

Science, society and responsibility

K.R. Sreenivasan
Abdus Salam Research Professor
Director
ICTP, Trieste, Italy

March 30, 2009

I believe that young and aspiring scientists are influenced most by living examples, and thus subscribe to the goals of the essays you are collecting. Thus, I write this short piece with pleasure.

As a young student, I chose science (as opposed to philosophy, literature and history, in all of which I was good, or banking and commerce in which I could have been equally good) because I intuitively believed that science would connect me with universal truths that underlie the structure of the universe. I felt that science would make me feel one with people of similar interests in places like Cambridge or Caltech, without even having to go there. That I could understand someone profound from those distant and famous places, and that such people might similarly understand me one day was a great propelling force.

Around the time I grew up, engineering was much in demand in my country and science for its own sake less so. I thus chose engineering but always tended to be on its basic side. I studied subjects related to physics and mathematics because of the intrinsic appeal that one needs to master only a few tools to solve many problems. I didn't go to medical school or study biology and chemistry because of the large number of isolated pieces that one seemed to have to master separately. At least I felt so at the time though I was greatly fascinated by chemistry.

Now I have been in science for more than 35 years. What have I learnt that might be of interest to general audience or to a young person? How do I distil the fruits of the wisdom I may have acquired?

First, I believe that optimism is essential for doing science successfully: the internal feeling that you matter, that you can do something useful, is more conducive to doing something than a sense of pessimism and despondence. You have to feel that you are working for yourself, and remain confident that human achievements are limited neither by race nor by origin – even if experiences might sometimes contradict it.

Second, you should remember that not everyone can be an Einstein. Most of the time, scientific research deals with small problems which you have to puzzle over and solve. In doing so, do not limit your imagination. Doing science is about asking questions and going about trying to find the answers, which can be unpredictable and inconclusive. To make something out of yourself, along with developing fertile imagination, develop adequate skills to be able to put the imagination to rigorous test; confront it by facts with personal integrity, since there will be many facets which you may have ignored and of which you should have been aware.

Third, to do good science, you must train yourself in some discipline, sometimes in more than one. Most often one withdraws from an inquiry as being fruitless because one doesn't have adequate skills to proceed, so make sure that you develop adequate skills before giving up your inquiry.

Fourth, you must possess the energy to follow through with your ideas; nothing will happen easily (except to a fortunate few). This is indeed why you must not associate with people who can drain your time and energy for no good reason.

Fifth, Jim Watson of the DNA fame was entirely right when he said: “I think it is extraordinarily important that you have a scientific patron because there’ll be times when you are bound to strike it bad and you’ll need somebody to convince people that you are not irresponsible.” A young scientist should thus find a good mentor and, if possible, choose a research group that is on an upward trajectory. You may not be able to figure this out right away but must study this issue with some intensity. This is especially important because you cannot work in isolation and must know what others in your discipline have been doing.

Sixth, you should be open to interesting problems and look for new phenomena that need explanations, wherever they are, without looking down on any discipline.

If you follow these norms, even if you do not build edifices as Newton and Darwin did, you will have the satisfaction of having maintained a small part it, or repaired it, or fixed up a brick that has come loose. No amount of external recognition will compensate for the inner strength that you will derive from this knowledge of yourself, and no one external will be able to rob you of this confidence.

Let me now comment on science as it relates to the public. Some people have much better neuronal connectivity to perceive the structure of our world better than others, so science (or any creative activity) is not democratic. How should this elitist ethos of science be woven into the fabric of a successful democratic society from which it derives its sustenance? This dilemma, which has created imperfect relations between science and the public whose support is important – especially in democratic societies – seems to have grown with time; it has tarnished the image of science even as its accomplishments have grown. Let us, therefore, spend a few minutes on it.

I myself have seen public’s concern that scientists come across as arrogant, and this perception, real or imagined, has not only created a chasm between scientists and the public, but it has alienated good students; it is often a barrier also to the inclusion of underrepresented groups in science. It dulls the willingness to reach out to such groups even before they achieve something, spot their talent and encourage them. My view is that there is no room whatever for arrogance. Indeed, our knowledge of the material world, however profound, is not applicable to the many aspects of human life – such as love and hate, compassion and violence, rationality and irrationality. Perhaps what comes across as arrogance is the tendency of scientists to apply the objectivity of the natural world to the society around them. While the complaint of arrogance extends to other successful professions such as medicine and law, it is particularly insidious in scientists because it is easily justified in terms of objectivity.

I once conducted a survey of scientists from many developing countries about the status and influence of scientists in their own countries. Compared to the aftermath of the Second World War which witnessed a great surge in the influence that scientists wielded in the decision making of governments, especially physicists from the atom-bomb generation in industrialized countries, it appears that the role of scientists is diminishing. I think it is because the abuses of technology have increased, and the special place that science once held in the minds and hearts of the people of began eroding in importance. On top of it, the expense of doing big science just kept increasing, and it has often

become big business. There is also the connection between science and military technology that makes the society ill at ease. While many scientists are driven in these directions by the desire to preserve the values that they regard as paramount, and the decision on the destructive use of technology is often based on the ethical and moral stance of the society at large, these subtle distinctions are often lost on a sizeable part of the public, which feels that a number of the ills that affect human society are due to the rapid developments in science and technology.

It is important to discuss these issues openly. This does not, however, mean putting limits on scientific inquiry, but instituting steps to ensure that the applications of science benefit human society as a whole. Such a perspective has to be taken by society on the basis of commonly shared moral and ethical values.

I wish to add a few sentences on why I regard science as even more essential now than in the past. Today, problems such as the depletion of ozone, environmental degradation, climate change, wide ranging degradation of natural resources, unknown risks associated with advances in biology, have all increased the number problems which only science and scientists can effectively tackle. Unfortunately, the number of scientists in many developing countries is pitifully small. Without high-level scientists who can offer sensible advice to their governments, all the problems just mentioned assume high levels of urgency. We cannot ignore the situation in any part of the world as being remote from the other: bad decisions made in one part of the world affect all others because of the finiteness of the Earth's resources and our global interconnectedness. It is clear that, if we have to survive as humanity, we need scientific solutions for an increasing range of problems.

Essentially everyone agrees that Science and Technology will continue to advance rapidly. What is important is to ensure that these advances benefit humanity as a whole. Parochial considerations of narrow commercial interests, nationalism, religious and other inflexible ideological divides have to give way to the basic ethics of human dignity and human rights, and harmony with nature – value systems that are outside the realm of science but have to guide its applications.