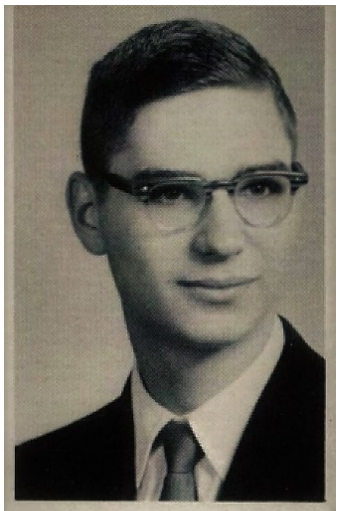
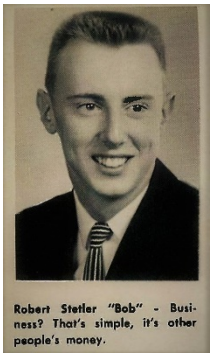


Walter Schreiner "Walt" - It is a moral obligation to be intelligent.

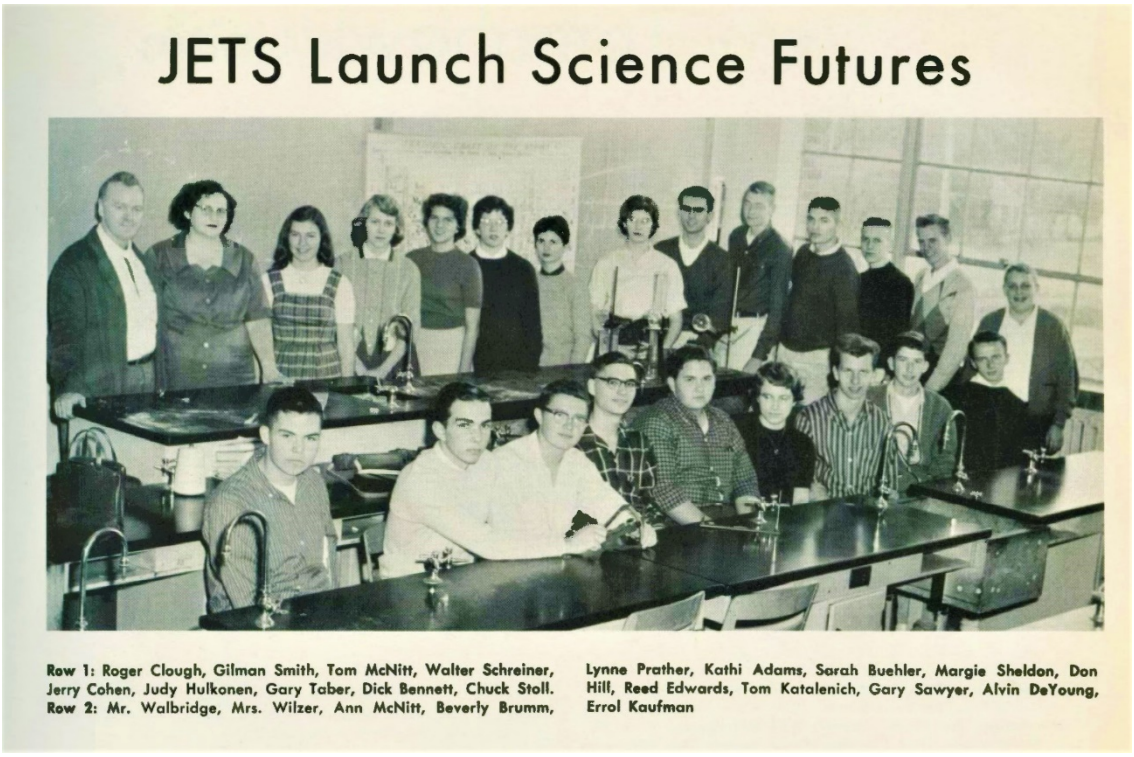
The Autobiography of a Physics Nerd: Walter N. Schreiner, Okemos High School Class of 1959

When I graduated from OHS, I was honored with the prize in mathematics. I was quite surprised, but disappointed at the same time – I wanted the prize in physics instead! So immediately after graduating, I went to the physics department at Michigan State University. I found a professor doing experimental nuclear physics in the basement and offered to work for him for free during the summer. Thus began my true career in physics.

