"WELL, I THOUGHT I MIGHT LEARN SOMETHING:" GOING BEYOND THE LIMITS OF SCIENCE

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When the National Science Foundation first authorized funding for SENCER eight years ago, its goal was to raise the level of public understanding of science by linking undergraduate education in the sciences with pressing issues of public interest. In the words of the SENCER ideals, the study of "complex, capacious and unsolved problems of civic consequence" would be the means by which students would acquire a stronger comprehension of science. That goal is embodied today in SENCER Summer Institutes like this one and in more than thirty-five (35) SENCER model courses on such topics as "Biomedical Issues of HIV/AIDS," "Energy and the Environment," "Sustainability and Human Health," and"Human Genetics." As the SENCER ideals put it, this kind of science education is the best way for undergraduates to discover "the power of science by identifying the dimensions of a public issue that can be better understood with certain mathematical and scientific ways of knowing."

From where I sit, the money has been well spent. Over the past several years I have participated in five (5) different courses in which SENCER principles have been put to work, and a sixth is on my schedule for the upcoming academic year. I am especially looking forward to that course, because my experiences with this type of teaching have been uniformly positive and rewarding. Even as the non-scientist on the teaching team, I could see that civic issues engaged students' interest in science at a high level, and that the students ended up learning the science

well. Perhaps because I was the non-scientist on the teaching team, I also noticed something else too. In keeping with the SENCER ideals, students learned about the power of science, and they also discovered the limits of science. They were exposed to what the sciences can do, and what they cannot. As the third of the SENCER ideals puts it, this way of teaching "helps reveal the limits of science by identifying the elements of public issues where science doesn't help us decide what to do."

This evening I would like to invite you to join me in a conversation about the limits of science. I'd like for us to give some thoughtful consideration to the fact that in every "complex, capacious, and unsolved problem of civic consequence" there are elements "where science doesn't help us decide what to do." I bring up this topic because I want to suggest some practical ways for us to recognize and understand the limits of science, so that we can transcend them. In each of the SENCER courses with which I have been involved, arriving at the limits of the science has been not the end, but the beginning. The most important learning has taken place when we have arrived at the boundary of what the science could tell us, and then kept going. In every case, crossing that horizon has been the gateway to discovery.

Last spring, for example, a biology professor and I led a discussion in her introductory biology course on the topic of public funding for embryonic stem cell research. The students had already learned the basics of the biology of embryonic stem cells, and in this class session they read illustrative examples (taken from major newspapers) of arguments both for and against public funding for embryonic stem cell research. In an interdisciplinary workshop format, students analyzed the rhetoric of the arguments pro and con. The first discovery came when they realized that neither side was arguing on the basis of the science alone. Both sides were also making substantial use of humanistic values – ethics, philosophy, religion, and politics – in order

to make their point. Biology, the students saw, only tells us what we *can* do with embryonic stem cells, not what we *ought* to do with them. In order to evaluate the strengths and weaknesses of arguments for and against public funding, the students were going to have to make use of non-scientific ways of knowing. So that's what they did. And their second discovery followed pretty quickly: the debate about public funding was not (as it was often portrayed) a conflict with science on one side and religion on the other. It was a conflict in which religious convictions were operating on *both* sides.

Specifically, one side opposed public funding with arguments based on religious ideas from the Bible, especially the book of Revelation. In these arguments, embryonic stem cell research was depicted as part of a frightening story about humankind's slow descent into a hideous fate, in which (as one opponent put it) "human life will be reduced to a commodity." Like the apocalyptic visionary who wrote the book of Revelation, opponents of public funding warned us to repent before it was too late. In their view, public funding for this kind of research would be the point of no return toward a grim and inhuman future. That ancient story of the apocalypse is deeply rooted in our cultural history. It has been updated many times, in (for example) the Frankenstein story or (more recently) in the Matrix films and in Al Gore's "An Inconvenient Truth." Despite variations, the old plot line is essentially unchanged: humankind is heading in the wrong direction, and unless we turn back now, it will be too late. Opponents of public funding for embryonic stem cell research looked at the science through a religious lens and decided that it did not measure up to their moral vision.

But religious lenses were being used on the other side as well. Although proponents of public funding sought to conceal this fact, their arguments also drew heavily upon religious ideas from the Bible, in this case from the book of Exodus. In these arguments, embryonic stem cell

research was depicted as part of a heroic story about humankind's brave journey toward a promised land where (as one advocate put it) "the word 'terminal' will disappear from our vocabulary." Like Moses in the Exodus, proponents of public funding for embryonic stem cell research summoned us to "come go with them" to a land flowing with milk and honey and regenerated organs. In their view, public funding for this kind of research would be the point of departure toward a bright and shining human future. That ancient story of the Exodus is deeply rooted in our cultural history. It has been updated many times since, including in the migration of Puritans from England to the New World, in the popular myth of the inexorable progress of science, and (most recently) in the Civil Rights movement of the 1960's. Despite variations, the old plot line is essentially unchanged: if we will just have courage to set out toward the goal, we can realize our highest hopes. Proponents of public funding for embryonic stem cell research, in other words, looked at the science through a religious lens and decided that it ***did*** measure up to their moral vision.

