So Ted was given a C grade in research, evidently as a disciplinary measure. In disgust, Ted returned to the dormitories to pack his bags. Word quickly leaked back to Koelsch that Ted was leaving school. Soon Ted's grade was 'corrected', and he stayed. In graduate school Geissman was 'der zweite Fuehrer' of the 'Sieben Ecken Bier Verein', a beer drinking conglomerate which met on Saturday nights to discuss the meaning of life. The leader of the group was Joe Runkel, a psychology student who earned the position of being able to whistle the piccolo part of 'Stars and Stripes Forever' and telling dirty jokes in German. Other chemists in this convivial group included Norman Cromwell, Malcolm Renfrew, and Stan Wawzonek. Ted became a little more serious after he met Loraine in the summer of 1936. At their first meeting he was quoting Swinburne and a little smashed. They were married on December 31, 1936. Fred gave them a case of gin as a wedding present and all their friends were invited over to the Geissman's apartment to help drink it. In those days Loraine was labeled a Bolshevik bomb tosser by his drinking companions. It was a term of affection.

Ted obtained his Ph.D. degree (A Study of α-Diketones of the Cyclopentene Series) in May 1937, and then went to the University of Illinois where he worked with Roger Adams for two years as a postdoctoral fellow. It was during this time that he developed an interest in natural products working on the structure of gossypol and the canna-

binoids. Adams thought very highly of Ted, especially in later years when Ted became internationally known as a natural products chemist. Adams thought that the U.S.A. lacked a tradition in natural product chemistry, and that more should be encouraged to enter the bio-organic area of research. At Illinois Ted played short stop, and sometimes pitched for a baseball team, sponsored by a local food market. Charlie Price, with one hand, was their main pitcher. Baseball was always Ted's favorite sport, and he only ran (440 yards) to keep in shape for this game.

In 1939, Ted left the frigid Midwest, accepting a position in the young chemistry department at UCLA. Ted immediately fell in love with the Mojave desert and its flora. Over the years he became an expert taxonomist, able to identify species even when traveling along the highway at 70 mph. One of his first independent publications ((1941) *J. Am. Chem. Soc.* **63**, 656) was concerned with the 'anthochlor' pigments he had isolated from the yellow flowers of a Compositae he had collected in the desert. He showed that the pigment, which became bright red on treatment with alkali, was butein, a chalcone.

When World War II came along, he would have preferred to stay in California and investigate why the yucca cactus (*Yucca gloriosa*) develops so quickly on blooming. However, he was assigned to a project at the University of Pennsylvania, where Melvin Calvin was directing some wartime research on the reversible fixation of atmospheric oxygen by the cobalt complex of salicylaldehydeethylenediimine (salcomine). On a fateful day in April 1944, a technician had opened a stopcock too wide, blowing the contents of an absorption tube of this cobalt complex as a cloud into the laboratory. Ted rushed into the laboratory to turn off the stopcock, but he also inhaled a lot of this compound. Ted became seriously ill and Loraine was told that he would probably die that night. Their son, Jim, (now living in Australia as a geographer), had been born just a month before. Ted's liver was seriously damaged and he spent over a year in the hospital. He was finally able to return to California in the fall of 1945. Medical problems continued, esophageal varices developed, which broke, causing massive hemorrhaging. Slowly and painfully his health improved. He was reluctant to travel. He took sleeping pills to help him on the long train journeys to Smith, Kline and French where he consulted. His association with this pharmaceutical company lasted for over 25 years. One of Ted's interests was the mechanism of drug action, and at one of the consultants' conferences he gave a paper entitled, 'A Theory of the Mechanism of Enzyme Action'. It was the kind of provocative and intuitive theory that Ted was noted for, and it was so well received that he was encouraged to publish it ((1949) *Quart. Rev. Biol.* **24**, 309). One of the compounds which Ted had made as a potential antispasmodic agent: 1,1-diphenyl-4-piperidino-1-butanol, was later found by Smith, Kline and French to be an antinauseant, and was marketed as such. Ted was happy that one of his compounds had made a modest contribution to medicine.

