

1995 Distinguished Teacher of the Year

Luc T. Wille, Ph.D.
Professor of Physics
College of Science

Getting the Two Hemispheres to Communicate

President Catanese, Provost Osburn, colleagues and students, friends. At the beginning of this century, Rudyard Kipling was considered the most successful author alive. His writings sold so well that publishers paid him a shilling a word. Obviously, he was not in academia. Some undergraduates at Oxford University decided to pull his leg, so they wired him a shilling and requested of him to send them one of his very best words. Back came the reply: "Thanks."

"Thanks" is indeed one of the very best words of the English language, albeit somewhat under used. As I receive this recognition, I am only too well aware of the many thanks I owe. Thanks to the students who nominated and selected me. Thanks to the staff of the physics department who always went the extra mile in support of students. Thanks to many colleagues and friends who always gave freely of their time. Let me just single out one person by name. Thank you Isabelle for sharing your life with me, for accepting challenges without knowing where they would lead, and for your understanding of the many hours spent on class preparation and letters of recommendation. Finally, let me also emphasize the element of "luck" in receiving the Distinguished Teacher Award. As I hear the other nominees' names, in addition to those of many excellent colleagues who were not even finalists, I can only be humbled and deeply grateful for this recognition.

"I teach physics." Now there's a conversation stopper for you. To the general public choosing to be a teacher seems madness enough. But of all the possible career choices, why would anybody want to be a physicist? Occasionally, students will talk to me at the end of a course and say something like: 'I really like you and I enjoyed your class, but I still hate physics.'" Although physics probably gets top billing in the dreadfulness polls, the same sentiments are expressed about most other disciplines in science. Science is supposed to be cold, analytical, rational and impersonal. Contrast this with literature and arts, subjects that are full of emotions and warmth, accessible to anyone, open to intuition, and leading to a true understanding of the "*condition humaine*." The observation of a dichotomy, between science on the one hand and arts on the other is, of

course, not new. It was first stated in 1956 by the British physicist and novelist C. P. Snow in a lecture at Cambridge University and further expanded in his 1959 book *The Two Cultures*. This classification was labeled a silly conceit by the late Allan Bloom in his diatribe *The Closing of the American Mind*. I guess this proves Snow's point exactly.

Snow remarked that we take it for granted that any educated person should know something about Shakespeare and have read some of his works. Yet, he argued, the scientific equivalent of this would be to ask somebody to describe the second law of thermodynamics. Needless to say, many people who consider themselves educated fail miserably at this task. I must confess that I feel that Snow overstated the case somewhat, and I suspect that he just couldn't resist the temptation to call an austere group of Cambridge dons "uneducated" to their faces. As was pointed out by a number of later authors, Snow's categories reflected to some extent the British class system of his time, and the rift may not run as deeply in other societies. Yet, the gist of the argument still stands. To this day, seemingly intelligent people seem to feel no shame to admit "I never was any good at math" or "I hated science in high school and avoided it as much as possible." However, the person who confesses to never having read a novel or visited an art exhibition would be rightly considered a Philistine. It amuses me to see in these two extremes a reflection of the way the human brain is composed. The left cerebral hemisphere is used predominantly in tasks that are analytical, verbal, symbolic, objective and logical. Does that sound like anything I mentioned before? Lefty is the science geek. The right hemisphere allows us to be creative, to understand metaphors, to dream and to speculate. Righty is the touchy-feely artist, the visionary, the mystic. The question I propose to address today is: "How can we get these two hemispheres to communicate?"

