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My unusually dedicated mentor

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I did not know anything about John Edsall when I entered Harvard College in the fall of 1959, and the possibility that I might become a biochemist had not yet occurred to me. In fact, up to that time I had been rather unimaginative regarding career choices. From early childhood until eighth grade, I had wanted to become a medical doctor. Then, in eighth grade, I began to read science fiction avidly. Since human flight to the moon was still 14 years in the future, it seemed to me that the best way for me to build on the excitement I felt about science fiction was to plan to become a theoretical astrophysicist, a cosmologist, someone who would understand warped space-time. That was still my plan when I registered for my first courses at Harvard.

But events during the following year eventually persuaded me to change my course. First, I learned from another freshman about the structure of the DNA molecule and its implications for biology. Although Watson and Crick's seminal paper had been published in 1953, the news had not reached my high school when I studied biology in 1957–1958. To me, high school biology had seemed to consist largely of senseless memorization of phyla, classes, orders, families, genera and species, and it had done nothing to alter my intention of becoming a physicist. Now, however, the recently discovered

structure of the DNA molecule suggested that biology could become a real science with a molecular basis. If so, there would be much to learn. Perhaps biology—rather than physics—would be the new scientific frontier.

That notion was reinforced by my experiences in physics classes during my freshman year. The more I learned, the more it seemed to me that physics was no longer a frontier. I want to emphasize that I am describing my feelings at that time—a time when much was known about electrons, protons and neutrons, but quarks were not yet on the horizon and string theory was totally unimaginable.

The promise of an exciting future in biology rather than (it seemed to me) physics—combined with my love of chemistry (I had an unusually well taught advanced placement chemistry course in high school)—led me one day in the spring of my freshman year to walk between the large rhinoceroses at the entrance to Harvard's Biological Laboratories (go to <http://mcb.harvard.edu/intro/tour/biolabs.html> for more information about these animals) and into the office of the Biochemistry Department so that I could inquire about the possibility of majoring in that field.

Whether the decision by the Biochemistry Office to assign me as a tutee to John Edsall (Dr Edsall to me at that time) was intentional or random I shall never know, but I do know that I shall always be grateful for that decision. John's enthusiasm for biochemistry and personal warmth over-

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came my lingering doubts. I never looked back at physics.

For the next 3 years, I visited John in his office on a weekly or bi-weekly basis. Before each meeting, I would read recommended essays or book chapters dealing with biology or biochemistry. Then, during our meeting, the two of us would discuss the content and philosophy of whatever I had read. I was pleased to be the recipient of his undivided attention. I am even more pleased now, because—as a busy professor myself—I realize what a sacrifice he was making to devote several hours each week to individual sessions with his tutees. At the time he was also directing an active research laboratory and serving as editor-in-chief of the *Journal of Biological Chemistry*. Clearly he was unusually dedicated to the education of his tutees.

As a result of my tutorial meetings with John plus the courses I took in chemistry, biology and biochemistry, I was gradually transformed—during my 3 years with him—from a totally naive student to a partially naive one. At the time I was under the illusion that the transformation was more complete, perhaps to the status of sophisticated, nearly practicing scientist—but such illusions of accomplishment are common among college undergraduates, particularly at Harvard. The illusion was certainly not John's fault—he always encouraged me to question what I thought I knew. I think it was simply a consequence of the fact that I did, indeed, learn a great deal under his tutelage, and I had no way of knowing at that time how much there was left to learn. In fact I have found that with each passing year I feel as if I know less and less—even though I am continuing to learn at a prodigious rate—simply because knowledge in the field of biology is accumulating at a much greater rate. Biology has indeed proved to be a new frontier, far beyond my undergraduate expectations.

Although my tutorial sessions with John took place 40 years ago, certain memories remain strong. Perhaps the strongest—because the scene was repeated many times—is of John and me sitting in his office with the late afternoon sun streaming through the windows. I am summarizing one of my readings. He is listening with closed eyes, occasionally emitting an 'Ahem' or 'Hmm'

and at times apparently napping. Perhaps he is indeed catching a brief snooze every now and then, but he is certainly not soundly asleep, because every time I stop to ask a question, he responds promptly and energetically. After I have finished my summary, he asks penetrating questions. We are not finished until he is sure I have a clear understanding of the subject matter.

