Letter to the editor

On Monday, February 28 I attended a debate addressing the issue of gender and science at Behrend. The central thesis of the debate was the perception of non-scientists that "science," as practiced at Behrend specifically, and in the United States generally, is a discipline that is hostile to women. As a scientist, I found the take-home lessons of this debate frustrating. As a woman, I found the lessons infuriating.

Lesson 1. "Science" is a collection of facts and rules and is, therefore, distasteful to women who, by their natures, prefer "creative" and "conceptual" rather than factual fields of study. Two serious misconceptions are present in this lesson. First, "science" is NOT a collection of facts and rules. It is a method for learning the organizing principles of our universe. The method consists of careful observation (gathering information), induction (drawing a conclusion based on the observations), deduction (hypothesis generation - making a specific and testable prediction), and experimentation or further observation, followed by modification or rejection of the hypothesis. Just as one must to learn to spell before writing great prose, learn to play scales before performing Mozart, or learn to read before studying Shakespeare, one must learn some basic facts, techniques, and principles before "doing science." The exciting part of science is the knowledge that with enough creativity and careful analytical thought, one can find the answers to any testable question or create new ways of conceptualizing the world. The difficult part of science is that it requires great discipline to master even a portion of the information that already has been gathered. The part of science that "turns people off" is the long road to mastery of what already is known, but that road is essential. The concept "antibiotic" is useless if the physician has not learned (memorized) which antibiotic is used to treat a specific pathogenic bacterium. One cannot predict the outcome of an experiment in organic chemistry without a basic knowledge (memorization) of synthetic pathways in chemical reactions. The ability to learn the fundamental information upon which science rests is not gender specific. So why are we perpetuating the myth that women cannot master the basics of a scientific field of endeavor because they "think differently than a man," or worse, the myth that women who "do science" are in some way unfeminine?

Second, the implication that scientists are not creative or capable of conceptualizing is insulting, and it is dead wrong. Many scientific disciplines such as mathematics, cosmology, particle physics, or theoretical ecology are highly abstract and conceptual. Science is a discipline as is music, poetry, political science, and figure skating. "Doing science" requires discipline, great effort, creativity, and careful analytical thought, none of which capacities are specific to the Y chromosome.

Lesson 2. Men and women "do science" differently. It is important to remember that science is a method for learning and testing hypotheses about what one has learned. Everyone, regardless of gender, has a personal learning and research style. Some individuals are comfortable with rigorous experimentation, others prefer to theorize, and still others observe and categorize. How a scientist "does science" is a matter of personal style just as methods of teaching are a matter of personal style. It is not a matter of gender.

What I observed during the debate was that "doing science" was being confused purposely with "playing the political game." It is entirely possible that male and female scientists play the political game (networking, grantsmanship, publishing) differently. In my experience, however, playing the political game is, again, a matter of personal style rather than a matter of gender. Many women are highly successful at the political game without losing their personal integrity - and so are many men. Other academicians, male and female, decide to limit their participation in the political aspect of scholarly life.

Lesson 3. Science as practiced and taught at Behrend, is inherently "masculine" and hostile to women. Fully 67% of the biology majors at Behrend are female. This is in spite of the fact that, until this year, the biology faculty members were exclusively males with reputations for intellectual rigor. I might add that the newest faculty member (a female) in biology is actively seeking the same reputation. None of the women in biology at Behrend, including the female faculty member, feel that learning or "doing" science at Behrend has been a struggle in a hostile environment, although some will tell you that they experience hostility and prejudice from their non-scientist peers. In fact, the male faculty in biology are outstandingly supportive.

Female biology students at Behrend are highly successful because they are willing to work as hard as necessary to master the fundamentals of their chosen field of study. Their personalities run the gamut from strongly assertive to shy and quiet. Most are involved in scientific research under the direction of a faculty member. They are in the process of learning how to apply the fundamentals they have mastered to the fun part of science - hypothesis generation and testing.

Science majors, both male and female, will tell you that the faculty members from whom they learn the most (in any field) are those who are intellectually demanding at the same time that they are compassionate and sensitive to students' needs. If being demanding enough to require a student's best effort is a masculine trait, then more faculty members should become masculine in their approach to education. All students need to learn to accept responsibility for their educations. This means hard work, study, and intellectual rigor. In the long run, no student, male or female, benefits from kind, but non-demanding, instruction. Intellectual rigor is not incompatible with compassion and sensitivity, and none of these qualities is gender specific.

Lesson 4. To "succeed" *in science*, women are forced to choose between career and family, and even after making such a choice, women cannot reach positions of "power" in science. This was, perhaps, the most insidious argument made at the debate. First, this problem is NOT specific to women in science. It is a universal problem faced by any woman with both children and a job. Yes, a career in science requires time and discipline. So does any other career. Second, this problem is NOT specific to gender. Men who become involved in their careers also must deal with the trade-off between time devoted to their jobs and time devoted to their families.

The implication in the word "succeed" is that there exists some universal definition of success that includes acquisition of personal, political, or academic power. The notion is that women in science are prevented from reaching positions of power by a "glass ceiling" above which they do not rise. By definition, then, women scientists frequently are failures in their chosen discipline. The truth is that many scientists, both male and female, do not define success in terms of power. Success is a personal thing defined differently for each individual. For many of us, professional success means that we can consistently excite students about science and conduct research respected by other scientists. Many scientists, both female and male, CHOOSE not to seek positions of academic or political power because such positions frequently prevent them from doing what they love best - science.

It has become fashionable to blame one's difficulties in any endeavor on circumstances or society, but the key to success in any discipline is to accept personal responsibility for one's life. This is true whether the discipline is science, humanities, athletics, or the fine arts. And it is true whether one is male or female. I would say to any female (or male) who aspires to learn the beauty of science that this is a difficult endeavor and not for the faint of heart.

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