PRESIDENTIAL ADDRESS

REFLECTIONS ON ONE HUNDRED YEARS OF SERVICE TO THE STATE BY THE SOUTH DAKOTA ACADEMY OF SCIENCE

Address to the South Dakota Academy of Science
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Steven L. Matzner
Augustana College
Sioux Falls, SD

Have you ever wondered how you came to be at a particular place and time? What myriad of seemingly innocent events conspired to land you in your current situation? Prior to 1975, the "Presidential Address" was given by the outgoing president rather than the incoming president; outgoing president Jack Saunders suggested changing that practice in his 1975 address and in 1976 the incoming president gave the address. Without that change, I could be sitting with you in the audience, comfortably thinking I have a whole year yet to worry about this speech. On the other hand in 2013, the South Dakota Academy of Science was canceled because of the "freak ice storm" in Sioux Falls. This prevented the vote on electing a new president, resulting in Gary Larson being one of the relatively few people who were president for two consecutive years. Without that ice storm, I would have given my presidential address last year and would also be comfortably sitting in the audience right now. Of course, if I really want to place "blame" on my current situation, I don't have to look any further than a couple of chemists. In 2011, I did not attend the Academy meeting for the very good reason that I was on sabbatical in New York with my family. Dr. Miles Kopang was on the executive committee and they needed a 2nd vice-president and apparently he thought of me. Now, at this point he could have contacted me or sent me an email, but that is NOT what happened. No, Dr. Kopang called a fellow chemist, my wife Dr. Jetty Duffy-Matzner, and my wife has a LONG history of "volunteering" me for things. Those are just a sample of the web of interesting events that has conspired to result in my having the honor of giving the presidential address for the 100th anniversary of the South Dakota Academy of Science.

When I teach photosynthesis, I usually talk about the eighteenth century English clergyman/scientist Joseph Priestley. He reported that he "accidently hit upon a method of restoring air that had been injured by the burning of candles". He was burning candles in an enclosed glass container "which would injure the air" (the candle would go out). He found that putting a living sprig of mint into the container with the injured air for 10 days (I suspect he forgot about it) would "restore the air", and that this restored air would "not be at all inconvenient to a mouse". Let's think about that for a second. He obviously had some experience

in knowing that the injured air WAS inconvenient to the mouse. I don't think he would have received IRB approval for this. For his work however, Priestley was awarded a medal that stated "For these discoveries we are assured that no vegetable grows in vain…, but cleanses and purifies our atmosphere."

I like this story because the work of Priestley illustrates the importance of scientific discovery as service to humanity. This theme of service has long been a theme of the Academy. In perusing presidential addresses, I would say that about 1/3 of the addresses had a theme of service to the state of South Dakota, to our country and/or to humanity. In his 1916 address, the first president of the Academy, Dr. Hilton Ira Jones noted that "Scientists work for appreciation more than money and I find that that is the very thing that is generally lacking in most of the schools of the state." He went on to say that in South Dakota the "call is to real work with real things-to solve the bread and butter problems of a state." Gregg Evans continued with this theme in his 1937 address saying that "the great Pasteur made his name immortal by solving the immediate, necessary problems of his community and state. We cannot all be Pasteurs, but we must do, through the years to come, all in our power to solve the grave problems facing our state.