By the time we finished our work that day, the students' thinking about embryonic stem cell research had reached an entirely new intellectual level. They not only understood the basic science, but they also understood that the issue of public funding: 1) could not be settled by the science alone; 2) was not a disagreement between science and religion; and 3) was a disagreement between two different religious evaluations of the science.

I bet you can imagine what it felt like to be one of the professors in that room with those students. And I bet you can also imagine how exciting it was for all of us when, just two days after our workshop, an article appeared in the New York Times in which one of their reporters laid out this same analysis of the stem cell debate. It was an unforgettable experience of science

education SENCER-style. The power of science and the limits of science, all served up to students in the context of a "complex, capacious, and unsolved problem of civic consequence."

Of course many of us here this evening can tell stories like this. Crossing the boundary at the limits of science, when both scientific and humanistic ways of knowing begin to come into play, is an exhilarating experience. Yet, in the interest of full disclosure, we have to admit that there is also a downside. As in some other areas of life, a price has to be paid for that exhilaration. When we bring our students face-to-face with the power and the limits of science, then we will also bring them face-to-face with the power and the limits of our own knowledge, our own expertise, our own training. To admit that the sciences do not have all the answers is to admit that *professors of* the sciences do not have all the answers. It means that we have to stop playing the role of "the sage on the stage" and start playing the role of life-long learner.

At first it will feel as if we're back in graduate school again. The imposter syndrome can kick in, with nagging doubts that we don't really know what we're doing. The first time we teach these SENCER courses, we may not really enjoy it all that much. Certainly most of my colleagues in the sciences at Wofford College have been very uncomfortable (at first) working with non-scientific ways of knowing. Like strangers in a strange land, they have struggled to learn the language and understand the customs. Many have reacted by going to one extreme or another: either they have been paralyzed by fear, or carried away by overconfidence. They have become either a deer in the headlights, or a bull in a china shop.

But think with me for a moment about what would happen if, rather than behaving like deer and bulls, we were to work like *scholars* instead. Several years ago, a colleague and I were planning to teach a SENCER-style course together, on the topic of psychology and religion. Acutely self-conscious about his lack of background in the academic study of religion, he asked

me for copies of the syllabus and of all the textbooks for my introductory religion course. And on the first day of classes for the semester *before* we were to teach our course together, I found him seated in the back row of my introductory class. He said, "Well, I thought I might learn something." And all semester long he was there for every class session. He did all the readings. He asked good questions. By the end of the semester he was passing along great suggestions about how to improve the course. Later, I was able to sit in on one of his introductory courses as well. Do you suppose it was just a coincidence that when we taught our course together, students gave it the highest ratings any interdisciplinary course at our college has yet received?

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Am I now, like the proponents of public funding for embryonic stem cell research, starting to make an argument based on religious ideas from the book of Exodus? Am I now depicting SENCER as part of a grand story about our pilgrimage to a promised land of higher education? Am I casting David Burns and Karen Oates in the roles of Moses and Joshua, brave leaders who know the way to that promised land? Am I saying that if we will all just have the courage to set out, our highest hopes for science education can be realized?

Could be. I have to confess that I do really love that Exodus story. As a child I learned it, and as young man I saw it come alive in the preaching of Martin Luther King. It is one *powerful* story, so it may well be that I am trying to tell it to you here today. After all, one of the most valuable insights of the humanistic ways of knowing is that stories shape our thinking and acting in ways that most of us never realize.

But consciously, at least, my aims are not so grand. All I want to do is offer some practical assistance in getting past our anxieties about interdisciplinary science education. My modest goal is to put us a little more at ease with crossing the boundary at the limits of science.

Consider the following example from my subject area, the academic study of religion. Today, unfortunately, misconceptions about religion are widespread. When it comes to this subject, there are a lot more bulls than deer out there.

Three specific misconceptions about religion pose an acute threat to interdisciplinary education, because they are inter-related, mutually-reinforcing, and wrong. A person who holds these ideas is unlikely to participate constructively in interdisciplinary conversations.

The first misconception is the notion that religion is belief in supernatural beings. This misunderstanding comes naturally to those of us who live in cultures dominated by the monotheistic religions. We can easily forget that close to a billion people on earth today practice varieties of Buddhism, Taoism, and Confucianism in which there are no deities of any kind. Globalization will eventually do away with this misconception, but for now it survives. Actually, the notion that religion is belief in supernatural beings disappeared from the academic study of religion nearly 120 years ago, when Emile Durkheim demonstrated that religions are cultural systems based upon the concept of sacredness. Since then Clifford Geertz has shown that religions are systems of symbols which render the physical world humanly meaningful. Peter Berger has expressed it with elegant simplicity: "Religion is the audacious attempt to conceive of the entire universe as being humanly significant."

