

Readers Respond About Arrogance, Confidence, Brilliance, Humility, and Stupidity

Hats off to J. Murray Gibson for his Opinion piece, "Arrogance—A Dangerous Weapon of the Physics Trade?" (PHYSICS TODAY, February 2003, page 54). Arrogance is indeed a virus that infects the physics community, and I've seen its insidious effects on the career choices of generations of students, particularly women and other underrepresented groups.

But one thing about the piece puzzles me. Although Gibson's main point is that arrogance creates problems, his article repeatedly makes positive claims about arrogance: It is "a prized commodity," "something to be nurtured," or even "a tool . . . [for] cutting through the misconceptions that surround the natural world." To what effects of arrogance do these quotes refer? The only potentially useful ones I can imagine involve Machiavellian schemes to promote one's own agenda by simply being nasty. I hope we're not a profession that promotes that kind of behavior.

On the other hand, perhaps Gibson confuses arrogance with self-confidence. If you want to cut through those misconceptions, a high degree of self-confidence can be very important. But self-confidence need not entail arrogance. The greatest physicists I've known have been able to combine strong self-confidence with a concern for others that is the very opposite of arrogance.

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In his Opinion piece, J. Murray Gibson persuasively argues for moderating scientific competence with modesty. Physics is not just about pursuing one's curiosity with enthusiasm and asserting the superiority of its method over others. Physics also has a role that is best

achieved through pursuing thoughtful conduct. And Gibson's perspectives can be expanded to look at "arrogance" of the physical sciences in general, rather than just physics.

Physical scientists have come to believe that their scientific method will help them understand and quantify everything they need to know about the material world. They believe that, with that knowledge, they could control and subdue that world. Such confidence is double-edged. On the positive side, it nurtures curiosity, traditionally the main inspiration for scientific inquiry. On the negative side, it fosters an attitude of conquest that is true arrogance. Especially troublesome at present is that the attitude of conquest is nurtured more by commercialism than by inspiration. The universality of Isaac Newton's and Albert Einstein's findings is truly impressive. Yet, those findings are limited; they are not applicable to the remarkable natural phenomenon, the life-to-death cycle. Living things possess remarkable abilities to sense their surroundings, to determine what parts of their environment are acceptable for sustenance, and to adapt their bodies and chemical behavior to changes in the world around them. Higher-order living things simultaneously possess opposites such as love and hate, compassion and violence, rationality and irrationality. Unlike the behavior of inanimate objects, that of living things cannot be predicted with equations; the elements of any such equation are capable of making judgments, whether conscious or unconscious.

Most people in our modern technological society, led on by the cockiness of the physical sciences, think that they can subdue Earth as they please. But nature's biosphere, the nutritional cycle, and the hydrological cycle are all intertwined in a way that cannot be predicted or controlled. Although practitioners of biotechnology and genetic engineering succeed in manipulating chemical molecules, they have no way of rationalizing how species and genera as a whole will respond to human manipulations. Viruses and microbes that quickly develop resistance to

new drugs or vaccines and pests that develop resistance to pesticides demonstrate the lack of knowledge. Physical scientists cannot predict and control at will because living things possess abstract attributes that lie beyond their science's foundational concepts. True, a connection exists between the physical body and those abstract attributes, but no framework yet exists to make sense of the connection between the palpable and the abstract.

Just as profound as the knowledge of the physical world is the knowledge related to the functioning of Earth—the environment, ecosystems, and the behavioral patterns of living things. Those areas of inquiry require descriptive, qualitative, and intuitive thinking. Such qualitative knowledge is as deep and valuable as the quantitative knowledge of physical properties and laws.

Gibson's seemingly simple statement that "we easily forget that we are all too human" is, in fact, profound. Humans are as capable of great leaps of imagination, creativity, beauty, and compassion as they are of indescribable violence and destruction. Concerns about global warming, destruction of habitats, and pollution of air and water, as well as the desire of world commerce to control natural resources for profit, indicate that the world of the living transcends the scope of the physical sciences. Many in the natural sciences think that we are at a threshold of either adapting our living to the constraints of nature or wreaking incredible damage to Earth as we destroy ourselves.

The arrogance that Gibson highlights, rather than being an irritation in the form of having to tolerate someone's attitude, has more profound implications. Much will depend on whether we as physical scientists opt for the path of arrogance, or moderate it with a recognition that physics is only one component of the totality of human knowledge.

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As an undergraduate who is just receiving his physics degree, I have never seen such naked arrogance as

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that in my physics program. J. Murray Gibson's discussion of his undergraduate training was very enlightening: I now see that the trial I went through is the rule rather than an unjust aberration. I had a teacher who was tyrannical, and I found the totalitarian classroom nearly intolerable. I learned that, although physicists are very smart people, they just don't get the idea of "human being." Perhaps the mathematical models on this subject are still not adequate for physicists' understanding. Gibson writes, "For the real physicist, this trial by fire is not quite enough to extinguish interest in the field." Ah, yes, an analogy that conjures the tempering of steel—you see, just a hardening process. You need lots of heat, and no emotions. Who needs emotions? They're not objective! Those physicists may be "real," their interests having survived, but they will be emotional cripples, looking to cripple others.

A different analogy may serve as a better model for the physicists trying to acquire a feel for this "human" stuff. The forester will tend seedlings in the nursery and provide the right environment for growth. When they are ready, they will be transferred to the ground where they may thrive. The forester cultivates them and does not force the issue. You will not find the forester hitting the seedlings with a hammer when they first break through the soil.

Perhaps the physicist might try to see potential in the undergraduate who can be cultivated. Of course, that variety of teaching is an art. I have found that there are two jobs one can get without experience. One is parent; the other is college teacher. Most physics professors have never cracked a book on learning theory and don't understand different learning styles. Gibson recasts arrogance as a virtue, but I think it is an archaic and unproductive teaching posture in dire need of updating. It is probably psychologically damaging and apt to arouse American students' intrinsic questioning of authority. If physics professors regarded undergraduates as sentient humans who get blown out of the field when confronted by poor treatment, then physicists would see the danger of arrogance and educational facilities would not need hubris monitors stationed outside the classroom next to the fire extinguisher.

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I couldn't disagree more with J. Murray Gibson's Opinion piece on arrogance. First, I believe that we physicists can be arrogant because we believe we are smarter than people in other professions and not because we are objective. In fact, our belief in our supposed objectivity may be one of our major failings.

Second, the attitude at other laboratories can be far different from that at Bell Labs, as described by Gibson. We at the David Sarnoff RCA Laboratories were blessed by working with Albert Rose, who has been called the father of photocon-

ductivity. Far from being arrogant, he was a brilliant but humble person. His humility permeated the labs; we all looked up to Al as a model of how to behave.

My conclusion is that arrogance in our profession is a one-edged sword aimed at ourselves, not a two-edged sword as Gibson has proposed, and arrogance should always be avoided. Let's use Albert Einstein as our model of behavior, and not brilliant but arrogant physicists.

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