How exactly did the early Academy envision serving the state of South Dakota? In her 1973 address, Sister Veronica Fasbender of Mount Marty College summed up the three main goals of the early Academy as "the upbuilding and industrialization of the state, the development of resources for the improvement of science teaching, and advising the governor and state legislature in scientific matters. Indeed, as N.E. Miller's address in 1980 stated, the "early years were filled with inventories of the state's resources and lofty expectations for the use of these resources for the betterment of all." For example, J.W. Parmley's 1921 paper on "The undeveloped possibilities of electricity in South Dakota", called hydroelectric power "the one great development project in our state today." It wasn't long however, before calls for the development of the state's resources were supplanted by calls for conservation of the state's resources. In his 1934 article, "The return of the deserts", J. Gladen Hutton passionately stated his concern for the issue of soil conservation, "for 25 years I have been crying out against this ruinous process, but in most cases have been met with gibes and jokes and even sneers, on the part of the people who should be concerned with the welfare of the people of the commonwealth. They have said "oh the soil will always be with us. We can study it when we have more money, when the taxes are not needed for something else." Concern for the environment has been a notable theme in several presidential addresses. James Schmulbach suggested in his 1977 address that the South Dakota Academy of Science should consider being the "legal guardian of the South Dakota Environment". In 1982, Theordore Van Bruggen said "Ecology will ultimately engulf economics. We must move away from the values of growth, profligacy, and exploitation typical of "economic man", toward sufficiency and frugality." One can hope that on the issue of climate change today that our political leaders (and I use the term leaders loosely) will understand that the long term environmental costs must trump short term economic gains. As was illustrated in the March 17 Argus Leader article "School science standards ignite debate", we are not even to the point of debating how to solve the problem

of climate change, we are still fighting the battle in the state of South Dakota over whether climate change and evolution even exist as real topics to teach.

The Academy has long been embroiled in issues related to education in the state of South Dakota. Of about 66 presidential addresses that I perused, 22 or about 1/3 were directly about some aspect of teaching. In his 1939 address, Ward Miller stated that teaching science was also about making good citizens. He stated that "science contributes not only to a student's technical background, but as well to his cultural background for serviceable citizenship." He also noted that we are asked to do this for an "increasing number of students" and "without corresponding increase in funds." An issue that perhaps still resonates today. Despite all efforts being focused on the war, in his 1942 address, Henry Lowsma found it important to remind the Academy of the importance of teaching. He said that "at the present time our scientific efforts will be directed toward winning the war. During this period our youth will continue to grow. Their training cannot be neglected." Lowsma also said, just a few years before dropping atomic bombs on Hiroshima and Nagasaki, that "the products of science may be used either for man's benefit or woe". Prophetic words.

In 1960, V.R. Nelson eloquently summed up the importance of science teaching. "Let us join together to raise the teaching profession to its rightful place of pre-eminence in American life. Let us impress the public with the importance of science to the security, economy, and health of our nation." Charles Vaughn echoed these sentiments in 1962 saying "the greatest responsibility of the Academy is to the people, especially the youth of today, who will be the citizens of tomorrow."

Most recently Gary Larson in his 2012 address highlighted the inadequate funding for K-12 education in South Dakota and noted that South Dakota was last in teacher pay. South Dakota is still last in teacher pay and the problem appears to be getting worse. In the April 2, 2015 article "Teacher openings: Here's the perfect storm", the Argus Leader reported that there were more teacher openings in March (by about 100) than in any month in the last 7 years and that job openings typically peak in April.

Perhaps our greatest success in the last 100 years has been the effect that the Academy has had on fostering collegiality and collaborations among South Dakota science teachers and researchers. Personally several of my research collaborations have been the result of timely encounters at the academy. In his opening address, Dr. Hilton Ira Jones noted that "there have been a few great hermit scientists" but "I know of no first rate ones that still survive". He went on to say "the pall of this country to me has always been the interminable stretch of miles that lay between me and anyone else that knew enough of the problem I was working on to appreciate what I was trying to do or to sympathize." I think we can all relate to that. He went on to say that "prolonged isolation and lack of initiative produce stagnation and mental atrophy." "Few scientists do good research without outside stimulus." To break down isolation and stimulate research is the second great function of an academy like ours." Aside from some lean years from 1928-1934, the South Dakota Academy of Science has consistently produced a proceedings each year. The proceedings are all online at the SDAOS website

which made putting together this talk so much easier and pleasurable. This was no small endeavor and is an important accomplishment.

