

Who Needs Science?

This morning marks the 18th time you long-suffering folks have listened to me on a Sunday morning. I say this not to accentuate your misery but simply to make a point. I speak today impelled by a combination of anger and deep concern. On only one other occasion have I spoken here similarly provoked. That was in November of 2012 and reflected the fact that at no time in the 2012 Presidential campaign did I hear or read a single comment on climate change. I found that unconscionable. As a result, I determined to present at least a few facts to this fellowship. As you are well aware, that talk shortly gave birth to the Climate Change Coalition - an effort you have been very supportive of.

Today my topic is clearly related to that discussion six and one-half years ago. We all need to have some understanding of science and scientists. I have no doubt this fellowship understands the need for and importance of science. That is not my concern today. My hope is that these following remarks will 1) give you something to think about and 2) perhaps provide one or two thoughts you may choose to share with your families and friends at an appropriate time or occasion.

The United States is an unique country in many respects. Presumably we're a scientifically advanced country. The US has garnered far more Nobel prizes than any other nation. Our society could not function without its overwhelming reliance on computers. Each Sunday morning we in this fellowship are reminded to turn off the computers many of us carry in our purses or pockets. Most of us would feel seriously handicapped without these electronic marvels. But, having said that, for a variety of reasons many US citizens simply don't accept what scientists tell us is true. The level of denial whether it pertains to the safety and efficacy of vaccines, the fact of evolution, or the truth of climate change marks the US as an outlier in the developed world. Of course, our current administration in Washington doesn't help.

We not only don't believe, we fundamentally don't understand or trust the scientific method, how scientists work or the value and importance of science. Jonathan Foley, the former Executive Director of the California Academy of Sciences, has written, "The war on science is war on America's future." I trust most UUs understand this. As we know, one of our seven principles promotes "a free and responsible search for truth." In a brochure entitled "What do UUs Believe?" we read, "the authority of reason and the never-ending search for truth."

Yet, far too many people in this country and perhaps many of us don't understand how science is conducted. Many published papers have multiple authors often residing in different countries. We don't understand how results and interpretations are subjected to often fierce internal and external reviews and critiques. We do not understand how very conservative the great majority of scientists are, not necessarily in their private political or social beliefs, but in their public pronouncements and their written reports. In short, we don't understand science and we don't know or trust scientists.

The American Association for the Advancement of Science, better known as the AAAS, has remarked that scientists in this country "are essentially invisible." To support this statement, it goes on to say that only 30% of Americans can even name a living scientist. Only 44% are able to name a place where research is conducted." Frankly, I find that situation both incredible and truly alarming.

To emphasize our lack of scientific understanding I would like to share a personal story. Unfortunately, I will need to provide some background for it to be understood. More than 20 years ago President Clinton's administration adopted a very ambitious and far-reaching plan affecting 24 million acres in Oregon and Washington. The intent was to safeguard what little remained of that region's heavily logged old-growth forests and to protect its imperiled wildlife. It was crafted to hopefully be a ceasefire to end the often bitter timber wars that crippled the region's economy in the early 1990s.

However, this situation exploded into a full-blown economic and political crisis. Federal judge William Dwyer had issued an injunction that shut down logging in the Pacific Northwest old-growth forests thereby throwing between 60,000 and 100,000 people out of work. Think of that! The Northern Spotted Owl, an endangered old-growth dwelling bird whose population had been decimated by aggressive logging practices, became the "poster child" or "poster bird" of the timber wars and served as a proxy for many other old-growth dependent species. As you can well imagine, many logging-dependent families had no use for owls and even less use for the Clinton administration and the U.S. Forest Service. These folks wanted their jobs back.

I want to pause here for just a moment to try and insure I don't confuse you with some titles. The President's cabinet consists of the heads, called secretaries, of the various executive departments. Thus we have the Secretary of Defense, the Secretary of State, and for our purposes this morning, the Secretary of Agriculture. These Secretaries are the most powerful Presidential appointees outside of the White House. The Secretary of Agriculture is responsible for many agencies including the Forest Service. The Forest Service is a large agency headed by the Chief. Thus we have the Forest Service Chief, who is responsible to the Secretary of Agriculture who is, in turn, responsible to the President.

