A Role for the Science Faculty at the Catholic University

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Two specters follow me through my professional life. Sometimes they stand before me in the form of living undergraduates, but usually they drift just off my shoulders, murmuring their discontent, incorporeal but very, very tangible and very, very audible. These two beings are quite different from one another, but their main discontents are the same: why do they have to put up with me? Why does the University of St. Thomas force me upon them? I teach general biology, and both of these students wonder why a school such as St. Thomas wants them to study the science that I offer.

One of them, who generally appears as a freshman science major, dreams of a career in medicine. "Dreams" is perhaps too weak a word. This person already has emotionally finished studying and training and is some sort of health care professional. Even though the world still obstinately insists upon a few years to be spent taking tests and accumulating degrees, this pre-med specter wears a full length white lab coat in a manner that suggests it is some sort of full-body halo. My expectations that this person experience something more of biology than those small parts of the field that prepare one for the MCAT are the single most powerful irritant in such a student's life.

The other specter generally takes the form of a slightly older student, often a junior or senior, who has avoided finishing the general education requirement that all students must complete at least one course in a laboratory science. Sometimes this spirit is willing to learn about science, and would tolerate a lecture or even reading assignments, but why the lab? Why must students actually DO this stuff; no other classes make students do things like my biology class does.

As different as these cases seem, they actually address the same issue: what is the role of science education in a liberal arts context, especially in the context of a school such as the University of St. Thomas. We pride ourselves on our efforts to educate the "whole person" and to mix traditional academic education with an examination of personal values and vocational/professional training. Although all of the natural sciences play an important role in this kind of education, I am a biologist and my comments will focus on the role of biology in an undergraduate education at a Catholic institution such as St. Thomas. Through a series of vignettes drawn from episodes in my life at St. Thomas I will try to show my understanding of how the natural sciences can contribute to the intellectual and spiritual development of our students. I will ignore the vocational or professional aspect; that part is too easily seen and actually tends to obscure the role of the natural science faculty in the other two aspects of a Catholic education as defined by St. Thomas.

I will also ignore the idea that science represents a distinct "way of knowing" that complements the forms of human understanding cultivated by the arts, humanities, and social sciences. Empiricism, precision of observation and description, detailed communication of data and conclusions ... these are all skills and aptitudes that scientific training can hone. These things are properly seen as a valuable contribution of science to a liberal arts education and their inclusion in the curriculum of a Catholic university could well be defended on that basis alone. A Catholic university should go beyond simply offering a solid undergraduate liberal arts education in a way that addresses the spiritual and moral development of its students. What are we to make of this world and of our existence in it? What can we know about this world, and what are we to do during our time here? All human thought is in some way directed towards these questions, but the natural sciences offer a unique perspective that enables people to explore some alternative answers to these questions.

On the opening day of the fall semester 170 members of the introductory biology class (Biol 201: Ecology, Adaptation, and Diversity) sit in the lecture hall. I stand before them, musing behind my beard while they wait for the period to begin and wait for the period to end. Looking up, I begin.

"Good morning! I would like for you to imagine some place. It does not matter where this place is or what kind of place it is, but it might be better if the place you imagine is out of doors. Now imagine that two individuals begin their lives at exactly the same moment in this place. Over the course of their lifetimes these two individuals will face a small number of ecological problems that every living thing on this planet (and presumably on any other planet) must face. First, they must acquire resources in order to live, to maintain their bodies, and to grow. Second, they must avoid becoming a resource for some other organism. And last, if their success overcoming these first two ecological problems is to mean anything in the long run, these two creatures must each reproduce.

"Now further imagine that these two creatures are not the same kinds of organism. And further imagine that the exact spot where each of these creatures has begun its life within the place you have imagined is not completely suitable for the fulfillment of the three ecological objectives I just mentioned. That ought to be easy to do; most of us are dissatisfied with something in our surroundings and most other creatures find the world at least a bit lacking in something they want or need. Well, if one of those two creatures that you are thinking about is an animal, chances are it will get up and move away from the spot of its birth or hatching or whatever.

"Most of the creatures on this planet do not have that option, however. Plants, fungi, even many animals are physically tied to the place they happen to occupy at the beginning of their life. They must find some other way to cope with the limitations of their environment, and since there are a great many such creatures you can probably guess that a great many ways exist to cope with an environment that is not completely suitable for a successful life. That is what this course is about: Ecology: the things a living creature must do in order to complete its life and the limitations of the environment in which that creature lives, Adaptation: the things that creatures do to cope with the particular

limitations of their particular place on the earth, and Diversity: the variety of creatures displaying different adaptations that they use to solve the problems presented by their particular place on the earth in their effort to meet those same three ecological objectives."

The opening moments of my first meeting with the new group of students starting the biology core sequence contain the essence of what scientists have to contribute to a Catholic, liberal arts education: we try to present a non-anthropocentric view of the world, and tied to that is the goal of presenting ourselves as biological entities. If we, as a teaching institution, are trying to challenge our students to examine and define their values, and even to examine the assumptions underlying those values, then these are important issues to address. We tend to interpret the world in terms of our experiences as humans, but at the same time we tend to think of ourselves as outside of nature. I think that both of these attitudes are themselves perfectly understandable, even "natural," but they raise some profound barriers to our ability to understand anything else. They represent the assumptions that underlie the rest of human thought.