If breaking down isolation and stimulating research has been perhaps our greatest success, the dream of the early founders of the South Dakota Academy of Science as advising the governor and state legislature on scientific matters has been perhaps are greatest unrealized expectation. N. E. Miller summed up the Academy's unrealized expectations in his 1980 address by saying that "the history of the academy is a bittersweet tale of muted aspirations whose outline is still discernible as one reads the proceedings." It would not be hard to become disillusioned with our lack of progress on being consulted on scientific issues by the public and with our state government. I read with relish the presidential address of Charles Estee in 1957 who said "Perhaps it is time that we caused a little trouble. Perhaps it is time that we members of the scientific community use the Academy to state in a firm clear voice that we as scientists speak for the age in which we live; to demand that we be heard, for unless we stress the facts of our existence in this world today-unless we publicize the dependence of our very form of government upon our scientific technology-tomorrow our troubles as a nation may be far greater than those today. And as we hear the cries of those who deplore our age of science, who despair at the necessity of dealing with truth, of gathering, analyzing and justifying facts, perhaps we as individuals and as a society should cause just a little trouble and demand that our side likewise be heard." We as scientists often lament our ability to communicate to politicians and the public about important issues. It is true that as scientists we could improve our message, but it also doesn't matter how good the message is if no one is listening. As stated by Jack Saunders in his 1975 address "several President's, Ballew among them, have announced to state government the availability of the academy to provide assistance by way of research or as an advisory body," and "the state government hasn't come to us for help!" The Academy is probably the most highly educated and largely ignored group within the state. I find it ironic that in a state where the teaching of evolution is objected to largely on religious grounds, that the history of the Academy in being a voice on scientific issues within the state has similarities to Old Testament prophets. From warning of environmental degradation to the funding of education, the Academy has been like a voice crying in the wilderness, largely unheeded, unheard. I am reminded of Jeremiah, speaking for the Lord telling the people of Judah "your ancestors refused to listen. They were stubborn, and whenever I wanted them to go one way, they always went the other. You have ignored me and become even more stubborn than your ancestors ever were. I am reminded also of Nehemiah, who wrote "you brought them into the land" and "blessed their nation". "In spite of this they rebelled and disobeyed your laws. They killed your prophets who warned them." Perhaps it is my upbringing, but I actually find this comparison comforting. Yes, it is discouraging when no one is listening, but our obligation to speak the truth about important matters is no less diminished.

What can we expect in the next 100 years? I expect the Academy to continue to advocate for best science teaching practices. I also expect that we will continue to be limited by funding. Somethings never seem to change. I expect the Academy to continue to provide a venue for the presentation of research. But

the recent declines in both full author papers and memberships require us to reconsider how we do that. I became involved with the Academy because of the mentorship of faculty at Augustana. Those of us involved with the Academy need to be mindful of recruiting the next generation of scientists. There is pressure on younger scientists to publish in journals with a higher impact factor and attend national meetings rather than a regional meeting. Perhaps we can reach out to citation indices to try and make South Dakota Academy of Science a more attractive publication venue. Also, networking and collaborating with other scientists within the state has its value. It can be as difficult to maintain an effective long distance research collaboration as it is to maintain a long distance romantic relationship. The recent participation of NIH BRIN supported undergraduate researchers significantly increased membership numbers and livened up the proceedings. We need to continue to reach out and connect with our fellow scientists in the state involved with NIH INBRE, NASA EPSCoR and NSF EPSCoR to look for opportunities where the Academy can be a resource for these groups. In particular, we need to ensure the Academy is a venue for undergraduate research to be presented.

I expect that scientists and the Academy will continue to speak the truth on issues such as climate change and evolution. Recently, I have been co-teaching classes on the ethics and economics of food. I have come to have grave concerns about an agricultural system that is increasing relying on trying to maintain monocultures. As Charles Estee stated, "perhaps it is time that we caused a little trouble". I expect we will continue to struggle with getting the public and politicians to listen to us. But our obligation to engage the public and speak the truth about important scientific matters is no less diminished. Thank you.

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