

“Multi-Success”
by
Dianne Prost O’Leary
Commencement Address
University of Waterloo
October 2005

Congratulations to the class of 2005! I am proud and honored to count myself among you. Today we celebrate your success. Congratulations, too, to the parents and spouses of the graduates. Your financial and emotional support led to this success. Waterloo’s faculty members also celebrate success in guiding these students in their studies. And support staff of the University share in this success, since without their efforts the university could not function.

Graduates, you have good reason to celebrate. Your hard work and perseverance over the past several years have led to this tangible citation of your success. Today there is no doubt that each one of you is successful...

.. but what about tomorrow? As you leave the incubator of academia, you also leave behind perhaps the last unambiguous standard of success. Starting tomorrow, each of you decides for yourself what success is and how you measure it. How will you measure your own success? Does the person who dies with the most toys win? Is power the measure of success? What passions and values will last you a lifetime?

Let’s consider one candidate for success as a scientist, Art Schawlow, a physicist and Nobel Prize winner. He holds a special place in my heart because, although I never met him, he was my husband’s Ph.D. advisor.

He was born in the U.S. but educated here in his mother’s country, receiving his undergraduate degree and PhD at a nearby university, which will go unnamed¹. While here he started a jazz band, and his passion for jazz remained with him throughout his life.

¹University of Toronto

In 1949 he moved to Columbia University for a postdoc. While there, he and his advisor Charles Townes published a paper defining the LASER. What an exciting time that must have been, developing an invention that would change the way physicians do surgery, the way music is recorded and played, and even the way we buy our groceries! At first, though, the LASER was considered a solution in search of a problem. What did Dr. Schawlow have to say about this invention? He had a keen sense of humor, and suggested changing the “A” for “amplification” to “O” for “oscillation”, making the acronym “LOSER” instead of “LASER”.

Surely later, after the LASER had had such an impact on science and industry, Dr. Schawlow must have looked back fondly on his postdoc years. Indeed he did, and when asked about the highlight, he responded that the best thing that happened was that he met his future wife, his advisor’s sister.

Dr. Schawlow spent many years on the faculty at Stanford University. In the 1970s, he kept his research group very small, because he was having difficulty getting funding, but his spirit and his sense of humor prevailed.

His advice to young scientists was, “To do successful research you don’t need to know everything; you just need to know one thing that isn’t known.” He often gave demonstrations of the LASER’s capabilities by popping a dark-colored Mickey Mouse balloon while leaving a clear outer balloon intact, illustrating the principle later used to repair detached retinas. He was fascinated by the variety of materials out of which LASERs could be constructed; his group worked toward an edible LASER made of gelatin (foreshadowing the distributed feedback LASER) and a laxative LASER, too, earning my husband a local award for impure and inapplicable chemistry. Happily, the group also made other substantial research contributions to the understanding of matter, including LASER cooling.

In 1981 he made his trip to Stockholm, honored for his work in LASER spectroscopy. And what did he do with the Nobel Prize money? He donated it to a center he founded for people with autism. In fact, he and his wife wrote a paper on using computers to lessen the communication barriers of autism. His interest in the subject was triggered by his son, Art Jr, a resident at the center.

So how would Dr. Schawlow measure his success? He was clearly a failure as a professional jazz clarinet musician. He was less successful than many in getting his research funded. He was unable to immediately grasp the importance of his major invention. And his dearest wish that his son be able to live independently was never fulfilled. There are some things that even a Nobel Prize can't fix.

None of this takes away from Dr. Schawlow's achievements. He loved what he did. He was an outstanding scientist, an effective president of two major physical societies, a beloved mentor, a devoted husband, a loving father of three children, and a person of grace, caring, wit, and humility. Without a doubt, we would call him a success.

So success cannot be measured on a single scale. Some of you may have studied multi-objective optimization. For example, you may want to design a structure that is both light-weight and low-cost. Often, the lighter the structure, the more expensive the material, so the two objectives must be considered separately. The idea is to seek a *Pareto optimal solution*, one of the many designs for which no other design is both lighter weight and lower cost.

Success in life is similar. You may want to be successful in your profession, in love, in financial security, and in other measures. You probably cannot maximize your achievement in any one area without diminishing your achievement in some other. You might decide to establish a start-up company, emphasizing financial gain at the expense of family time. Or you might take your dream job of establishing a source of clean water in a third-world village but never achieve financial security.

As you make your decisions, keep in mind the many facets of success. "Charity begins at home," and so does success. Devote considerable energy to relationships with your children, your life partner, your friends, and your parents. Measure your career success by how well you do your job, how much you enjoy it, what ethics guide your decisions, and whether what you do is important to society. Devote time to service to your local community and professional community, and make your lifestyle reflect your values. And don't ignore politics and world affairs; your unique talents and knowledge of science and technology are essential to averting global catastrophes related

to climate change, disease, poverty, and culture clashes.

As you make decisions over the next year or two, judge all of your choices against your own standards of success. Remember that although your time on earth may seem to stretch further than you can see into the future, it will look different when you perform the midlife exercise of examining your choices and mourning lost opportunities.

Today your success is defined by the conferring of your degree; tomorrow, you define success yourself. To the class of fall 2005, congratulations and best wishes for true success now and always.

References:

Stephen Chu and Charles H. Townes, "Arthur Schawlow May 5, 1921 - April 28, 1999," *Biographical Memoirs*, V.83 (2003), National Academy of Sciences, pp. 196-215
<http://www.nap.edu/books/030908699X/html/196.html>

Timothy J. O'Leary, Private Communication, September 2005.

Arthur L. Schawlow, "Autobiography,"
<http://nobelprize.org/physics/laureates/1981/schawlow-autobio.html>

Arthur L. Schawlow, "Nobel Prize Lecture 1981,"
<http://nobelprize.org/physics/laureates/1981/schawlow-lecture.pdf>

Stanford University, "Memorial Resolution: Arthur Schawlow (1921-1999),"
<http://news-service.stanford.edu/news/2000/may31/schawlow-531.html>