The second misconception is based on the first. Since religion is (supposedly) belief in supernatural beings, and since there is no empirical evidence for the existence of supernatural beings, then religion is belief without evidence. In religion, people believe things without any good reason. In its stronger forms, this misconception will go further, asserting that religion is belief *precisely because* there is no evidence. Karl Marx's idea of religion as an opiate, and Sigmund Freud's analysis of religion as an illusion, or wish-fulfillment, both drink deeply from

this mistake. Over a century ago, however, in his classic work, *The Varieties of Religious Experience*, William James demonstrated that religions rest on foundations that are pragmatic rather than empirical. By 1926, Bronislaw Malinowski had shown that religion is (as he put it) "a vital ingredient of human civilization, not an idle tale, but a hard-working, active force."

The third misconception fits like a keystone between the first two. Since religion is belief in supernatural beings, without any evidence, then religion is disappearing. On this view, religion is a kind of cultural dinosaur, gasping out its last breaths in our time, killed not by an asteroid strike but by its inability to survive the steady advance of rationality. For obvious reasons, this misconception is especially seductive to scientists, who are easily persuaded that that science is steadily driving out the forces of darkness, irrationality, and religion. Like the other misconceptions, this one too long ago disappeared from the world of responsible scholarship on religion, primarily because it is contradicted by the data. Empirical evidence from all around the world over the last several decades has repeatedly shown that religion is not only not disappearing, but is thriving. We scholars of religion actually have our hands full trying to keep up with a global effusion of new religious varieties and innovations. To describe religion in our world today, dinosaurs are not the right analogy at all. Instead, we should use Charles Darwin's elegant turn of phrase from the closing paragraph of *The Origin of Species*: there are "endless forms most beautiful."

We could go on, identifying similar misconceptions about other fields in the humanities and social sciences as well. Take political science: in that field, highly-trained and disciplined scholars carefully analyze long-term trends and current developments. But stop into any bar at happy hour, and you will find an expert on politics sitting on every stool.

Misconceptions like these are dangerous. Like stealth bombers, they fly under the radar to attack and destroy the SENCER ideals of undergraduate science education. Stealth bombers conceal themselves from radar defenses, and these ideas disguise themselves as "common sense" which "everybody knows." Their illusory effects have fooled some of the best scientists, leading them to the erroneous conclusion that they already know everything they need to know about what is out there beyond the limits of science.

Unlike stealth bombers, however, there are highly effective defenses against these misconceptions. And they do not cost billions of dollars. All they require is an attitude of open-minded curiosity. Remember my colleague sitting in the back row of that introductory religion class: "Well, I thought I might learn something."

The antidote to bad information is good information. That is why getting started in interdisciplinary teaching can feel like going back in graduate school: we have to find a teacher, and then we have to do the reading. Granted, most of us do not have academic schedules that will allow us to sit in on a colleague's class for an entire semester. But there are still some practical steps we can take. If your college or university has departments in the humanities and social sciences, then your teachers are ready and waiting. It can start with something as simple and easy as an e-mail asking a colleague in another department for some background information. In my experience, it is surprising how many kindred spirits are out there, and how quickly we can find each other.

So here's my point: there is every good reason to *respect* the boundary at the limits of science, but no good reason to *fear* it. *Inter*-disciplinary science education is not *un*-disciplined science education.

In my judgment, SENCER's greatest strength – its genius -- is this ground-breaking commitment to interdisciplinary study of pressing public issues. That is what attracts me, a scholar of religion, to SENCER. I am taken by its potential for the future, the long-term difference it will make. Most of our students, even those who major in the sciences, will not become scientists. Instead they will go into careers in business and the professions, and in those careers they will put their knowledge of science to work on pressing civic problems and complex public issues. In the not-too-distant future, they will take seats at tables where these civic problems are being discussed. In order to participate in those conversations, they will need to know much more than just the science. They will need to know how to put the science to work with politics, sociology, culture, ethics, morality, law, justice, and yes, even religion.

I have come to Chicago, as you have, with that future in mind. The work we begin here over the next four days will bring it closer to reality.

Several years ago my best friend, who is not an academic, decided to start his own business. After years of successful work with a large company, he quit that job and opened up his own shop. It was a big step; he was married, with kids, and he was giving up a stable income and a good health insurance plan. But he went ahead, and in what seemed like no time at all, his business was doing just fine. One day he told me, "When I quit that job to start this business, it felt like I was stepping off a cliff. It turns out I was just stepping off the curb."

Can we really do interdisciplinary science education, SENCER-style? You bet we can.

Here in Chicago, let's step off the curb.

Thank you very much.