

Citizen Science and Our Democracy

The theme for the National Center for Science and Civic Engagement's 2009 Washington Symposium and Capitol Hill Poster Session was "citizen science." The term usually describes the observation and data gathering activities of ordinary people, often working from or near home, and assisting a research scientist or team in a project. We were interested in a slightly different meaning of the term, however—one that would invoke scientific literacy and numeracy as essential capacities for citizens conscientiously engaged in a modern democracy.

We asked: What do we really need beyond a basic understanding of the scientific method, or discrete mathematics, or elementary statistics, to make sense of the complex civic questions we face today and will face in the future? More fundamentally, though, we wanted to explore what scientific practices and democratic practices have in common. How are the two "projects" related? And what should we do to encourage each to reinforce and strengthen the other?

For help in thinking about this, we turned to one of the handful of citizen scientists currently serving as a member

of Congress, Representative Rush Holt of New Jersey. A thoughtful public servant who formerly worked in the Plasma Physics Laboratory at Princeton University, Holt graced our meeting with an original, nuanced, and encouraging address. He reminded us of the common roots of science and democracy in the Enlightenment. He reviewed the critical role that science played in what I have elsewhere called "the making of our democracy." Echoing C.P. Snow's critique of more than 50 years ago, he lamented the separation of the scientific and non-scientific communities into "two cultures." Lastly, he suggested how we might begin to bridge these gaps.

We asked Mr. Holt for permission to transcribe his remarks and to include them in this issue. The man whose campaign bumper stickers playfully assert, "My Congressman IS a Rocket Scientist," kindly assented and we are pleased to present his thoughts to you.

—*Wm. David Burns*
Executive Director, NCSCE

Representative Holt's Remarks

I'm really pleased to recognize the role of Rutgers in sowing the seeds for this SENCER program. It is, I think, tremendously important.

I'm delighted to see you, and to see your posters, and to hear about the programs at the various universities, and to run into some old friends like Will Dorland from Maryland, who was at the Plasma Physics Laboratory when I was assistant director there at Princeton.

This is almost to the day the 50th anniversary of C.P. Snow's address on "The Two Cultures." Snow's was an interesting observation at that time, but the cultural divide Snow described has turned into, at least in this country—and I would venture to say in other countries—a critical problem that, I think, puts us at risk in a number of ways as a society.

C.P. Snow, a chemist, government advisor, novelist, and otherwise diversely-oriented person was talking about England 50 years ago. But his analysis applied equally well to the United States, because at the same time we launched—and "launched" is the right word following the launch of Sputnik—into an education program in the United States that really did divide our society into the two cultures of scientists and non-scientists. This divide persists to this day.

Following Sputnik, we set in place an educational system that was intended to produce a generation of scientists and engineers the likes of whom the world had never seen. Our initial motivation was fear and our justification was national defense. And indeed, we have produced generation after generation of the world's best scientists and engineers.

However, we have relegated them, or allowed them to relegate themselves, to a compartment of our society, of our economy, and of our political world, and we have relegated everyone else to the extra-scientific area. That's dangerous. So it was music to my ears, really, when President Obama, in his inaugural address this year said, "We will restore science to its rightful place."

Now, he made this promise in a section of his address dealing with the economy. And of course, the theme of his inaugural address was, "We're in deep trouble, economically." The President was making the point that investment in science is important for us to be able to grow out of our economic problems.

But that statement—that we will restore science to its rightful place—is much richer than to say that science produces jobs. Of course, science does produce jobs, which it does,

even in the short term. That is why it's great that there is a lot of money for science in the economic stimulus bill that was passed by Congress and signed by the president. It provides \$22 billion of new research money.

But the president was saying a lot more than that science creates jobs in the short term. He was also saying that science creates jobs, productivity, and economic sustenance in the long-term. And he was saying quite a bit more than that, when he said we will restore science to its rightful place.

He said that we will do away with the kinds of censorship and stifling of science—ideological stifling of science—that has undermined a basic principal of the United States. The United States has had, over the centuries, really until roughly fifty years ago, a very scientific bend. It was not a coincidence that the guys—and they were guys, sorry to say—who wrote the Constitution called themselves in many cases, "natural philosophers." Back then, that was the equivalent of our word scientist today.