The White House, the Secretary of Agriculture, and the Forest Service were regularly taking a beating in the press. One day my secretary walked into my office and told me the Chief wanted to see me. I asked if she knew the reason for the call. She had no idea. So, I paid a visit to the Chief whom I had known for some time. The Chief told me that he had just received a call from the Secretary of Agriculture. The Secretary was growing tired of the continuing negative press and told the Chief to send someone over to his office to explain the importance of "That Damn Bird" and, in general, lay out what research the Forest Service was conducting and why the Service wasn't doing more to get some answers. I was the lucky messenger.

So, I returned to my office, collected my thoughts for a few minutes and proceeded to walk across Independence Avenue to the Secretary's office complex. As I approached his office an Assistant Secretary intercepted me and explained that the Secretary had just been called to the White House and he had asked her to meet with me. I didn't know her and she didn't know me. She was pleasant enough but several facts became very clear, She had a boss, the Secretary, who was not happy. Further, neither he nor she knew much about how scientists work and how impractical it was to substantially and immediately redirect and augment the focus of an on-going multi-million dollar research program which was what they would have liked the Forest Service to do. I tried to carefully and respectfully explain the kinds of research we were conducting involving the work of several dozen agency scientists plus University profs and grad students supported by federal dollars. Not only was a massive redirection impractical but even if it could be done it wouldn't show any results for at least several years. She listened, asked a few more questions and then I asked her if I could share a brief story. She agreed and this is the story and the point I hope to leave with you today.

Some time ago a prominent Swedish research physician wanted to expand his laboratory. So, he wrote a grant proposal and sent it to a fairly new Swedish foundation, the Wallenberg Foundation which, by the way, is flourishing today. Now, those were simpler times and shortly after submitting the proposal Mr. Wallenberg himself paid a visit to the good doctor. The resulting conversation went something like this.

“Dr. _____, I understand you wish to build a new laboratory.”

“Yes, I do. I need more space, more sophisticated equipment, and more help.”

Wallenberg looked directly at the physician. “If we give you the money, what disease will you cure?”

“I won’t cure any disease” the physician replied. Pause. “But do you have a watch?”

“Well, yes,” Wallenberg replied, glancing at his watch.

“And if your watch stops, what will you do?”

“I’ll take it to a watchmaker to get it repaired.”

“Why a watchmaker?”

“Well, the watch maker understands how watches work and thus knows how to repair them.”

“That is precisely why I need a new laboratory. I need to better understand how the human body works so that I and others can more effectively repair or correct the body when something goes wrong.”

Wallenberg looked long and hard at the physician. Finally, he said, “I understand. You shall have your money.”

Here’s the point. Neither the Ag. Secretary’s office nor the President of the Wallenberg Foundation, at least at first, understood how science and scientists work and what guides their research. You may recall that President Nixon declared “war” on cancer December 23, 1971. That’s almost 50 years and billions of dollars ago. And this “war” hasn’t been won yet. Yes, we’ve made progress but the plain fact is that we still don’t understand many aspects of this disease. Many problems, not just medical problems, require intensive research over many years by scientists of many different disciplines. There are rarely any shortcuts.

And, speaking of shortcuts, in the interest of time I will omit one of the three stories I was going to discuss this morning. Thus my second and final story is a real life, magnificently successful “bug” story. It is also an excellent example of how the public can be easily misled about the conduct of science and why it is so important to trust and support scientists even if you don’t understand what they are doing or why they are doing it.

I would guess most of us are unfamiliar with the screwworm fly that feeds on healthy flesh in the wounds of animals. It’s scientific name, which I won’t repeat, literally means “the snail-like fly that devours people.” How’s that for a lovely-sounding beastie? Screwworms do sometimes attack people but they more often attack cattle along with other domestic and wild animals.

During her lifetime, a female fly may lay over 2,800 eggs in masses of up to 400 near a wound on an animal. This wound may be nothing more than a tick bite or a nick from barbed wire. The maggots that hatch one day later enlarge the wound as they devour the healthy flesh at its edges. As the wound grows larger, it attracts more and more egg-laying females and grows ever larger. Without intervention, the result is often death. Screwworms once attacked tens of thousands of cattle and other animals in the United States each year. The only cure was the prohibitively expensive and time consuming procedure of searching the range for each infested cow and smearing its wounds with an insecticide ointment. The occasional human cases were gruesome. A text on medical entomology shows a photograph of a man whose face was almost entirely eaten away by screwworm maggots as he lay unconscious in a field for several days.