In the 1949–50 academic year, he obtained a Guggenheim Foundation Fellowship dividing his time between the Donner Laboratory at the University of California, Berkeley, where he learned how to use radioactive tracers, and the Department of Pharmacology, at the University of Utah. During this time he was working extensively on flavonoids, and published with Elly Hinreiner (one of his graduate students), a comprehensive account of these compounds ((1952) *Bot. Rev.* **18**, 77–244). Elly was impressed by Ted's nearly photographic memory. During research seminars he would often recall a reference he thought pertinent and cite author, journal, year and page from memory. His phenomenal memory was again apparent in a game he used to play sometimes with a few of the more literate of his graduate students: guessing the title of a book from the first or last sentence of its text. In the early 1950's the University of California was embroiled in a controversy in which the State was demanding that all its employees sign a loyalty oath. This was a sad time for America when the politically powerful Joe McCarthy was finding communists behind every pillar. Ted and many other liberals opposed this oath of allegiance on principle, and he campaigned actively against this requirement. In the end he signed the oath; he was a pragmatist, not a hero.

In December 1954 his daughter, Anne (now a graduate student in Geography at the University of Wisconsin), was born. This event was very special for Ted and Loraine, since it convinced him that his liver damage was healed; also, he would not have to rejoin the Lutheran church in order to adopt a child—Ted was an agnostic. He took great delight in his children. The whole family spent the 1957–58 academic year in Australia and he was a Senior Fulbright Research Fellow working for nine months in the CSIRO Laboratories in Melbourne. Jerry Price had initiated a phytochemical program which was developed to examine the chemical components of Australian plants. Ted undertook research projects on the pyrrolizidine alkaloids, which at that time were recognized as the cause of major liver diseases of livestock in Australia. He was able to sort out the extensive spectral and degradative information on jacobine, an alkaloid of *Senecio jacobaea*, and came up with the now accepted structure ((1959) *Aust. J. Chem.* **12**, 247). With Claude Culvenor he deduced the correct structure of mikanecic acid ((1959) *Chem. Ind. (London)* 366). Ted formed many friendships in Australia, and in subsequent years many of his postdoctoral fellows came from this country. He enjoyed the Australian Bush almost as much as the Californian desert. He cultivated Australian plants in his garden in Los Angeles, and developed a fine appreciation for Australian wines. His daughter, Anne, picked up some choice Australian epithets, and he told with pleasure her description of Buckingham Palace at the age of 5: "That's a bloody big bugger, isn't it!". His interest in the pyrrolizidine alkaloids continued after his return from Australia and included the first total synthesis of retronecine ((1962) *J. Org. Chem.* **27**, 139). He also studied the biosynthesis of this base ((1964) *Phytochemistry* **3**, 357) and seneciphyllic acid ((1966) *Phytochemistry* **5**, 1).

The first edition of his elementary textbook, 'Principles of Organic Chemistry' (W. H. Freeman, publisher) appeared in 1959. This was a popular text and was widely adopted in the U.S.A. and Europe. The 4th edition was published in 1977. Ted was always noted for his clear lectures to students. In his public scientific talks he always preferred to use a blackboard, rather than slides. His benzene rings were perfect hexagons. On occasion the undergraduates at UCLA were upset by his high standards, and the speed with which he tried to give them information. However, when told of this defect he was able to come down to their level and go a little slower. Some of his graduate students found him very

unapproachable. Ted felt that his students should be independent. His approach was to monitor, but not to direct their activities; as a result, research failures were lonely experiences for his students. Those that survived this treatment were individuals with a fierce independence. This may be the reason that so many of his students have survived in areas distal from organic chemistry, such as plant pathology, entomology, and pharmacology. Ted was, in fact, proud of the fact that so many of his students were in areas other than chemistry. He was a rather private person when it came to interactions with his fellow faculty members in the chemistry department. He hated gossip and small talk. He did not suffer fools gladly. He and Saul Winstein admired and respected each other. David Lightner was quite surprised to hear Saul tell him and other organic faculty members that whenever he wanted to discuss something in chemistry, he went to talk to Ted.