Perhaps it really began with rockets. In 1956, before Russia launched Sputnik, Tom Gunn (1960), Bob Stetler and I got interested in launching a rocket. After some research we designed the nozzle, and got it fabricated on a lathe. Tom called up a company and got a free sample of seamless steel tubing, and we filled it with powdered zinc and sulfur. We built a rocket launch platform and towed it to an Army proving ground somewhere in Michigan with the help of the Lansing Jaycees. There were several other groups with rockets, but ours was the only one that actually worked! The thing shot straight up and out of sight. I had built a transmitter with a little parachute in it which was supposed to eject at the apogee, so we could track and retrieve it. But the signal was either absent or too weak being so far away, and we never found it. The military estimated the rocket flew a couple of miles.



Robert Stetler "Bob" - Business? That's simple, it's other people's money.



JETS Launch Science Futures

Row 1: Roger Clough, Gilman Smith, Tom McNitt, Walter Schreiner, Jerry Cohen, Judy Hulkonen, Gary Taber, Dick Bennett, Chuck Stoll.
Row 2: Mr. Walbridge, Mrs. Wilzer, Ann McNitt, Beverly Brumm, Lynne Prather, Kathi Adams, Sarah Buehler, Margie Sheldon, Don Hill, Reed Edwards, Tom Katalenich, Gary Sawyer, Alvin DeYoung, Errol Kaufman

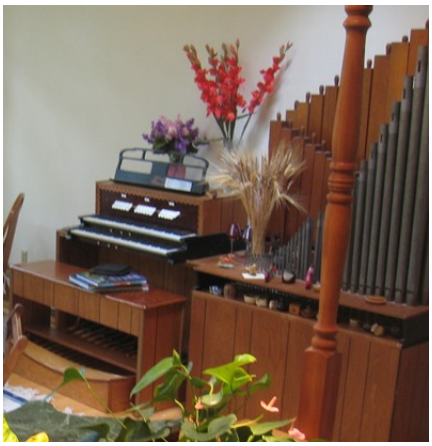
Why study physics? Maybe it's obvious now, but when I was in high school, I was interested in lots of things, rockets, electronics, mechanical things, how things worked, like locks, clocks, hour meters, etc. I was always busy wiring something up at home. I asked my mother what I should study in college, and she immediately said "physics". Thinking back on it, I am really impressed that she even knew what physics was! But she was exactly right. Smart mother!

But I had one other key "advisor". We all had to take English classes at OHS, but I didn't like diagramming sentences, studying literature, writing essays, etc. Then I noticed that Carol Price was always getting A's, so I asked her if she was getting good grades because she liked the subject. She said, not particularly, but she figured since she had to take the class anyway she might as well learn it. Might be useful later in life! Well -- that was an important, eye-opening lesson for me! And I've followed Carol's advice ever since. Whatever you do, focus on doing it well and enjoy it! That became a signature behavior in my life – diversity with enjoyment. Dr. Carol, I bet you never knew the effect you had one me, did you?


Carol Price - The secret of success is constancy to purpose.

The most useful skill I learned in High School was touch typing. It was a natural for me because I played the piano (remember when I played the Chopin's Op. 55 Funeral March for our graduation?) Today, I'm amazed how people can type with two fingers on a cell phone. I have to think where the keys are when trying to type that way, because for me, typing is all muscle memory. I prefer a "real" keyboard!

My physics career took many twists and turns. After that first summer at MSU (and for a couple years thereafter) I became a lab assistant for two professors doing experimental nuclear physics. Then I switched to higher energy and worked with the cyclotron group, where I learned to program the MSU Electrical Engineering Department's copy of the ILLIAC computer. It had 1,024 bytes of memory, 36 bit wide "words", and we had to program it in pseudo-machine code because there was no assembler language for it. We used paper tape, like ticker tape, and a teletype. The machine was all vacuum tubes. We only got two hours of computer time per night to run our programs. The rest of the night was used by the Ag Dept to analyze Design-of-Experiment (DoE) data for crop yields (MSU, being a land-grant college, had acres of crop land out back). Later in life I used that story many times when teaching Statistical Engineering, which included teaching engineers how to do DoE analysis.



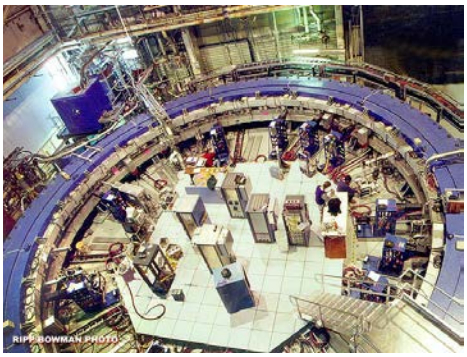
After graduating from MSU, I enrolled in the University of California, Santa Barbara (UCSB) physics department to get a master's degree. I held a Teaching Assistant position to help pay tuition, room and board. That took two years, but I was also very interested in a possible music career. So I joined the men's glee club, took organ lessons, studied choir directing and practiced the piano. I built a practice two rank pipe organ in an off campus apartment I rented with another student and used a vacuum cleaner hooked up backwards for the air supply. I remember practicing piano in one of the Music Dept's practice rooms when someone came by and shouted, "Kennedy's been killed!" What an incredible feeling of deflation! I walked out of that room totally drained!

