



## **PSSC: a Student Perspective**

*by Jane Bray Nelson*

Kids today can't image a world without computers, cell phones, and digital everything. So it is for me and physics education without PSSC Physics. I was raised on it. I didn't realize there had been a time before PSSC until I was a college graduate and teaching physics myself. I had a hint that there had been a time before the alphabet sciences when I took my SAT Achievement Test in chemistry, and there was a question asking if I had CHEM Study or traditional chemistry. I thought CHEM Study was traditional! What did I know? I was just a kid. Well, I found out just as soon as I started taking the test. There were all these factual questions about preparations and properties of chemicals. I had NOT been taught science as a collection of facts. I had been taught BSCS Biology, CHEM Study Chemistry, and PSSC Physics. I didn't know that in the mid-60s, I was part of a revolution in science teaching. All I can say is that, "I am so glad that I never knew that world before PSSC Physics."

For me, physics was nothing but experimentation and mathematical models to represent what I had discovered. Little did I know that these models had been "old hat" to physicists for years. I can remember being so excited about really measuring the size of a molecule. I had taken chemistry the year before; so measuring molecules seemed impossible since they were really small. Yet, there I was, doing the PSSC Experiment with monatomic layers of oleic acid and the mathematics to do just that. Oh yes, the mathematics.

Now there was a change that became a joke for all the kids in my classes. We would estimate the time to get to the beach, and then we would laugh and say something like, "Well, close enough for physics." That's because we had learned about significant figures and measurement. It seemed to us that everything was always being rounded, and no measurement was perfect. How profound that is in retrospect. We had gotten the message that there is uncertainty in scientific measurements. We were ready for Heisenberg, DeBroglie, and Compton. It did not bother us that there were two ways to look at the behavior of light, that the model had to blend data from several perspectives, or that there was always going to be uncertainty in anything we measured. We had been raised on this kind of scientific thinking. We had learned this kind of thinking in our PSSC Physics class.

There were some in the class who did not respond to the fact that there was so much mathematics to do in the physics class, or that we had to analyze data ourselves to reach conclusions based on our particular data. But they did not blame the curriculum, they just asked for help from the rest of us. Group work was the only way to survive PSSC Physics. I can remember tutoring one of my best friends. She would ask over and over, "Can't you just show me how to get the answer?" I knew even then that it would do her no good to know how to do the particular problem we were working on. To succeed in PSSC, a student had to learn how to analyze, interpret, and choose an approach to a problem based on its particular parameters. Since we all had been exposed to the alphabet



sciences before PSSC Physics, we knew that memorizing factual information might have been good enough for our other classes, but it sure was not going to make it in science.

I led a perfectly normal life for several years after having PSSC Physics in high school. I went to college, majored in chemistry, took the required physics, and never gave it a thought when I breezed through those classes at the introductory level. I had experienced physics. It was not the enemy; it was real to me because of all the laboratory work I had done in high school. As I look back, the laboratory experience I had at the college level would have been so much more confusing had I not lived through PSSC Physics as a high school student. So I put behind me the physics lessons of college, and began my teaching career as a chemistry teacher. Hum, did I not know that specific heat in physics was the same as specific heat in chemistry? It seems impossible when I look back now, but I had no idea that the electron I taught about so easily in chemistry was so ordinary to me because I had been given a chance early in my physics experiences to experiment with static electrical phenomena, electrical circuits, and magnetism. These all were part of my understanding of indirect measurements done by physicists like Millikan and Thomson because I had never know a world without PSSC Physics thinking.

I was comfortable traveling through life teaching high school chemistry, and then the impossible happened. I was told that the next year I would be teaching PHYSICS! Oh goodness. I was in a state of panic until I saw the laboratory manual for the book from which I had to teach. There were all my old friends from high school. I knew that as long as I stuck to the experimental approach to teaching physics, let the students support each other in group-activities, and used the laboratory activities from the PSSC curriculum, I would make it through the year. I came to realize that by the 80s many other physics curricula had followed the PSSC lead in changing the established curriculum of the 50s into the student-friendly, laboratory-based curriculum introduced by PSSC in the 60s. So out came the recording timers. My students cut and pasted tapes on to graph paper. They developed equations for motion in much the same way I had done years before. Since then, I have added the real-time activities of computers graphing carts moving up and down ramps, but for every motion that the computer graphed, the students graphed it first from recording timers. There is just something wonderful about turning the long strip of paper into a graph that pictorially represents the motion of that object that can't be experienced any other way. PSSC curriculum writers were way ahead of their time!

I had splashed my way through the ripple tank laboratories and knotted my share of Slinkys by the time I was asked to teach physics. But when the time came to teach the waves, sound, and light units in my own classroom, I had my students on the ground making waves, in the dark making waves, and watching old movies in which men in bow ties were making waves on wave machines. These were memories from my introduction to physics, and I was sure that my students would profit from these experiences just as I had done so many years before. There is no other way for students to appreciate that they can actually measure the wavelength of light at the end of the unit without experiencing all the laboratory investigations that lead to an understanding of wave behavior and measurements of waves in media like Slinkys and ripple tanks that can be seen. It is



**PSSC**

50 Years Later

profound to consider that in order to measure something about light, we have to understand how waves behave in other materials we can see since we really can't "see" the wavelength of light. Only after the students have worked their way through the now traditional PSSC laboratories do they animate waves and photoelectric effects virtually on their computers in my modern classroom. How strange to realize that the PSSC experiences of my high school days are now the traditional laboratories in my current classroom.