I also recall the relish with which John answered my questions. He was never satisfied with a simple short answer. He would explore the question from every angle. Usually this meant going back to the literature, which in his case meant recalling the year, volume and page number of the relevant article, then looking it up in his extensive collection of back journal issues. I am still amazed at John's skill at recalling articles. Fortunately, we now have PubMed for the rest of us.

Being John's tutee involved more than discussions in his office. There were evening get-togethers at his pleasant Cambridge home, where I met his wonderful wife, Margaret, and some of his children. There I also met members of his laboratory and his other undergraduate tutees. With two of those other tutees, David Eisenberg and Bob Eisenberg (they are not related to each other), I developed strong friendships.

There were also occasions when John and I, or John and all his tutees, would go to faculty dinners and social get-togethers. At the time it seemed perfectly natural for me and the other undergraduates to mingle and interact informally with men (at the time biochemistry was dominated by men) who, I subsequently realized, were some of the most important biochemists and biologists of the time—men like Konrad Bloch, Paul Doty, George Wald and Matthew Meselson. On these occasions it was gratifying for me to see that John Edsall listened to *most* conversations, not just mine, with partially closed eyes and numerous 'Hmms' and 'Ahems.' I also found that he responded vigorously to most questions, not just mine, and not just questions dealing with biochemistry. The conversations on these occasions ranged widely, from science to politics to art to social theory to just plain gossip. It was clear that John had, and was willing to express, strong views in all of these areas.

John offered me an assistantship in his laboratory during the summer between my junior and senior years. This was my first experience in a working laboratory, and it was sufficiently rewarding that it cemented my intention to continue with biochemistry. I worked under the direct supervision of a Swiss postdoctoral fellow, Egon Rickli, who must have been very patient, because, despite my inexperience and clumsiness, by the end of the summer I had helped to purify and determine some of the amino acid sequence of human carbonic anhydrase. It was a very pleasant summer in warm and leafy Cambridge. I am always unhappy when summer comes to an end and the responsibilities of the new school year beckon, but I was particularly sorry that time.

During my senior year, I needed to decide whether to seek a Ph.D. or M.D. degree after leaving Harvard. The idea of obtaining an M.D. degree and mixing research with clinical practice was appealing to me. John was an M.D., so it was clear from his example that one could be an M.D. and do superb research. On the other hand, I felt strongly that my primary interest was in research and that clinical practice would be a minor part of my future activities if I were to obtain an M.D. degree. Finding it difficult to reach a decision on my own, I asked John for his opinion. I was impressed by the strength of his answer: if you are interested in research, get a Ph.D. Do not waste time with the numerous research-irrelevant activities of medical school. Although, as I have stated, John had always been willing to voice strong opinions on non-personal matters, this was the first time I had heard him respond in such a decisive way to any of my questions about career paths. Usually, he simply presented the pros and cons of each side of the issue and encouraged me to make the final decision. It was evident that this particular question was different for him. Reasoning that he must have good reasons for his strong opinion, I took his advice. At the end of the following summer I

began my Ph.D. studies in the Department of Biology at Caltech.

It is now nearly 40 years since I graduated from Harvard. I have kept in touch with John via annual exchange of letters at Christmas time, but I have seen him only a few times since then, most recently at the celebration in Cambridge of his 80th birthday. On that occasion I was impressed, once again, by his tremendously wide-ranging interests and vigorous intellect. The celebration consisted mostly of oral presentations by past members of the Edsall laboratory. I found some of these to be interesting, but most were so far from my own specialty that I had difficulty staying awake. Unlike John, I *really* went to sleep during some of the presentations. But I always woke up at the end, perhaps due to the applause, and my waking up was always rewarded by the opportunity to hear John ask one of his penetrating questions. I hope that I have half his stamina when I am 80 years old.

Whether I will have stamina at age 80 is something over which I have little control and over which John has no influence. But there are numerous ways in which John *has* influenced my life. I have already told you about his impact on my choice of career. Perhaps more important for my students has been my conscious adoption of his policy of not providing strong advice except in unusual situations. When one of my students asks for advice, I try, like John, to present the pros and cons as objectively as I can. My hope is that the student will be able to reach a decision based on information and his or her own needs without being influenced by my personal preferences. In this and other ways I, like John, try to encourage student independence, growth and self-confidence. I believe this policy has been successful.

I would also like to follow John's example of speaking out strongly on social and political issues. I hope that when I retire and have time to think deeply about current problems, I will find ways to be as effective as he has been in supporting whatever I conclude to be the right course of action.