When Edward Knipling and Raymond Bushland, two US Department of Agriculture scientists, set out to control the screwworm, they went back to fundamentals rather than relying on insecticides. One of their first projects, and this was a stroke of genius, begun in the 1940s, was a study of the sex life of the screwworm fly. This is a classic example of how important it is to ask the right questions. They didn't start their research by searching for the most effective insecticide. They started their research by seeking to understand mating behavior or, if you will, the flies' sex life. Now, let me stop right here. How do you imagine the average man or woman on the street would react if asked whether they supported the expenditure of federal dollars to study the sex life of a fly? How would you react? Would you be savvy enough to ask a few questions before leaping to a probable premature conclusion? Fortunately, Wisconsin Senator William Proxmire was not yet around to jeopardize their federal support with one of his infamous Golden Fleece awards meant to ridicule scientific research that seemed completely ridiculous to him. Proxmire was trained in business administration and seemingly had little or no interest in understanding science or scientists.

Now, bear with me for just a few minutes. Knipling and Bushland soon discovered that screwworm males mated many times but females mated only once. Now, some of you may be thinking "Isn't that just like many typical males?" But, not so fast. No one had ever asked that question before and it was absolutely key. Why was that so important?

Here's why. Males, could be raised by the millions in the laboratory where they could also be quickly and easily sterilized with radioactive cobalt and, crucially, they remained sexually active. Females that mated with a sterilized male did not mate again and laid only infertile eggs. Now this x-rated sex lesson gets conclusive. During the winter of 1958-59 hundreds of millions of sterile males were released from aircraft on 85,000 square miles in Florida. No people were bothered by them because they were released at the rate of only 200 per square mile per week. The last screwworm to be seen in Florida was found on February 19, 1959, just a few months after the start of this campaign.

Previously, winter weather had wiped out all the screwworms in the Southeast except for the population in southern Florida, but every summer they reinvaded the rest of the Southeast, usually transported on infested cattle and often appeared as far north as Illinois. The cost of the control program was \$10 million but at that time the yearly loss to screwworms in Florida alone was \$20 million. The subsequent eradication of screwworms from the Southwest United States freed the entire country of them and has saved our economy billions and billions of dollars - all because two creative scientists had been allowed to study the sex life of a fly. That is why it's so important that the American people, including the politicians, have some understanding of the need to support scientific inquiry.

For their work, Knipling and Bushland were awarded the 1992 World Food prize plus a similar award from the Japanese government. There is also the Kipling-Bushland U.S. Livestock Insect Research Laboratory in Kerrville, Texas.

Now, a few concluding thoughts. "Scientists work with a deep sense that their quest for reliable knowledge leads somewhere - that following the evidence and excluding bias help to make sense of the world." Can science or scientists answer all our important questions? Of course not. Einstein recognized this when he commented:

Religion without science is blind.
Science without religion is lame.

I get asked a fair number of questions about “bugs” and I thoroughly enjoy these opportunities. But occasionally someone will come up to me and comment, “You’re a scientist so explain this to me...” what follows is a question about anything, but rarely is it about insects. Sometimes I can help but not because I’m a scientist but simply because I read a great deal. Carl Sagan once reminded us that “Science is a way of thinking,” in other words, asking the right question, “much more than it is a body of knowledge.

”Science is key for our nation’s survival. Federal dollars in support of science have been declining since 1990. Do we care? Is there any good news concerning our nation’s understanding of science and scientists? Yes, thankfully, there is. First, when asked to draw a scientist, school-age children are increasingly sketching women. In the 1960’s and 70’s less than one percent of students depicted scientists as female. By 2016 that had risen to 34%. And, among only girls the figure has risen from less than one percent to more than 50%. One more example of good news. Nine new members of Congress are scientists - eight in the House and one in the Senate. They include an ocean expert and biochemical, industrial, and nuclear engineers.

Now, we can’t all be scientists. Thank the Good Lord for that. But what all of us can do is to support those groups, those people, those politicians who are working to preserve our environment, our health, our safety, and, I would submit, our humanity. I am deeply troubled by our nation’s lack of understanding and support for the scientific enterprise. But I am hopeful of a better future.

Our “democracy requires a citizenry that is informed, as well as engaged. We must find” a way “to reinforce among citizens a renewed appreciation for evidence” and the necessity to support its development. Scientists have a responsibility “to communicate that evidence-based thinking is available not just to scientists” but to all thinking people. We are all entitled to our own opinions. We are not all entitled to our own facts.