

Arrogance—A Dangerous Weapon of the Physics Trade?

J. Murray Gibson

Ask a scientist who is not a physicist and you might hear that we physicists are an arrogant bunch. And to a layperson, scientists in general often seem arrogant. No, we shrug, we're not really arrogant, we are just very objective and thus usually right! We are certainly a group with admirable strength in our convictions. Could there be a problem with well-tempered arrogance? I have worked in a number of high-quality research institutions and have learned that arrogance is, for good reason, a prized commodity. During my early career at Bell Labs, a senior executive asserted that arrogance was something to be proud of, something to be nurtured. And since Bell Labs has had such phenomenal historic success, we should not dismiss his point lightly. Now, 20 years later, I am a senior manager at a large research laboratory, and I understand better what he was trying to get at. But do we understand the downside of arrogance? I have come to believe that while arrogance is a tool that can be powerfully used when cutting through the misconceptions that surround the natural world, it is a double-edged sword. The problem with arrogance is the subject of this article, and I hope that I may convince you that we should keep this weapon in its scabbard much of the time.

The power of ignorance

Many physicists believe that physics is the pinnacle of science, since it can tackle the completely unknown. In the experimentalist's lab or on the theorist's scribbling pad, unhesitating questioning of assumptions, dismissal of previous models or confidence in a naive approach have repeatedly proven successful. Rodney Hodgson, an ex-colleague of mine from IBM's Thomas J. Watson Research Center, once counseled me that "ignorance is a powerful weapon." Although Charles Townes had argued that it

J. Murray Gibson is the associate laboratory director of Argonne National Laboratory, and is responsible for the Advanced Photon Source. The opinions expressed in the article are his own.

would be increasingly difficult to build lasers as one approached very short wavelengths, Hodgson was unaware of that argument. Instead, he tried to produce a vacuum ultraviolet hydrogen laser—and succeeded. (His creative approach included hammering a nail through a capacitor to create a discharge.) That was a wonderful lesson for a young postdoc, as I was at the time. Since then I've observed that newcomers to a field have often been able to see a solution that experienced scientists were unable to see. I firmly believe in the value of arrogance and controlled ignorance in the pursuit of science, and have often counseled my students on this. However, from other experiences, I believe that ignorance and arrogance can be dangerous weapons, and we must take care where we are pointing them.

The trap with arrogance is that you don't leave home without it. We must distinguish the profession of physics from physics itself. Unfortunately, the success of arrogance in the lab breeds in many physicists an attitude that one can construct one's own independent and completely objective model of all human behavior and act it out. There is often miscommunication when an "objective" scientist attempts to argue with, for example, an axiomatic humanist. The scientific method has only limited value in many important fields of human thought. The real danger, I believe, comes if we are deceived that our objectivity about the natural world applies to our views on society and our workplace. Such mistaken attitudes are partly to blame for several difficult problems faced by the physics profession. These maladies include severe underrepresentation of women and minorities, and imperfect relations with the public whose support for physical science is so important to us.

Of course, physicists are not the only scientists or engineers who are guilty of this arrogance. And arrogance extends to many professions, including medicine and finance. Yet, in some respects, arrogance amongst scientists is particularly insidious because it is so easily justified, and thus so difficult to expel.

Let me examine the negative implications of arrogance in the physics profession.

Education

It is now widely recognized that we must improve communication between scientists and the public. Such communication overwhelmingly takes the form of education. The intrinsic relationship of "me teacher, you student" is in itself arrogant. It fails to emphasize that a part of scientific progress occurs by questioning authority and conventional wisdom. To be provocative, let me exaggerate my perception of the physics education that I received and have in turn doled out to undergraduates. First, the student is shown the relatively boring classical physics of Newton and Coulomb. This is a test. A real physicist will see the beauty in this tedious stuff and will seek out further, more interesting knowledge. For the real physicist, this trial by fire is not quite enough to extinguish interest in the field, and he or she can move on to the good stuff, become a physicist and inherit the secrets of the kingdom. Meanwhile, those students who have lost interest in physics, due to intellectual stimulation by other subjects that have been better presented, feel "chewed up and spit out." Are these people friends of basic physics when they later become captains of industry or political leaders?

Obviously we need a system that can train our expert successors. But this system must also train the intelligent nonscientist to support and value science, and to take pleasure from science. I believe that the burgeoning of pseudoscience can be partly attributed to the public's hunger for things scientific and to inadequate exposure to the real stuff. Nonscientists have sometimes criticized the arrogance of scientists as a means of discrediting scientific ideas such as evolution. So arrogance can be an Achilles heel, preventing us from winning the arguments we need to win.

In a great democracy such as the United States, the people's elected representatives are entrusted with

the decisions about resource allocation, including science funding. It is likely that there will always be very few trained scientists who are members of Congress. If too few people in Congress are educated well enough to make sensible decisions about science, then that should absolutely be viewed as a criticism of us, rather than of them. We have failed in our role as teachers of nonscientists.

