Autobiographical Anecdotes

by Edward W. Schlag

One of the nice traditions of these Festschrifts is that one is permitted a few very personal reflections affecting the historical developments of one's science and one's person.

In my case I should perhaps start with my maternal grandfather, Carl Adolph Nolte, who, even though I never knew him personally, had a great influence on my life. He was born in 1834 in a small village near Hannover, Germany, the reputed son of a valet at the Ducal House of Braunschweig, and put up for adoption. He was raised by a very religious woman and relegated early in life to a missionary school at the famed Hermannsburg mission near Celle, which was funded totally by the local farming communities. The Hermannsburg mission sent missionaries to Africa before Stanley and Livingstone. My grandfather was sent to Zulu country near Johannesburg via a sailing ship that took months to complete the voyage. After sending so many missionaries there, the missionary society decided to send a load of women for them to marry. This led to a violent complaint from my grandfather and the eventual severance of all ties with the society, which even demanded repayment of his educational expenses.

My father emigrated in 1867 to the new world where he founded a series of Lutheran parishes in Missouri and Tennessee before settling in Los Angeles in 1875, a town that was still sparsely populated (5728 inhabitants) but was excellent for growing oranges and investing in real estate, which he did. He had two daughters, one of whom, my mother, became a concert pianist in Los Angeles. Considering her education to be in need of some improvement, she went to Berlin to study with the highly honored Russian pedagogue, Josef Levine. The housemother at her boarding house introduced her to a nice young German lawyer and so a bilingual family tradition was initiated.

My mother was a 110% Californian, and so I was born in Los Angeles in 1932; however, after some three months she returned with her newborn via the Panama Canal to Berlin, where my father was a banker. Thus I was raised in Berlin, which had a good tradition in science, but as the war left everything in shambles, we returned in 1946 to the Nolte tract in Los Angeles, where I had my first introduction to the American way of life by attending an inner-city high school, an experience which I consider one of the highlights of my background in positive and traditional American thinking. It was the chemistry teacher at this high school, a retired sugar chemist and single woman of some age, Miss Bessie Farr, who inspired me in endless after-school sessions to go into chemistry. Our income from running a rooming house was only enough to attend a local college for my undergraduate education, but through some contacts at Boeing I decided on the University of Washington for graduate school. Here I had the great pleasure of meeting outstanding co-students, or better roommates, such as H. E. O'Neal, who later wrote the beautiful book with Benson, and John Utzinger, who taught me philosophy. I had the good fortune to make the acquaintance of an outstanding teacher and taskmaster, in the form of the renowned Seymour Rabinovitch, who lavished enormous effort on the training of his students.

Here I was given the task to make *trans*-cyclopropane-d2 in order to determine whether the ring recloses upon the isomerization of cyclopropane to propene. To our great surprise it did reclose, which stirred up enormous controversy at the time and started much general interest in small ring isomerizations. The problem was how to understand all this theoretically. To this, Rab, as Rabinovitch was called, recalled some papers by his former colleague at McGill University, R. A. Marcus, that he had been carrying around with him for some five years and that had never been applied to a real problem. So I got the task of attempting to set up a counting of states program for unimolecular reactions—a computer activity considered then to be nearly impossible and which occupied me for some years.

While in graduate school I proceeded to court, and later marry, much against the advice of Rab who felt graduate students should stay single, Angela Castell, who it turned out also had a binational background. Her father had emigrated to the U.S. in the 1920s and was from an extremely old family that traced its origins back to the court of Charlemagne, and, as I found out later, still was living in the same village near Würzburg ever since that time, having moved only once during the peasant rebellion from the destroyed castle on the hill to a new "house" in the village, built in 1690.

Having little interest in the perceived rigid world of academia, I proceeded to industry and worked in a polymer laboratory where I was put into a group involved with ionic polymerizations. Because I was unhappy with the current mix of catalysts and co-catalysts, I thought about starting ionic polymerization in the complete absence of any additives with only one component. Hence I proceeded to liquefy isobutene and photoionize it in the vapor phase with vacuum UV radiation. This worked, and polyisobutene could be made with 4 million molecular weight.