Soon I realized I would never make it as a musician (my best friends were incredibly talented and I knew I could never compete with them), so after getting my M.A. in physics, I decided I would teach physics at a junior college in California. But to get certified in CA, I needed to take a year of teaching methodology from the Education Department, so I hung around and took the course. About 6 weeks before the end of the year, my Education advisor called me into his office and said that after reviewing my undergraduate resume from MSU, he saw I had not taken an American History course (it wasn't required). But it was a requirement to get the teaching certificate from UCSB. I'd have to stay around another year and take the course! Well, why didn't you tell me that a year ago? Grrr! Was there any way of getting out of it? Yes, he said, I could take a comprehensive exam and if I passed, I'd get certified. Turned out about 20 other students were in the same

boat (all of us were out-of-staters), so we got the history book from the book store, studied it and took the exam. About a week before the end of the semester the results were posted on the Education Department door. Out of 20 of us, no one passed! The American History department needed students and they weren't going to let people just comp an exam! Again, total deflation! What was I going to do?

On the way back to my apartment I saw a group of students clustered around a booth on a knoll. I walked over to see what it was about, and it turned out to be the Peace Corps looking to sign up volunteers. The Peace Corps was only 5 years old at the time (1966). They were looking for people with Master's degrees to join teaching programs in South America -- country to be specified later. I immediately signed up! Much better teaching at a 4 year university than a crappy 2 year junior college in California where teaching physics also required a year of American History study! And indeed it turned out to be incredibly fortunate!

I was assigned to Chile, to teach at the Universidad del Norte in Antofagasta. I didn't know any Spanish, so we had a three month intensive immersion course, 2 months at the University of Washington in Seattle, and another month in Mayaguez, Puerto Rico. In Puerto Rico I had to teach a one hour class -- on physics -- in Spanish -- at a local university! Right! I passed and was on my way to Chile! The first year in Chile I taught both physics and mathematics (see, that OHS math award came in handy after all!) But for the second year, they wanted to start a Master's degree program in physics, and asked me to teach quantum mechanics to the professors. So I translated a book into Spanish and taught the future teachers all about Schrödinger's equation, the hydrogen atom and quantum mechanics. Lots of fun -- and a darn-sight better than teaching low level physics to uninterested junior college students in stupid California! Such is the randomness of opportunities in life! Jump on them and milk them for all they are worth!



When I got back from Chile at the start of 1969, I tried to find a job doing physics. I applied to over 100 companies, but they all said a Master's degree was useless – they wanted bachelor's degrees for technicians or Ph.D.'s to do research. So it was back to school! Some professors at Virginia Polytechnic Institute and State University were looking for grad students to help with a large synchrotron experiment at Brookhaven National Laboratories, and I joined. They were building a huge spark chamber to go inside a mammoth magnet to study proton-proton interactions at 30GeV, the highest energy physics available in the world at the time. It was spectacular! The equipment was awesome! For example, there were 20 wires, each 2" in diameter to feed a megawatt of DC power to the magnet! 4' x 4' x 8' blocks of concrete stacked up 20 ft high to protect against radiation. Electronics – ahh, what a sight -- racks full of modules inside a trailer we had near the experiment. That first year I spent entirely on site, often sleeping on a cot in the trailer while working to set up the experiment.

Eventually my main assignment was to program the Control Data 6600 computer at the computer center to track the particles coming from the interactions and analyze the data we'd collect. But I also had to go to school in Blacksburg, VA to take the necessary courses for the Ph.D. So for two years I, along with another grad student, commuted to VA. We used the Associated University's six-seater airplane to fly down on Monday afternoon, took classes on Tue-Wed-Thur, and then flew back to Brookhaven on Thur evening to work on the experiment from Friday thru Monday. We had some exciting experiences in that airplane with weather and

plane malfunctions. But the pilot was excellent – he had over 15,000 hours of flying time and handled all the emergencies with aplomb. One time they even had to clear a runway for us at the Washington DC airport, now called Ronald Reagan. Many stories from those trips and that great pilot!

