

## Acceptance of the Mineralogical Society of America Award for 1987

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I would like to thank the Mineralogical Society for the honor they have bestowed upon me by selecting me for this award. It has a very special significance for me for the reasons mentioned by Ed Stolper; in particular that it is the first time the award has been given to someone in the general field of isotope geochemistry. Having studied the list of former recipients, I am substantially awed and a bit scared about being included. I would also like to thank the people who nominated me for this award. I appreciate the time and effort and the breadth of view needed to see me as an appropriate recipient.

On these occasions one has several alternatives on how to proceed, each with their special rewards and risks. One is to thank those who helped one to achievements made unexpectedly more pleasurable by recognition. Another is to philosophize on science and related issues. A third is to trace one's scientific roots. I intend to do all three (briefly), but to spare you for the most part my incompletely molded philosophy.

I want to start by thanking, in a roundabout way, the most important actor in my life—fate—and by offering some musings on how I arrived here. In my mind, this fragmented story is not so much about me in particular as it is about members of a large fraction of U.S. society and how its members occasionally find their way into science. The story is apropos to the extent that this morning's *USA Today* carries a front-page article in which the chairman of a major corporation terms U.S. public schools a "failed monopoly." My story, however, is about dedicated teachers and good schools.

I was born and raised in a predominantly blue-collar area of western New York in the city of North Tonawanda. The local chamber of commerce calls the general area the "Niagara Frontier," which of course derives from the name of an incidental feature of the last ice age. If one looks in an old-enough encyclopedia, North Tonawanda can be found to be described as having been one of the biggest lumber ports of the world in the 1890s. This was due presumably to its location at the western terminus of the Erie Canal. It lost this status at the turn of the century following some disastrous fires on the docks. Now it is more-or-less a suburb of Buffalo, a somewhat lesser distinction.

I attended all public schools in North Tonawanda, and the schools were very good. I don't know why they were good, but perhaps it had something to do with the fact that by local standards, the pay, benefits, working conditions, and job security associated with public-school teaching jobs were regarded as attractive. It is also my



recollection that the teachers were afforded a modicum of respect, although it would be safer to ask one of them rather than trust my since-rectified kid's-eye-view.

I had two pieces of good fortune during my public-school days that stand out in my memory. One of these had to do with the *Golden Book Encyclopedia*. My parents were not great readers, but nevertheless they had the sense to buy (weekly in the grocery store) this brightly illustrated little gem. I remember that I could hardly wait each week for the next issue. One of the best features about it was the excellent maps—perhaps a source of what has turned out to be a lifelong addiction to maps. In the same vein, a Time-Life book called *The World We Live In*, a book that I still have, must have helped to get me interested in Earth science.

The most important thing that happened to me educationally was that in the fourth grade the North Tonawanda school system decided to start an "enriched" program for 5th and 6th graders. This was called the "Major Progress Program." They selected twenty pupils out of six hundred or so and a teacher named Norman Schoell, who was from Buffalo. Mr. Schoell was partial to mathematics and science (which suited me just fine) and in

particular introduced to the local school system what was then called the "new math," which was algebra using  $\square$ 's and  $O$ 's instead of  $x$ 's and  $y$ 's. This was novel enough at the time (1962) that this class toured locally and gave exhibition lessons (on Saturdays no less) for teachers from other school systems. Most groups (including our own PTA) were impressed by the material covered, but were shocked and dismayed by the wild and woolly sessions that characterized this class. These were precipitated by Mr. Schoell's ability to bait us with problems presented near the beginning of class, which left us using a lot of class time talking to one another in an attempt to crack the puzzles. The resulting continuous chatter was interpreted by the onlookers to be a sign of disrespect to the teacher. It was, in fact, not only just the opposite, but also a sign of his respect for us. Now that I have experience, I am convinced that lecturing, although it may be useful for transferring information, does not provide the stimulation that is really needed for learning.

Last, there was a significant role for a short vacation trip that my family took to the Adirondack Mountains. Although I knew next-to-nothing about geology at the time, I immediately recognized that topographic *relief*, was just that!

In high school, I had the opportunity to take Earth science as an elective course. It goes without saying that this must have been an important factor in my eventual career choice. At the time it was such a natural indulgence of my latent interests that I hardly noticed it. I also remember giving two lectures in this class, which I now recall with amusement. One was on relativity, and the other was on Kepler's laws.