The founders were thinking like scientists; they were asking questions so they could be answered empirically and verifiably. That's what science is. It is a system for asking questions so you can answer those questions empirically and in a way that others can verify your empirical tests for those answers.

Every shopkeeper, every farmer, every factory owner throughout American history has had this scientific tradition. It was common for Americans to think about how things work and how they could be made better and made to work better.

We're at a time now where, if I talk to most of my colleagues in Congress, most of your colleagues at the college or university, or any American on the street, however well educated, however able, however smart, they will likely say, "Oh, science, oh no, I'm not a scientist. I can't understand that, that's not for me."

And thus we are deprived of the scientific way of thinking. The scientific way of thinking is important not just for developing new technologies, but for creating the kind of self-critical, self-correcting, evolving society we need to create. The whole balance of powers in our constitution, the whole idea of openness that we embrace as a democracy, these are very scientific in nature.

It is so important that we try to bridge this chasm, merge these two cultures, so that no educated person in America would ever say, "Oh, that's science, I can't think about that."

Your courses are so good because you work at from both directions. Much of my career has been as a teacher, and any

teacher will tell you, the first challenge is motivation. You know, there is nothing you can teach. That's the dirty little secret that faculty members sometimes learn. You can only help students learn.

Students have to have some reason to do the work, a purpose for learning the material. You provide that purpose in many cases by reminding them that learning has to do with the quality of their life in areas that they may never have thought had anything to do with science. You have shown them that they don't have to wear lab coats or do equations in order to bring a scientific understanding, and more important, a scientific frame of mind, a kind of questioning attitude, to their lives, their work, and their roles as citizens.

Looking for empirical answers and independent verifications is essential to help find the answers to the important questions in daily life, whether it's trying to decide what kind of soap to buy, or what kind of college to attend, or what kind of candidate to vote for. In what you do in your courses I see an attempt to provide for students that very kind of motivation.

But you also are working at it from the other end, nudging the scientists to move out of their culture. You are helping scientists understand that non-science students at the university—and the 80 percent of the American population who say science is not for them—are not just a necessary nuisance in their lives, but really the whole reason that we practice science.

Why do we practice science? So that we can have a better quality of life, so that we can understand how the world works, get along with each other, and provide for the needs, and not just material needs, the needs of the people and society.

You know, I'd like to say that President Obama thinks like a scientist. He might dispute that, but I see it in how he conducts meetings. I see how he asks questions in a way that they can be answered empirically with evidence. He asks questions with an open mind, recognizing that the answer to the question must necessarily be regarded as provisional. You know every scientist—every physicist anyway—has somewhere in the back of his mind or her mind that whatever it is you think about how the world works, how this subject works, what is known about plasma physics or planetary science, is

provisional. There might just be a patent clerk in Switzerland who has a little different idea or maybe even a very different idea. And empirically, some day that patent clerk's ideas might supersede everything you thought you knew.

It is this kind of thinking that has made science so successful. Science gives a kind of reliable knowledge, provisional though it may be, that allows people to improve their lives.

It is this kind of thinking that allows citizens to improve their government. It is why we are the oldest surviving constitutional government in the world, because the authors were thinking like scientists, and they set up a system that allowed us to keep thinking like scientists.

Every business major and English composition major that you bring in to your classes is not just someone who can have the beauties of science unlocked for them in a small way. It may be that this student will be the citizen who will help move our society along through scientific thinking.

You are doing a favor for each faculty member you nudge out of her or his narrow specialty to be exposed to the great unwashed non-science student body. You are doing a great favor by reminding them their science is all about. They're not doing science for their own esoteric entertainment. A few might be, but that is not why the National Science Foundation puts out billions of dollars a year. That is not why this Congress is interested in science. We are interested and making investments because of what this means for our society and the welfare of all of these people who are in this nation conceived in liberty and dedicated the proposition, that all, not just those who did differential equations, or you know, spectrophotometry, are equal, and deserve the benefits of our society.

So what you are doing is the missing link between things that the NSF, and the NIH, and NIST and others have funded for years. And what all the rest, the 80 percent non-scientific society have not only been deprived of, but have ignored for all these half-century, roughly speaking.

So thanks for doing what you do. I hope you understand the importance of what you are doing. I certainly do. And I thank you very much.