As I mentioned before, Snow was a respected physicist who was involved in the British atomic bomb project and later took on various tasks in government. As a reward for his services he was knighted and eventually given a life peerage, earning him the title Baron Snow of Leicester. Although he was a knowledgeable and capable physicist, he certainly was not of the first rank, unlike people such as Einstein and Bohr, both of whom he knew quite well. He never made any major discoveries nor did he lend his name to any new laws, phenomena or inventions. I have it on good authority that the snowmobile is not named after him. However, in addition to his scientific work Snow was also the author of several serious novels that were considered of above average literary quality. He was one of a small number of modern Renaissance men and women who succeed in bridging the gap between the two cultures. There are few other competent scientists who are considered serious authors. The late Primo Levi comes to mind: a chemical engineer by profession, a Holocaust survivor and the writer of some hauntingly beautiful prose, he truly transcends traditional boundaries. Modern authors

who have exhibited a genuine knowledge of and interest in science are also relatively rare. John Updike is one such *rara avis*, as shown, for example, in his novel *Roger's Version*, the story of a computer programmer who sets out to prove by scientific means the nature of the divine. His aim is to convince a theologian of the existence of God. Needless to say, this turns out to be an impossible task.

So why is it that science and scientists have such a bad reputation? To some extent, scientists have only themselves to blame. In years past, it was uncommon for scientists to write popular works, accessible to a wide public. Such activity was considered below the dignity of the academic and was left to such lower forms of existence as science journalists. As a consequence, popular works often focus more on personalities and rivalries than on results and methodology. In recent years, this blasé attitude toward popularized writings has somewhat diminished, and several first-rate physicists have heeded the call of the Muse and Mammon, no doubt inspired by the spectacular success of Stephen Hawking's best-seller *A Brief History of Time*. The titles often reflect the authors' narcissism with slogans, such as *Dreams of a Final Theory* or *The God Particle*. The authors of these books, Steven Weinberg and Leon Lederman, respectively, are Nobel Prize-winning elementary particle physicists whose message seems to be that physics has nearly caught up with the final secrets of nature. All that is needed is some lavish funding for a supercollider leading to perhaps another Nobel Prize for the authors. Once this final piece of nature's puzzle has been found, all that will be left to do is some intellectual mopping up. Oh, and by the way, in doing this we will also have proved the existence, or rather non-existence, of God to the satisfaction of even the most stubborn theologian. With friends such as these why would science need any enemies? The backlash was not long in the making and came from a rather unexpected corner. Earlier this year, John Horgan, a senior writer at *Scientific American*, published a book called *The End of Science*. The title is short and to the point, and Horgan means it. His thesis is that, indeed, science has accomplished all that it could possibly hope to accomplish. In times of budget cuts one needs to be very careful with statements like this one. Let me therefore hasten to add that this is a proclamation with which I strongly disagree. Even if science had unraveled the last microscopic details of nature, and I am not sure that it has, this would only imply the end of science's reductionist phase and would herald the beginning of a new "integrative" phase in which the individual elements are put together again and their cooperative effects analyzed.

While we are soul-searching, we have to recognize a second issue that contributes to the public's cynicism and distrust of science. This has to do with the gratuitous use of statements such as "it is a scientific fact that ..." or "it is medically proven that..." When outrageous or evidently false claims are made, scientists have a moral obligation to speak out and denounce these assertions. If it is possible that for any statement "A"

by an expert witness, another expert witness can be found to attest to “not-A,” credibility will go down and science will suffer. Statements by politicians and journalists should be scrutinized and, if found wanting, challenged. Can it really be true that raising the speed limit on freeways will not cause more accidents? I, for one, find that hard to believe, but I am willing to keep an open mind and to investigate the evidence. Scientists should speak up on these issues. I recognize that scientific debate and attempts at verification or falsification are part of the scientific process, but this should not stop us from attacking the truly irrational. By the same token, when communicating to the public, scientists should aim at precision and completeness and avoid misleading or inflated claims. Many of us remember the 1972 best-seller *The Limit to Growth*, a report by the Club of Rome that painted a true doomsday scenario: based on computer simulations it was predicted that several natural resources would run out in the next decade, followed by a swift collapse of civilization as we know it. Well, that didn't come to pass, although funding for education in the state of Florida dwindled considerably, an effect that was not predicted by the models. Seriously, I understand the difficulties of making forecasts based on limited information. As the old adage goes: “One should never try to predict, especially not the future.” Still, neither the authors nor the Club of Rome made any efforts to moderate the tone of the report or to repudiate the many misconceptions that were based on it. In 1992, the same authors published a new study called *Beyond the Limits*, which is largely more of the same, except that imminent collapse is now somewhat further into the future. If this is the best that science can do, how do we differ from the Nostradamus interpreters and the end-of-the-world predictors?