Ethics

Since the recent withdrawal by Bell Labs scientists of highly cited papers about charge transport in organic field-effect devices, a lot of attention has been paid to ethical issues in our profession. That case received great attention because of the potential importance of the results. However, I believe that there are many more cases involving ethics abuse that do not see the light of day. I think our approach to ethics has been a symptom of our arrogance as physicists—we easily forget that we are all too human. We usually do not explicitly teach ethical guidelines to our students, because we feel those guidelines are self-evident and are somehow “automatic” in physicists. As a result, honest physicists are perhaps relatively gullible victims of those who do not feel restricted by ethics. Open discussion about the importance and challenges of ethical behavior, such as the guidelines for coauthorship (see *PHYSICS TODAY*, January 2003, page 20) is a very positive outcome of the unfortunate organic device case. Although the scientific method finds the right path in the end, it is healthier when we openly recognize that ethical weakness is as common in physicists as in others.

Underrepresentation

Arrogance has been a barrier to the inclusion of underrepresented groups in physics. I am a member of the majority white male group, and I can recount how our group culture values arrogance and creates an obstacle to the inclusion of others.

The old Bell Labs was an organization with few levels of management and a genuine open door policy. I believe many perceived that environment as the ideal “fair” workplace since “there were no rules.” And I found it a wonderful place to work. However, the arrogant, aggressive (assertive) behavior patterns of white males created a set of super-rules that are nearly impossible for outsiders to learn. As a white male, I know just how to shout at my white male boss and get what I want without offending him. This is a

sophisticated behavior pattern that one learns only from the inside. Even if outsiders can learn how to do this, they may not get the same reaction when they act it out. If a black male is shouting at me, I may not emotionally react as well to it because of cultural stereotypes. And a shouting woman may evoke a negative stereotype. But a shouting white male can be just a “tough” character, whose success we admire. This is a classic “Catch-22” and contributes to a glass ceiling for success of minority groups.

A classic example of the problem is seen in mentoring. Of course white males need and get mentoring. I know that I get it, even today, from my peers and superiors. Mentoring taught me how to get what I want, and what I should want to get. But it happens naturally and informally for me. It is difficult for mentoring to happen naturally for those who are in the minority. In fact, mentoring is a classic example of the need for affirmative action to achieve equality. Unfortunately, many reject a formal mentoring program as a sign of weakness. After a mandatory mentoring program was introduced by management at one institution, I heard some white males boast that they had never met their mentors. In that way, they sent a clear message that to need formal mentoring was weak. The games people play!

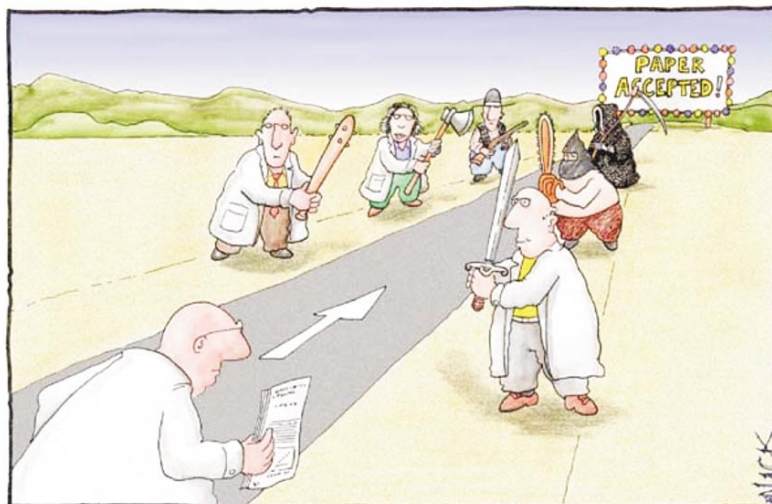
I have heard otherwise rational and intelligent scientists argue about the problems of under-representation, who say, “Just show me a well qualified XXX and I will hire him or her on the spot—I have no bias.” This is classic arrogance at work. How do such people rationalize the fact that the status quo has barely changed for many years? Since I do not believe

that white males have an intrinsically higher ability in physics than other groups have, I think we have a problem in our profession. Perhaps that problem lies in the hidden barriers I am emphasizing here.

To solve these problems, we must clearly separate our personal limitations from our physics, and be more aware of our lack of objectivity. Admission of limitations is the first step to progress (just like repenting is the key to forgiveness in Christians). We are human. It is important for us to teach the danger of arrogance to our students and avoid the traps it provides.

My thesis, that physicists suffer from an abundance of misused arrogance, is presented in the hope that in the future we physicists can separate our profession from our science. Let us hope we can keep our razor-sharp “no axioms allowed” intellects at their most productive level while becoming humbler in our interactions among ourselves and with the public. Although we may be privileged to appreciate and discover the secrets of nature, we have no right to claim any ownership over them or to exclude others from decisions about what to do with our knowledge.

I have taken an extreme perspective by asserting that arrogance is a two-edged weapon. In the lab, where we physicists are thrilled as we learn about nature, arrogance can be a very powerful, positive force. But in the workplace and society at large, I believe arrogance can be blamed for some of our professional woes, even though such behavior is not usually intended to be malicious. I am not proposing a new “soft and cuddly” approach, but I think we should appreciate and mitigate the downsides of arrogant behavior. ■



Most scientists regarded the new streamlined peer-review process as 'quite an improvement.'