My initiation into college life at Cornell in 1969 was traumatic. My freshman year presented the challenges, not only of adjusting to life away from home and to university courses, but also to fraternity rush, antidraft demonstrations, student uprisings, and what I now refer to as the "Cambodia-Kent State Spring." The diversity of activity and the resultant disorientation were useful in a way because they led to a re-evaluation of my career goals. It was at the end of this year that I transferred out of engineering and made the decision to major in geology, after coming perilously close to deciding on political science. I am still proud of the decision I made, because it was made with purposeful disregard for what I perceived as practical issues, such as the availability of jobs and whether it would provide me with financial security. It was almost a revelation when I realized that it was possible to choose my major simply on the basis of my enjoyment and interest in the subject.

I obtained my B.S. in geology from SUNY Binghamton after transferring from Cornell in my sophomore year. Although I didn't realize it at the time, I received a solid education in geology at Binghamton, and I have drawn on it heavily since. The main hurdle of my undergraduate days was the decision to go on to graduate school. I had at one point all but decided to call 17 years of schooling "enough," when Rosemary Vidale, then a faculty mem-

ber at Binghamton, managed to change my mind. This began on a field trip to the Adirondacks in conjunction with her metamorphic petrology course. I remember the trip well because we saw the basketball-sized garnets at Gore Mountain (and not much else because the fog was so thick) and because I was lax in collecting the three rock samples I was supposed to pick up for later study in the lab. On the return trip to Binghamton we stopped at a fast-food restaurant, and Rosemary decided to have a talk with me about graduate school. This was followed up by other appeals. Then, in the fall of my senior year, I was notified of my selection for a NAGT summer field assistantship and realized for the first time that it might be possible to make a career out of science. Although this seems like a minor point, it was actually large. Having grown up without ever knowing personally a professional person (other than the family doctor), it had never occurred to me that I might become a scientist; it seemed about as remote a possibility as that I might grow up to be a Martian.

So I did go to graduate school, and for no apparent reason I chose a place that suited me very well. I would like to start my explicit "thank you's" here, but first I want to mention another decision that I am proud of—the one of a Ph.D. thesis topic. At Caltech one was allowed, if not encouraged, to shop around for a thesis project. I took this quite literally and started the task from ground zero. I had worked on some research in my first year, but I decided not to let that constrain me. I wanted to do the best thesis possible; preferably one that would be in a sense "bigger than I," one that I would have to live up to. Needless to say, this thought resonated with Jerry Wasserburg's views, and I think we both recognized this.

For graduate students generally, I think it is important to challenge their potential advisors with questions like: "Is this problem really so important that I should commit four years of my life to it?" Of course, they had better have their own answer to the question as well! However, the other problem is to have the experimental and analytical facilities necessary to really advance the field, and these were available in Wasserburg's laboratory and at Caltech in general.

I am, of course, deeply indebted to Jerry Wasserburg. Not only for his philosophy of science, but for his concern and attention, and personally as an intellectual father. I am also in debt to Dmitri Papanastassiou, for his insistence on technical perfection and for his thoughtful advice on many matters that became critical to me after I left Caltech. More in relation to this occasion, my interest in igneous petrology comes largely from Lee Silver and Hugh Taylor. Lee Silver's infectious dedication to and love for Earth science, and his appreciation for its breadth and complexity, have benefitted many of the students who have passed through Caltech. It is largely because of him that I feel comfortable (perhaps unjustifiably) being in the field with igneous thoughts on my mind and a hammer in my hand. Hugh Taylor passed on the tremendous ex-

citement of attacking petrologic problems with new tools and provided a model for an isotope petrologist that many of us have tried to emulate. He exemplifies the broad knowledge necessary in order to attack the problems of igneous rocks, but at the same time has demonstrated the power of reducing the complexities to a set of simple rules.

Over the past several years I have become friends with Frank Richter, Ed Stolper, and Ian Carmichael. Each has enriched my life in his unique way. And now that we have all become interchangeably petrologists, mineralo-

gists, geochemists, and geophysicists, there may be great things in store, or much to fear! But in any case I would be proud to be counted among their friends. The rapid rate at which I find myself learning whenever they are around is a source of continual stimulation.

Lastly, I want to thank my wife, Lynn, for her many contributions to my enjoyment and appreciation of life, and her significant contributions to my research as well. The future may not turn out to be all roses, but it looks sufficiently like it at the moment that I use it as a working hypothesis.

## NOTICE

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