Ignore the subtleties of understanding how a carrot, for example, experiences the world. Ignore, as well, the question of why anyone would or should want to understand how a carrot experiences the world. The purpose of challenging anthropocentric world views is actually to improve our experience of the world. If we interpret the world anthropocentrically we interpret only reflections of ourselves that exist only within our own minds. Under such circumstances anthropocentrism becomes a blinder that limits, or even prevents, human experience. To bring the point to even greater immediacy consider our efforts to incorporate aspects of human diversity into St. Thomas' curriculum. If our students cannot see that carrot as different from us, but still entitled to toleration for its different way of life, how can we hope that they will ever be able to recognize and tolerate (let alone respect) differences among humans. The exercise of understanding another species teaches us the skills necessary to understand another human. Our tendency to assume that other humans are like us is even stronger than our tendency to anthropomorphize the rest of nature. The natural sciences, in general, give us a way to begin experiencing the world on its own terms, a way to understand a universe in which we are a very small part. Biology, in particular, gives us a way to begin to understand diversity and variation.

A few days later in the same fall semester, in the same large auditorium, I stand before the same class, only it is larger thanks to the graces of the drop/add schedule. Sigh.... Let us begin:

"Good morning! When the British colonized Australia they brought many familiar parts of their lives and lifestyles with them and introduced these aspects of Britain into the Australian landscape. Among these were rabbits. There are no native rabbits in Australia, and the British colonists brought them along for food and sport. Of course they did not bring the predators of rabbits, and they only selected healthy rabbits for shipment. When the imported British rabbits were introduced into their new Australian home they did what rabbits everywhere do, and soon there were lots of rabbits throughout Australia. The

exploding population of rabbits ate anything and everything. Soon the rabbits were destroying so much of the grasslands that the colonists had serious difficulty finding enough food for another animal they had brought from Britain: the sheep. This was an economic disaster. The British tried many ways to control the size of the rabbit population, always without success. Earlier in this century, the Australians (as we should call them by this time in their history) brought some sick rabbits from Britain, rabbits that carried a viral disease called myxomatosis. The disease spread rapidly through the rabbit population, and for a while it seemed that the animals would be brought under control by the disease. However, after a decade or so the number of rabbits started to climb again. The virus was still present, but the rabbits did not die at the same rate as when the virus was first introduced. What had happened?"

We have an interesting discussion that leads to the conclusion that the rabbits had become more resistant to the virus AND that the virus had become less virulent. Then I lecture for a short while about the evolutionary basis of these changes and explain the role of natural selection in the process. Most of the change seems to have occurred in the virus – the rabbits constitute the habitat of the virus, and virulence destroys the environment of a pathogen. This is not in the best interest of the virus. For what is a pathogen? It is simply an organism that must find the necessary resources, protect itself, and reproduce, just like the rest of us. The rabbit is just a food source, but as such it has value to the virus.

"Now consider the protozoan that causes malaria. This is a single-celled, animal-like creature that spends part of its lifetime in the gut of a mosquito, and part of its lifetime in the bloodstream of a human being. The symptoms of malaria are simply the result of the interaction between the human being and the protozoan being that lives within the human. Both creatures, the protozoan and the human, are seeking to use the human's red blood cells for their own ends, and that causes the disease. Both the malarial parasite and the mosquito that introduced the parasite into the human view the human as a convenient source of high quality nourishment..."

We then work on a problem about the ecological and evolutionary history of the interactions between mosquito, protozoan, and human, and while doing so it becomes increasingly clear that the human member of this triangle is on a par with the other two members. It turns out that malaria, sickle-cell anemia, and a host of other medical and cultural attributes of humans are the result of a very long ecological and evolutionary entanglement of this set of coevolving species.

The interaction of science and theology occupies my work whenever the question of evolution arises. This interaction becomes even more dramatic when we touch upon human evolution. Students ask constantly about the implications of evolutionary biology for their religious beliefs, and they frequently object to those implications. This occurs at St. Thomas more often than at other schools where I have taught, perhaps due to the serious religious nature of the university and of many of the students' backgrounds. I cherish the opportunity for conversations with students about the broader meaning of scientific ideas for our lives.

I see no reason for conflict between belief in divine creation of the universe and acceptance that the universe, and life, has evolved. There are, however, at least two points that bear closer examination. The first is that if we are, indeed, descended from other species of hominids, which were in turn descended from other primate species, which were derived from some generalized ancestral mammalian stock, which had reptilian ancestors, and so on, how can we justify what we perceive as our unique position on earth, in the universe, and in the eyes of God? In other words, what does it mean when we say we are created in the image of God?

The second point is related to the first: how does our own eventual extinction and ultimate ecological replacement by other species influence our religious beliefs? Acceptance of our evolution places humans solidly amidst all other species, extinct and extant, and forces us to consider that we are subject to the same ecological and evolutionary patterns we observe for the rest. We are biological entities, and we must see ourselves as such. What does this say about our concept of the soul? Is the soul a characteristic of Homo sapiens alone? If the soul is a property of Homo sapiens as we currently exist, will members of a species derived from us also possess a soul? Did members of the species immediately ancestral to us have souls? If the soul, however we define it, is an emergent property of our species, will other, phylogenetically unrelated species develop (evolve?) "the soul" as (if) they come to occupy our ecological niche?

I have no concrete answers to these questions, but I am certain that insights I have gained from my scientific training lead to insights into such issues. Science, with its empirical description of the physical world in which we live, is going to influence, or even provide, the context within which we interpret revelation, the basis of religious authority. Religion may be an effort to define our relationship with the rest of creation and with a deity, but our conception of that relationship will be influenced by what we conceive our position within creation to be. How the scientific study of the material world, and of our position within that world, may enrich our understanding of our spiritual and moral nature is a valuable question to ask. Addressing this question is the ultimate role of the science faculty at a Catholic school, in general, and at St. Thomas, in particular.