I graduated from VPI&SU with a perfect 4.0 grade point. But during my thesis defense, one of the professors asked me why I had taken a glass-blowing class from the chemistry department (I wanted to make a real hourglass). He said I should focus on physics, but I was always interested in many things, and was following Carol's advice to take advantage of every opportunity. It had worked out very well until then, and would continue to work out well in the future. The professor didn't understand that concept, but no matter, my degree was issued. Theses topic? "High p-perpendicular events in proton-proton interactions at 30 GeV". Sure sounds impressive! After graduation I stayed on at Brookhaven as a post doc for two more years while completing the analysis of all the data we'd captured. When I presented our results at a graduate seminar at the State University of New York at Stony Brook, there was a Nobel Prize winning theoretical physicist on the faculty and I remember him saying they had figured out where the high p-perpendicular events were coming from. It was "jets" from quark-quark interactions! 6 years of experimental work -- and boom! They figured out the explanation in a couple of months! Seems unfair, but such is life with experimental physics. Later in life I found the same to be true when working with engineers in factories. It's tough to run good experiments and get surprising results, but (usually) easier to develop an explanation once you know the answer.

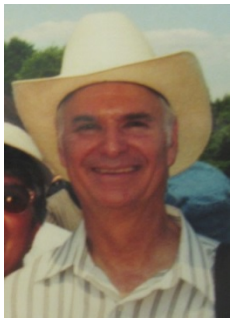
It was 1975, and with the Brookhaven experiment winding down, I had the opportunity to go to Fermi Lab outside of Chicago where they were building a new synchrotron with 500 GeV energy, the next step up in the world of high energy physics. But when I looked that the papers we'd published at Brookhaven, there were about 30 authors, and with collaborations of increasing size, I figured the number of authors was proportional to the energy, so there'd be about 300 authors on the first papers that came out. And there were! I didn't want to be buried in that. So I took a job with Philips Electronics doing x-ray analytical research, x-ray energy being down 6 orders of magnitude from Brookhaven! Besides, the equipment which Philips was producing, and which I would be developing, had a practical use, unlike p-p interactions at 30 GeV. (And just to finish with the publication's story, at CERN in Europe where initial energies were 8 TeV -- 8,000 GeV – papers had 3-5,000 authors and they get listed as an appendix to the paper – on 8-10 pages of fine print! Better to be a big fish in a small pond at Philips than a small fish in a big pond at CERN!)

So starting in 1975 at Philips Research Laboratories in Briarcliff Manor, NY, I spent two years writing software for a commercial x-ray spectrometer which would determine the elements present and their abundance in a sample of material. Then I spent another 3 years writing software for a commercial x-ray diffractometer, which would identify the crystalline compounds present in a sample of inorganic material. Philips made millions of dollars selling this equipment – a very practical and useful result of my career change to "low energy" physics. This was followed by further research into novel x-ray instrumentation and developing a high level language in English for controlling the instruments instead of having to write computer code. In 1981 this was the precursor to object-oriented interactive control systems.

During my x-ray analytical years at Philips, I joined the International Centre for Diffraction Data (ICDD), an organization which accumulated x-ray diffraction reference spectra for tens of thousands of compounds. I wrote and co-authored many papers with Philips colleagues, and taught x-ray diffraction classes at the Denver X-ray Conference, the annual meeting sponsored by the ICDD. Concurrently, I started a commercial x-ray

diffraction laboratory called IC Labs. We'd take samples from paying clients and measure their spectra on x-ray diffractometers which I'd acquired over time and set up at home. I'd do the data analysis in the evenings and write the client reports. My father taught me to do the accounting, and I learned how to run a business from a management perspective, not just the technical side. Lots of diversity! Eventually I became a Fellow of the ICDD and was asked to run the organization, but diversity was always in my mind, and I had moved on to another phase of my life – solving chronic manufacturing problems. I had the x-ray analytical business for 20 years, sold the equipment and started a new company.

During my x-ray analytical years several colleagues and I formed a barbershop quartet and for several years we'd sing at the closing dinner of the Denver X-ray Conference as entertainment. I chose and arranged the music and taught it to the quartet. With another barbershop quartet that I led, we'd sing at weddings and other invitational events. Beginning in Chile and continuing through Brookhaven and my x-ray analytical years, I directed three different church choirs and often played the organ. I joined a 100+ person choral organization in Westchester County in NY; we'd sing mostly classical music and I'd bring some of it home and teach it to my church choir in Putnam Valley, NY -- we had 20 choir members at one point, all volunteers! We'd give annual concerts for our church, singing portions of Elijah, Messiah, spirituals, and a variety of other church music. While in Chile, I also repaired the 15-rank pipe organ in the main catholic cathedral in Antofagasta – they were thrilled to hear it sound good once again! Always diversity in life!



