

Editorial

## Recollections of Julian M. Sturtevant

I think that, for many people as well as myself, Julian Sturtevant's scientific and personal influence extended well beyond the biothermodynamic studies for which he is best known. The path leading from my first research with Julian to the work I do today, an example of which is reported elsewhere in this volume, may bear this out.

In fall, 1967, I entered Yale to begin graduate study toward my Ph.D. degree and approached Julian to discuss possibilities for research in his group. Julian had known Jon Singer at the University of California, San Diego, since Jon's time on the Yale Faculty and both had collaborated on a seminal paper with Loren Day demonstrating by stopped-flow measurements the exceptional rapidity of bimolecular binding between haptens and conventionally raised antibodies. Julian had additional unpublished data suggesting that the shapes of related haptens, such as dinitrophenyl and trinitrophenyl, might be reflected in the shapes of the combining sites of conventional antibodies raised against these haptens. He felt that this matter might be examined by further kinetic measurements and I joined his group to pursue this project. In the summer after my first year, Julian sent me to La Jolla to learn practical immunology in the Singer lab. There I heard first-hand about the fluid mosaic model of the cell membrane which Jon was developing at that time. Over the next three years at Yale, with Julian's guidance and encouragement, I completed my research.

During this time, I encountered some of Julian's qualities that I often think about today. I think particularly of Julian's attachment to his family. He spoke often and warmly about his children Brad and Ann. Everyone who knew Julian also knew his attachment to the out-of-doors and how he often combined outdoors and family activities. I remember him enthusiastically describing a cold, rainy Cascades backpacking trip with his daughter Ann and her husband Peter. A particular highpoint of his life seems to have been his trip to the Everest region of Nepal in 1969 or thereabouts. He described how he and Elizabeth chose to hike up Kala Patar in order to see Everest rather than go to the climbers' base camp and I remembered this when I later visited Kala Patar myself on a climbing trip to Everest. It was on their Nepal trip that, as they bedded down after a particularly long day, Elizabeth was said to comment that their home didn't have any bed as comfortable as their tent. Julian's love of the outdoors didn't fade with the increasing years. The attached pictures of

Julian and Elizabeth were taken in May 1983, near the summit of 11,135-ft Pico Veleta, near Granada, Spain (Figs. 1 and 2) at the time of a thermodynamics meeting in that city (Fig. 3). On that occasion my wife and I climbed with them to within sight of the summit in a gathering snowstorm. As the day grew colder and the rest of us became ready to turn around, Julian was still eager to reach the top. He was then 75.

I was also influenced by Julian's broad scientific interests. With his help, I attended the Rothschild School on Antibodies and Cell Receptors in Israel in fall 1971. There I learned about the recent discovery that antigens cause lateral redistribution of lymphocyte surface immunoglobulins and I began to wonder how one might measure quantitatively such molecular motions on living cell surfaces. Meanwhile, the Israel meeting provided additional opportunities to work with Julian. In Israel, I met



Fig. 1. Julian and Elizabeth Sturtevant on 11,135-ft Pico Veleta near Granada, Spain, in May 1983.



Fig. 2. Another view of Julian and Elizabeth Sturtevant on 11,135-ft Pico Veleta near Granada, Spain, in May 1983.

Marilyn Johnston from Herman Eisen's lab at Washington University and we began, with Julian's gracious help, what became the first calorimetric examination of monoclonal immunoglobulins. My introduction to Israel Pecht of the Weizmann Institute of Science led to studies, conducted jointly in his and Julian's labs, on the distribution of hapten binding heats in antibody populations. Israel and I have worked together to the present day.

I began a faculty position at St. Louis University School of Medicine in 1975 with a view to exploring motions of cell surface molecules and soon another former Sturtevant student, Henry Krakauer, then at Washington State University, and I began a collaboration on the relation between lateral motions in membranes and lymphocyte activation. I constructed my first cellular photobleaching apparatus for this study. Since that time, our laboratory has specialized in such optical studies of motions and distributions of cell surface molecules.

Thus, my interests have shifted over time from stopped-flow kinetics to cellular biophysics. Nonetheless, modifying Julian's stopped flow to get better data for my thesis proved to be good preparation for building the optical systems I use today and my projects still center on immunological systems that Julian introduced me to in 1967. More importantly, my association with Julian taught me valuable lessons about conducting one's personal and professional life. The professional distinction he achieved never altered his fascination for actually doing science and he collected his own calorimetric data well into his 80s. This enduring love of science reminds me that science should, and can, be a lifelong pursuit. Julian provided consistent encouragement and support to all his students throughout our careers and I have tried to follow his model with my own students. But perhaps most important is that he loved his work, his family and the outdoors and found ways throughout his life to integrate these themes. I valued his friendship and admired the standard of intellect, integrity and grace which he set.

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Fig. 3. Julian Sturtevant among former members of his group participating in the International Symposium on Thermodynamics of Proteins and Biological Membranes, Granada, Spain, in May 1983. Back row (from left): Alan Cooper, Pedro Mateo, Hans Hinz, George Barisas, Ingmar Wadso; front row (from left): Gonul Veleçilebi, Julian Sturtevant, Tian Yow Tsong, and Phil Ross.