In the summer of 1960, he and I traveled together to the first IUPAC meeting on natural products, which was held in Australia. We went via Japan, Hong Kong, Thailand, and Singapore. This was Ted's first visit to Japan and it became one of his favorite countries. He admired the superior intelligence of the Japanese and their social order. At this time he published several papers on the chemistry of the sesquiterpene lactones, and this was an interest that remained with him until his retirement. He realized that the determination of the structure of yet another sesquiterpene lactone was of much less interest than the meaning of structures in terms of their biosynthetic history and interrelationships ((1973) *Adv. Phytochem.* **6**, 65).

He received a second Guggenheim for the 1964–65 period. He gave lectures in Australia, India and Taiwan, finally ending up in Japan, where he stayed for six months as the guest of Professor S. Shibata at the University of Tokyo. One alarming medical incident in Tokyo was an almost unstoppable nose bleed, Again, he survived. In 1969, he spent the summer and autumn at the University of Munich in the Institut für Arzneimittelforschung. He carried out personal experiments on the phytochemistry of central European Compositae. His expertise in taxonomy enabled him to correct the identification of some of the species in the Munich Botanical Garden. Loraine and Ted enjoyed music and Munich was a delight to them both. Ted's favorite composer was Mozart, and on occasions he surprised his students by joining his secretary (Teddy Nikos) in some arias. He was also fond of John Jacob Niles, an American folk singer.

In 1969, his advanced text entitled, 'Organic Chemistry of Secondary Plant Metabolism', appeared and this book has been widely used in courses on natural products. David H. G. Crout, who was a co-author of this book, attests to the speed at which Ted was able to write lucidly. In 1973, the Geissmans took another trip to Australia and Japan, and spent time at the University of Istanbul. He was the Senior Reporter of the first three volumes of '*Biosynthesis*', the Specialist Periodical Report of the Chemical Society. In 1972 he received the 'Outstanding Achievement Award' from the University of Minnesota. This award is given to exceptional graduates of the University who have distinguished themselves in the world. Pomp and pretentiousness were antithetical to Ted's character, but he graciously accepted this award. He was one of the founder members of the Phytochemical Society of North America and he was elected a life member in 1970.

Ted retired from teaching at UCLA in 1974, since he had been offered a research position at the University of Ibadan in Nigeria. He went there with much enthusiasm, planning to investigate the natural products in the local plants. Unfortunately, he discovered that it was not as easy to do experimental work in Ibadan as in California. He stayed only three months. The following summer Ted was feeling a little dragged out, and went to the hospital for a medical check-up, believing that he had picked up something in Africa. In Ted's own words (December 1975): "I emerged from the hospital a modern Prometheus. I am now warding off the vulture by weekly injections of 5-fluorouracil. I am now in a condition called 'stable' and feel fine. I even resumed the once-a-week 18-holes of golf, and I believe I could run 400 meters in less than 2 minutes". At this time Ted took up water color painting. He had little empathy with his teacher who belonged to the 'purple cow' school of painting. He worked at his painting very industriously. Loraine had some of his pictures exhibited at a local bank. Several were sold, and this was an exciting period for Ted. He even neglected his garden and the bonsai which he had started long ago after a trip to Japan. In 1977, he felt well enough to travel around the world again, visiting many of his former co-workers. He was greeted with great regard and affection. He realized, possibly for the first time, what an important factor he had been in the lives of so many others. In February 1978, the cancer of his liver began to metastasize and he died on 13 November, 1978.

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