

## Julian Sturtevant: Scientific giant, warm humanist, social activist, nature lover, gentle teacher, kind friend

It is often said that in our personal lives we achieve a modest form of immortality through the lives of our children, and through their children's lives, and so on. By extension, one should be able to achieve some level of professional immortality through those one has mentored, those who have been mentored by them, and so on. By this measure, Julian Sturtevant's professional immortality is assured forever. Julian's own scientific contributions were forward-looking, groundbreaking, salient, seminal, and fundamental; they already have stood the test of time. Julian's scientific immortality therefore is assured, both due to his own contributions, as well as to the work of the legions of students who represent his impressive scientific genealogy; a few of whom are contributing to this issue.

To those of us who knew Julian well, he was far more than a scientific mentor; he was the original "lab rat". His constant presence in the lab (as opposed to in his office, where most faculty resided) stood as a shining example to all of the ultimate passion for hands on experimental work. His enthusiasm for tinkering in the lab was contagious. All who studied with him caught his fever for being in the lab. Despite his formal faculty status, he acted like, and he wished to be treated like, just another group member; even annoyingly "stealing" your pipettes or dry ice when you were not looking.

Julian also exhibited affectionate quirks in the lab that clearly were vestiges from less well-funded times, as well as reflective of his philosophy of science. When I used more than one Kimwipe to clean the lenses on a cuvette, Julian would wince and show me how to fold and refold a single Kimwipe to allow it to last for nearly an entire week! Julian often would tell his group that they should be humbled by the reality that most of the great breakthroughs in science were achieved by giants of the past who were not armed with all of the technological advantages we currently enjoyed. He would gently smile while reminding us that Arrhenius collected the data from which he derived is fundamental relationships while using his right foot to stir his water bath. He challenged us to use high-end technology, but never to believe that sophisticated instruments ever could substitute for creative experimental design.

Julian practically founded the field of biothermodynamics, which today has blossomed into a major subdiscipline of

substantial interest to basic and applied scientists. His early work was so far ahead of his time that he frequently was criticized for attempting to make quantitative thermodynamic and kinetic measurements on systems (e.g. proteins) that were inherently heterogeneous, and therefore not amenable to such analyses. Others claimed that such quantitative measurements on isolated systems had no relevance to the complex biological machinery. Such was the burden of all whose thoughts, like Julian's, were substantially ahead of his contemporaries. Time has vindicated Julian's interpretations, elevating many of his contributions to the level of "classics" upon which armies of scientists have built. Julian, never was discouraged by the naysayers. He always persisted in his studies, writing eloquent justifications for his programs in the 1930s that could be verbatim transplanted today to serve as outstanding introductions for NIH proposals.

Julian the human being was equally impressive. As a mentor he was kind and unassuming, but always supportive in a *laissez faire* manner; giving his students the space and freedom needed to learn, but always available to help when needed. I fondly recall detecting some erratic behavior of the flow calorimeter one evening in my first few months in the Sturtevant lab. It appeared that some moisture had breached the sealed submarine in which the heat sink and flow tubing were embedded. With some trepidation, I called Dr. Sturtevant at his home, anticipating that he would tell me to stop and that he would look at it in the morning. Instead, Julian directed me to disassemble the instrument, place the heat sink in a drying oven, and then reassemble the unit in the morning. I politely listened, but I was terrorized by this directive, having never even seen the immersed calorimeter beyond the motor driven syringes I used to deliver the reactant solutions. When I shared my fear with Dr. Sturtevant, he chuckled and said "You should know what the insides of the instrument looks like and how it works. Only then will you understand what you really are measuring so you can interpret your data and design new experiments in an informed manner." I proceeded to disassemble the instrument, with the screwdriver shaking in my hand. I finally got to the heat sink, disconnected the flow tubing and I placed the aluminum block in the drying oven. I then returned to my desk to enter all this information into my lab notebook. An hour

later, I opened the drying oven and looked inside the heat sink. To my amazement and terror, I saw a pool of a reflective, silvery liquid that looked like melted metal. Had I just destroyed the instrument by melting the flow tubing? My terror prevented me from realizing that the temperature of the gentle drying oven was very far below the melting point of platinum or any other material used for construction of the instrument. I decided that I had to call and tell Dr. Sturtevant what transpired, despite fearfully envisioning next day headlines proclaiming the shortest tenure of a graduate student in the history of Yale University. When I apologetically confessed to Dr. Sturtevant what had happened, he roared with laughter and told me that the melted material was just “woods metal” used to enhance thermal contact, and that everything was fine. I instantly became a Julian Sturtevant fan for life.

I was in the Sturtevant lab during a politically and socially difficult period of time for our country; the Vietnam War. I vividly recall one day seeing Julian sitting in front of his homemade calorimeter making out a check and muttering, “She is the only candidate who has not sold out to special interests groups and will speak her mind.” I inched closer to find out whose campaign Julian was supporting. To my amazement and pleasure, he was supporting Shirley Chisholm. I felt thrilled that this silver-haired, distinguished Yale professor shared the political views of many of the young students, including myself. Julian further demonstrated his commitment to “the cause”, when I asked for some time off from the lab to participate in the anti-war movement. He told me to follow my sense of justice and that my PhD project would await my return. Understanding, supportive, and fair-minded—all words that describe Julian, a very special man.

Julian also knew how to have fun. He and his beloved wife Elizabeth would take the group on long nature path hikes. Julian always was proud that he could keep up with (actual exceed) the hiking stamina of his much younger graduate and postdoctoral students. He frequently would proudly describe to the group his great successes in hiking in the Himalayas. He also would tell each graduate student in the group that in partial fulfillment of the PhD degree they had to play him in squash—and lose! He knew how to use every possible angle on the squash court, thereby defeating many of us who were less than half of his age.

I fondly recall many wonderful parties at his beautiful home on Indian Neck Point, where he lived on a plot of land that majestically projected out into the Long Island Sound. Each year, the entire research group was invited to celebrate July 4th and watch the fireworks over the water. During all these get-togethers, Julian was not just a formal host, but also a full-fledged participant in the festivities. In fact, a number of parties abruptly ended when Julian’s wife Elizabeth thought he was over participating; causing her to announce, “Julian, the party is over now. Everybody please go home.” Julian knew how to have fun.

Julian’s scientific career is decorated by an amazing ability to design and construct unique calorimetric instrumentation that could be used to study biologically important phenomena. From the data he collected for over half a century, Julian derived numerous creative insights that allowed him to relate microscopic events to macroscopic observables. Today, the field of biothermodynamics, which he helped to create, is a vibrant area of study, as reflected, in part, by the contributions in this volume. There is no doubt that much of what we now take for granted in our thermodynamic interpretations of biological phenomena has its roots in the discoveries and contributions made by Julian Sturtevant.

Julian Sturtevant truly was, and remains, a scientific giant on whose shoulders we all perch as we attempt to discern the next horizon of discovery. We all owe a deep debt of gratitude to Julian the scientific giant, to Julian the warm humanist, to Julian the social activist, to Julian the nature lover, to Julian the gentle teacher, to Julian the kind friend. You are missed but you never will be forgotten. We all are better because you touched our lives.

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23 March 2006