Let no one mistake these criticisms for an outright attack on science. I have no patience with the neo-Luddites. Science and technology have contributed greatly and profoundly to our society. They have touched the lives of everyone on the planet and in the vast majority of cases improved living conditions enormously. However, we can and should do a better job of communicating the sweep and nature of our subject and contrast it with the irrational and unscientific.

There is a final stumbling block to the widespread appeal of science. It is one that affects physics in particular: it is at the same time its greatest strength and its Achilles heel. This is the use of mathematical language in expressing precise thoughts, equations and laws. Hawking relates that publishers have a rule of thumb that each mathematical equation in a popular text cuts the readership (read: sales) in half. He was able to tell the story of *A Brief History of Time* with just one equation (Einstein's famous $E = mc^2$) and the book was a runaway best-seller. This shows that it is possible to communicate science to the public without an excessive use of mathematics. Art too, at a more profound level can be quite mathematical. The pointillist paintings of Seurat or the

impossible worlds of Escher, the fugues of Bach, the literary theories of Derrida (whose brother, by the way, is a well-known physicist), all of these rely on deep mathematical or logical structures, but these do not detract from the art lover's appreciation for the painting, composition or novel. Science, too, should find ways to express itself that are not overly mathematical.

There is no doubt that the public is interested in science and eager to learn what it has to teach. Unfortunately, scientists have done a bad job of communicating what they stand for. As a consequence, confusion reigns: to the uninitiated, astrology is pretty much the same as astronomy, and numerology is not too different from number theory and, for that matter, physics is not too far removed from psychics. New efforts are needed to communicate the beauty of our discipline, the importance of its findings and, yes, also its limitations. In this endeavor, artists can be of the greatest help. Duchamp's famous painting "Nude Descending a Staircase" communicates the concept of velocity in a way that is very different from Newton's definition as a derivative, but that may be equally enlightening. Can we use a musical composition to explain Darwin's ideas about evolution? I think we can! Could a poem be used to illustrate tectonic plate motion? Why not? These possibilities have hardly been explored, but they seem to me extremely promising. This way, not only will the two hemispheres come to talk to each other, together they will also inform the public at large. As a teacher, I find that a very exciting prospect.

How can this new synthesis be accomplished? I believe that universities, true to their name as institutions of universal knowledge, can play a central role in this endeavor. In particular, Florida Atlantic University could become a leader in this effort. We have in our service area a public that is culturally sophisticated and with a genuine interest in science. Activities such as those of the Lifelong Learning Society testify to the high caliber of these individuals and their thirst for knowledge. We have some unique opportunities to explore new ways of teaching and learning. In particular I believe that the Internet opens up great opportunities in this effort. Yes, I am aware that some consider it just a fad. No, I don't think I have fallen in that trap. I truly believe that World Wide Web pages with their hyperlinks provide a great way to disseminate information at any desired level of sophistication. Animation and visualization allow one to explain concepts and ideas in a way that taps directly into the learning mind. Artists and scientists ought to work jointly in setting up these tools to impart human knowledge and to foster mutual understanding.

C. P. Snow expressed the hope that a third culture would evolve that would span the ravine between the two cultures. I think that with a little effort we can fill the chasm and attempt a totally new unification of human knowledge. Do you want to join me in

that effort? Just give me a phone call. Better still, visit my Web page and send me an e-mail.

Thank you very much.