

## Essay: Robert H. Siemann: A personal tribute

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On 18 September 2008 I received a short email from Miguel Furman, which came as a huge shock: Bob Siemann had passed away.

I knew Bob since 1988, when I started working with him as a graduate student. Earlier, in the fall of 1985, I joined Cornell University, and after three semesters of coursework, started looking for a research topic in accelerator physics. For around a year I worked on different things, but nothing clicked. During that time I only knew of Bob as a nameplate on a locked door, since he was mostly away at Fermilab. But, by early 1988 he was back, and I approached him. He gave me a copy of a proposal he was working on; I still have the copy, dated 11 January 1988. It was 25 pages of stuff I could not fully comprehend, but it looked exciting, and I was interested. Besides, by that time I had gotten over the joys of long Ithaca winters, and did not think I could take many more years of them. So I was less interested in the specifics of the proposal, and more interested in graduating in five years. When I went back to Bob's office I told him this. He looked at me somberly and said, "You know, that leaves you less than three years to write a thesis. You can do it, but it'll mean a lot of hard work." I started working with Bob, and finished my thesis in 5 years and 3 months.

When I look back now, I am amazed at my gall, but even more so at Bob's positive response. If a student came up to me today and insisted that he would like to complete his thesis in less than three years, I would probably launch into a three-hour lecture on the uncertainties of research and the virtues of patience! Bob's attitude was just to treat that as a constraint and push on, without obsessing about the time frame, and that was absolutely the best way to motivate a student to work hard and graduate. Another major motivating factor was that he worked very hard himself. As far as I could see, he worked from 9 to 6, six days a week, and while I am sure he took vacations, I cannot remember him being away for too long.

One of the things I enjoyed most was his accessibility. I could barge into his office at any time, and, irrespective of what he was doing, he would put his work aside and give me a patient



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and unhurried hearing. Friends of mine had thesis advisors who were far less accessible; some had to get appointments from the secretary and others communicated through notes. This was particularly in evidence when we were working on bunch-length effects in the beam-beam interaction. Bob asked me to write a code that included the finite bunch length of the beam (as opposed to the standard treatments that assumed a “pancake” beam). The thinking was that bunch length, through the hourglass effect, and perhaps through more detailed dynamics, was bad for the beam. But my simulations showed that, for some values of the bunch length, the situation actually improved; it gave a higher tune shift. At first Bob was convinced that I must have made a mistake. He went through the code line by line, finding numerous mistakes (including some embarrassingly elementary ones). I corrected them, and the numbers changed, but the basic result did not. He was then convinced that the phenomenon was real, and one needed to find an explanation. He asked me to try some analytic calculations with a simplified model, to understand things better. In this context I would barge in on him many times a day, with a new problem or a brilliant new solution. Each time he would listen to me patiently, point out obvious errors gently, discuss more subtle points avidly, and keep pushing me down the path. At that point I realized that he was a great teacher, who put his graduate students first. I was wrong.

Around the same time, Bob was teaching an undergraduate course in physics. One day I walked into his office to find him busy with a young student. He asked me to come back later. I was rather annoyed, since I had gotten used to having first dibs on his time. After this happened a couple more times, I asked him querulously who the student was. It turned out she was taking his course, and was not finding it too easy, so she came to him for a little extra help. It was a very trying semester for me, but it finally came to an end, the student disappeared, and my exclusivity returned. Imagine my consternation, therefore, when, one fine afternoon the next semester, I found the same student there again! After she left, I walked into Bob’s room and asked him rather sharply: “Are you teaching again this semester, I thought you only have to teach one course a year.” Bob smiled and explained. Apparently, the student had found his tutoring very helpful the previous semester. This semester she was taking another physics course (not taught by Bob), which she was finding difficult, so she wanted Bob to tutor her again! Bob could be demanding of his students, but he also put his students, graduate and undergraduate, first. His style of mentoring was never didactic, and therefore more effective.

My deadline of 5 years was fast approaching. After the work on bunch-length effects, we had progressed to looking at collective beam-beam instabilities. After a tense intermediate period, when we seemed to be making no progress, things panned out well. I had worked hard, been lucky, and had enough to write up a thesis. But I had heard stories of drafts of chapters returning from Bob’s room bathed in red ink! He had high standards of scientific prose, and was ruthless in implementing them. Someone (perhaps Gerry Jackson?) warned me that it could take anywhere between six months to never for Bob to approve a thesis. So I worked very hard on the writing part too, and rewrote many drafts before submitting anything to Bob, all of which he would get back to me in a matter of days. I was lucky. My chapters came back with only modest amounts of red, and were typically okayed on the second iteration. Many years later he told me that the theses that gave him the least trouble were Bob Meller’s and mine. It is a compliment I still treasure.

In 1991 Bob moved from Cornell to SLAC. In that same year I graduated and moved to LBL. The relatively close physical proximity made it easier to continue to collaborate on the beam-beam interaction. We generalized our work on collective beam-beam instabilities, started for round beams, to more general beam profiles. The most natural way to do that was to work in cylindrical coordinates. However, to simulate flat beams, it would be better to work in Cartesian coordinates. Though Bob’s interests were already shifting to advanced accelerator concepts, he encouraged me to work on this. Before I could make much progress, I moved back to India at the end of 1992, but continued to work on the problem only because of strong encouragement from Bob. At one point I needed to do a check, for nearly round beams, with our old code,

which I could not run because I did not have the requisite scientific library. I asked Bob, and he had the results faxed to me within a week.

Over the years we continued to keep in touch, and on my occasional trips to the U.S., I would make it a point to visit him at SLAC. Remarkably, I found almost no change in him. His dedication and enthusiasm for physics remained unabated, as did the joy and satisfaction he derived from remaining a “hands-on” physicist. As he and his group worked on new acceleration methods, and produced trailblazing results on plasma wakefield acceleration, it was a privilege to hear of the latest results and future plans first hand from Bob. As always, he believed strongly in mentoring young students, and took great pride in the large fraction of students in the group, and in their contributions and achievements, both then and later in life.

Bob Siemann’s contributions to our field are many, deep, and diverse, but perhaps none more important than his mentoring of young scientists. Those of us who were fortunate enough to be his students will miss him; the best tribute we can pay to him is to follow his example with coming generations of scientists. In addition, I hope institutions such as the American Physical Society will commemorate his contributions in this area, perhaps by instituting a student fellowship or prize in his name.

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