Project Kaleidoscope "Village Elder" Interview

Lynn Arthur Steen, April, 2008

One of several interviews with founding directors of Project Kaleidoscope
(PKAL) on the occasion of the project's twentieth anniversary.

Of the things you have done in life, which are most significant?

In the context of Project Kaleidoscope's 20th anniversary PKal insiders may expect me to say that it was my role in helping create PKal. School mathematics teachers would probably select *Everybody Counts*—the NRC report that I wrote 20 years ago on challenges facing U.S. mathematics education. College mathematics faculty may point to my leadership of the Mathematical Association of America, where I have chaired countless committees, edited over a dozen publications, and served as president. Folks in higher education probably identify me as one of the early advocates for quantitative literacy.

Interestingly, little of this has had any direct bearing on my career at St. Olaf (except as a source of time-consuming distractions). Here I helped lay the foundation for what is widely recognized as one of the best undergraduate mathematics departments in the nation. We did this by emphasizing a simple yet radical theme, that mathematics is not an esoteric subject for an elite but an indispensible liberal art for everyone. Once this message took root, I got out of the way and let the younger faculty run with it. That may be my most important contribution.

Has there been a particular project or event that has significantly influenced the direction of your career? If so, could you talk a little bit about it?

In retrospect, I see two events that switched my career from one track to another in ways that were entirely unforeseen. First was my choice of graduate thesis advisor. It turned out that my advisor went on to become chair of the mathematics department at MIT, and one of his colleagues (in geophysics) became president of the National Academy of Sciences. As a consequence, my advisor wound up working for the National Research Council (the action arm of the Academy) where he recruited me to serve on their new mathematics education board and later to serve as executive director of that board. These were not things that were on my mind (or even on my horizon) when I was a confused graduate student looking for a sympathetic thesis advisor.

The second event whose significance can be seen only in retrospect was my response to a question by a St. Olaf student early in my teaching career. She wanted to know what the word "spectrum" that we were studying in a senior mathematics course had to do with the same word in physics (e.g., electromagnetic spectrum). I couldn't answer the question either mathematically or historically, so I began doing some research and several years later published an article that provided the answer—and won an award. This foray into mathematical exposition tempted me to write other similar papers (including one for *Scientific American*) that explained mathematical topics in a form accessible to an audience of non-mathematicians. To secure time for this work I sought an NSF grant, which was declined for the logical reason that NSF supports research, not writing about others' research.

A few years later, much to my surprise, I was recruited by someone I had never met to work on a Washington-based project whose purpose was to explore the possibility of placing articles about mathematics in newspapers and science-oriented magazines. My work on that project opened several unique opportunities that led to many subsequent writing assignments. I learned years later that the person who suggested that I be recruited for this job was a member of the NSF panel that had turned down my proposal some years earlier. Although we had never met, he remembered my interest and credentials from that proposal and suggested me for this new assignment.

I take from these incidents two reflections: One is that the "butterfly effect" of chaos theory is as active in people's lives and careers as in global weather: the slightest perturbation early in a career can have significant yet unknowable consequences years later. The other is that applying for grants is worthwhile even if the chances of funding are slim. You never can predict what unexpected benefits may flow from a good idea.

Where do your ideas for your work generally come from?

Early in my career, I was motivated largely by a desire to make the students' experience of mathematics more engaging and compelling than what I felt it had been for many of my contemporaries. This was during the post-Sputnik era when mathematics and science were much on the public's mind—as they are once again—but most college mathematics courses were focused on filtering students out rather than opening doors of opportunity. The undergraduate mathematics curriculum was stagnant, narrow, and uninviting. Some of my ideas for change came from reports prepared by committees of the Mathematical Association of America; others emerged from intense discussion among the young faculty in our department. (I was fortunate to begin my career in a department on the verge of complete renewal.)

My concern to enliven collegiate mathematics led me to apply for grants from NSF to support summer undergraduate research projects. These proposals, fortunately, were successful. They were also somewhat controversial, since many people at that time did not believe that undergraduates were capable of doing research in mathematics. As I recall, there were only a half dozen or so such projects in the whole nation. Now, of course, undergraduate research is *de rigueur* for a high quality education. I cannot claim prescience for its current state, nor any credit for bringing it this far (since after a few years my own career moved in other directions), but I can clearly recall the source of my conviction, namely, that to learn mathematics students need to do it for themselves and not just solve problems in a textbook.

In the middle part of my career I focused on exposition of mathematical ideas to the general public—viewing the public at large as my new students. Here different criteria rule: outside the classroom what matters is not covering a syllabus but whatever might be of interest to the public and what might persuade gatekeepers (editors) to run a mathematics story rather than a science alternative. Medical breakthroughs trump mathematics almost all the time, so finding stories of sufficiently compelling interest is quite a challenge. Today many others have taken up this cause so mathematics is well represented in the news. It wasn't that way not so many years ago.

In later years, as my professional life expanded beyond St. Olaf, I listened a lot to people whose professional life was outside the mathematical sciences. This led me into a variety of enterprises in the penumbra of mathematics, including the mathematical preparation for the technical work force, high school mathematics standards, and more recently, quantitative literacy. The latter is a

good example of issues arising outside mathematics: my interest in quantitative literacy, and much of the current QL ferment on college campuses arose originally from questions raised by science faculty about the level and nature of quantitative reasoning on science AP tests.

What advice would you give to a young person starting out…?

Work hard to break out of the tunneling effect of graduate education. Undergraduate science and mathematics sit in several contexts—your peer departments, your college or university, your state's K-16 educational system, and national policies concerning science, economics, and social policy. Each play important roles and each offers opportunities to exercise professional responsibility. Rarely are these broader constituencies visible within the system of education leading to a Ph.D., but all are of vital importance to an academic career. It is important to be a good citizen of all these communities. To do this, seek opportunities to engage actively with people in other fields and outside academe.