Meanwhile I was pursuing my computational efforts, and I finally decided that I should make this my main job, not just my avocation. So I took a salary cut of about half and became an assistant professor at Northwestern University in Evanston, one of the other highlights of my development. The many friends I made there kept the home fires burning, even later in Bavaria. After more efforts in unimolecular reactions, I decided in 1963, during the symposium honoring Henry Eyring in Utah, to see if something could not be done to obtain unimolecular rate constants as absolute numbers, rather than as relative to other equally unknown parameters, such as the collision frequency or the fluorescence rate. We looked for a method of timing the rates absolutely against a laboratory clock at the relevant energies. This led us to spend three years on a then complicated Debye−Sears effect phase timing experiment, with which we then obtained our first direct lifetime of excited states together with Hanns von Weyssenhoff. This, in turn, formed the basis of some of the development of the theory of radiationless transitions by Jortner and others. We also started work on threshold ionization technique as a better way of measuring the eigenstates of molecular ions. This led to an interesting example of serendipity. It turned out that our electron monochromator produced the same resolution no matter how large or small the entrance slits were. Rejecting the explanation of little green men,

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we finally removed the monochromator and inserted straight pipes. The resolution was equally good. Hence steradiency was born.

At this time I took a sabbatical with Albert Weller in Göttingen and visited Germany. When the chair in Munich became vacant, my former colleague Ludwig Hofacker suggested that I should consider this as a possibility. Having just been promoted to full professor, I saw only some vague possibility, but upon investigating it further, I discovered that a wonderous world of fine mechanics and state-of-the art electronics could be built up there. Besides, I felt in need of a new challenge. This turned out to be a sound decision, which enabled me to make a blend of American and German academic philosophy. We started immediately into lasers together with one of my postdoctorates, Hans Neusser, and decided to look at the coupling of eigenstates, one state at a time, starting from low energies and moving to high energies. We could then do this only in the excited state, and for complexity we chose benzene. But single eigenstates had been done only for atoms using the Cherbotaev method of counterpropagating lasers. The large number of eigenstates diluted this nice method by some 4 orders of magnitude. Nevertheless, Eberhard Riedle, a graduate student, accomplished the impossible chore and started molecular sub-Doppler spectra analyzing thousands of rovibronic eigenstates and their couplings, which became a textbook example.

Meanwhile we were interested in multiphoton excitation leading to ionization, and some adjoining mass spectrometry using a home reinvented version of the reflectron principle of mass spectrometry, which revitalized time-of-flight techniques since it made an acceptable resolution available for the first time. In this process we discovered that going through resonance intermediates was a very powerful species-selective technique, the Resonance Enhanced Multiphoton Ionization technique that at the same time R. B. Bernstein was using successfully at Columbia.

Still unsatisfied with the marginally better resolution for ion spectroscopy afforded by the threshold steradiency technique, we decided with Klaus Müller-Dethlefs, a postdoc, to try some of delayed pulsing and discovered that molecules had dark states at high Rydberg states, just below the ionic eigenstates that were very long-lived, even high into the continuum, much to our surprise. In the meantime Leonid Baranov, a very able theoretical postdoc, suggested to consciously do this locking with programmed external nonadiabatically switched fields. Thus the zero electron kinetic energy (ZEKE) experiments were born.

In a personal vein I got involved in Munich in a rich program with all my old American colleagues through the Alexander von Humboldt Foundation, which brought us a long list of distinguished American guests. We got involved in finding a lot in downtown Munich on which we eventually built 44 apartments as an international guest house and faculty club. We also got involved with our old colleagues in Israel, R. D. Levine and J. Jortner, and started a large program of German−Israel funding that started with the Fritz Haber center at the Hebrew University and the James Franck program for German−Israeli scientific cooperation, which was conceived in my living room in Munich and has now blossomed into a full scale program.

To close the circle, one of my Humboldt visitors, Professor Egmont Rower from South Africa, it was discovered after some conversations, had a grandfather who also was a missionary in South Africa, and in fact also came from the same Hermannsburg mission that sent my grandfather to Zulu land. Hence the circle of science and German−American interactions closes. I finally visited the old Hermannsburg mission building near Hannover and found hanging in the museum a picture of my grandfather. Thus life makes a circle.