In 1985 Philips moved all the x-ray analytical research work to the Netherlands, and I was out of a job. But there were many other opportunities in Philips, and I took up management consulting. It was at a time when companies were focusing more on having their research groups directly support business operations. I'd had lots of experience working and coordinating with our commercial x-ray organization – a rarity at the time. I learned to do Business Process Re-engineering, and a small group of us at the Research Labs would go into one of our product division plants and map their business processes with a local team. Then we'd figure out how to make it more efficient, cut out non-value adding steps and develop an implementation plan. I led the teams from our side. We also did point problem solving, like developing Just-in-Time systems, or revamping inventory control systems to determine the optimum order points for product components. Diversity? Yup, all over again! The downside was that management consulting involved a lot of travel, and I had to give up my choirs, so I passed the baton to my organist. But I did manage to keep IC Labs for the time being.

In 1995 Philips, recovering from some bad times, began a training program for middle and upper level managers, and we in research were tapped to develop some of the training material, along with external consultants.

Having lots of experience training operating divisions I got involved in teaching a technical problem solving methodology developed by Dorian Shainin, called "Statistical Engineering" (SE). The method was aimed at solving "chronic" yield, quality and reliability problems, ones that local engineers, even with all their experience and process knowledge, could not solve. It involves a very different thought process from the way engineers learn to do problem solving – they learn through acquiring expertise over time. The root cause for most

problems in manufacturing are obvious to such engineers, but the root cause for chronic problems eludes them, and thus, requires a different strategy. Some phrases we use to characterize the SE method are: "Talk to the Parts", "Split the Dictionary", "Focus on the Red-X", etc. For several years until I retired I introduced this method to managers around the world, taught engineers how to solve chronic problems, and solved many chronic problems. One year, the savings from the problems I solved accounted for a full 1% of Philips world-wide bottom line profits! One person out of 250,000 employees. One percent! That's when my boss stopped complaining that I didn't know what I was doing and that he would never hire me if he were a plant manager! Something about prophets not being recognized in their home town . . .

I loved doing and teaching SE Problem Solving. With the methodology, I could walk into a plant, any plant, know absolutely nothing about their process, and figure out the root cause for their most difficult, chronic problem in 2-3 weeks. Some problems had existed since plant startup, 20 year old problems or more. Doing SE combined all the things that I loved most – physics, logic and teaching. Naturally, I had become well known around the world within Philips for doing SE. So when I retired in 2005, I'd continue to get calls from managers -- either still with Philips or having left Philips and now at other companies -- to come help solve a problem or teach a class. That's when I retired IC Labs and started CP Solutions. "CP" stands for Chronic Problem. These days I try to limit my SE consulting to about 25% of my time (initially after retiring it was much more, even 100% of my time!) Today, I don't do any advertising; all my business comes from word of mouth or prior contacts. And that leaves about 75% of my time to do other things!

One of those "other things" is to volunteer to help build / repair houses for people in need, both in the US an around the world. I always liked to build things – once I added a garage with a deck on top to the first house I owned. I had to learn how to do the engineering calculations to design the garage, and I had to get a license to do the electrical work. I learned to pour concrete, build cement block walls, and build stick-built structures. More diversity! I did all the work myself. I had a friend who used to volunteer to help build houses for people in need, but I never had time to join him while I was working. After retiring, opportunities finally came and I made my first trip to Haiti to help build houses in Leogane after the disastrous 7.0 earthquake in 2010. I went back twice more, and also made a trip to Louisiana to help build four houses there for US veterans. Since then I've been to Nepal, Armenia, Thailand, Peru, Nicaragua, India, Sri Lanka, and now also Croatia. Croatia is my 12th "build", and was reported on National Croatian TV. All my trips have been with the Fuller Global Builders. Its founder, Millard Fuller, was also a co-founder of Habitat for Humanity. Recently, I've also been volunteering with people from my church to help Habitat for Humanity refurbish a 2-family home nearby.

Other current activities include singing in my local church choir, video processing sermons for publication on YouTube, volunteering with our Social Justice Committee, running the "sports and outdoors" section of our annual church bazaar (they take in $25K/yr, all of which gets donated

to women and children's organizations), traveling for pleasure (in 2017 I saw the total solar eclipse from Nashville, and made a two-week loop of Colorado looking for dinosaur fossils), investing, playing piano, reading books, gardening, collecting unusual things from far-away places, eating 10 lb lobsters and playing with my cat, Cindy. Diversity -- the spice of life!

All in all, nothing boring around here! And I'm sure there'll be more fun things to come. Carol, thanks for your wise counsel to a physics nerd! ☺

Second Place Float