

## INTRODUCTION ACTIVITY: THE IMPORTANCE TO KNOW SCIENCE

**The famous physicist British Stephen Hawking received the prize Principe de Asturias de la Concordia in 1989. This is the speech he pronounced during the ceremony:**

"I would like to say a few words about public awareness and attitudes, to science and technology. Whether we like it or not, the world we live in, has changed a great deal in the last hundred years. And it is likely to change even more in the next hundred years. Some people would like to stop these changes, and go back to what they see as a purer and simpler age.

But as history shows, the past was not that wonderful. It was not so bad for a small privileged minority. Though even they had to do without modern medicine, and childbirth was a high risk for women. But for the vast majority of the population, life was nasty, brutish, and short.



Anyway, even if one wanted to, one can't put the clock back to an earlier age. Knowledge and techniques can't just be forgotten. Nor can one prevent further advances in the future. Even if all government money for research were cut off, the force of competition between companies, would still bring about advances in technology. And one cannot stop enquiring minds thinking about basic sciences, even if they are not paid for it. The only way to prevent further developments, would be a global totalitarian state, that suppressed anything new. But human initiative and ingenuity is such, that it wouldn't succeed. All that it would do, is slow down the rate of change.

If we accept that we cannot prevent science and technology, from changing our world, we can at least try to ensure that the changes are in the right directions. In a democratic society, this means that the public needs to have a basic understanding of science, so that it can make informed decisions, and not be left in the hands of experts. At the moment, the public has a rather ambivalent attitude to science. It has come to expect the steady increase in the standard of living that new developments in science and technology have brought. But it also distrusts science, because it doesn't understand it. This distrust is shown in the cartoon character of the mad scientist, working in his laboratory to produce a Frankenstein. It is also an important element behind support for Green parties. But the public also has a great interest in science, particularly astronomy, as is shown by the large audiences for television series such as cosmos, and for science fiction.

What can be done to harness his interest, and give the public the scientific background it needs to make informed decisions on subjects like acid rain, the greenhouse effect, nuclear weapons, or genetic engineering. Clearly, the basis must be what is taught in schools. But science in schools is often presented in a dry and uninteresting manner. Children learn it by rote to pass examinations. But they don't see its relevance to the world around them. And science is often taught in term of equations. Although equations are a concise and accurate way of describing mathematical ideas, they frighten most people. When I wrote a popular book recently, I was advised that each equation I included would half the sales. I include one equation, Einstein's famous equation,  $E=mc^2$ . Maybe, I would have twice as many copies without it.

Scientists and engineers tend to express their ideas, in the form of equations, because they need to know the precise values of quantities. But for other people, a qualitative grasp of scientific concepts, is sufficient. This can be conveyed by words and diagrams; without the use of equations.

The science people learn in school can provide the basic framework. But the rate of scientific progress is now so rapid, that there are always new developments that have occurred since one was at school or university. I never learnt about molecular biology, or transistors at school, but genetic engineering and computers are two of the developments most likely to change the way we live, in the future. Popular books and magazine articles about science can help to put across new developments. But even the most successful popular book is read by only a small proportion of the population. Only television can reach a truly mass audience. There are some very good science programs on TV, but some just present scientific wonders just as magic, without explaining them, or showing how they fit into the framework of scientific ideas. Producers of television science programs should realise that they have a responsibility to educate the public, and not just entertain it.

What are the science related issues that the public will have to make decisions on in the near future. By far the most urgent, is that of nuclear weapons. Other global problems, such as food supply or the greenhouse effect, are relatively slow acting. But a nuclear war could mean the end of all human life on Earth, within a few days. The relaxation of East West tensions, brought about by Mr Gorbachov and *perestroika* has meant that the fear of a nuclear war, has receded from public consciousness. But the danger is still there, as long as there are enough weapons, to kill the entire population many times over. Soviet and American weapons are still poised to

strike all the major cities in the Northern Hemisphere. It would only take a computer error or a mutiny by some of those manning the weapons, to trigger a global war. It is very important that the public realise the danger, and put pressure on all governments to agree large arms cuts. It probably is not practical to remove nuclear weapons entirely, but we can lessen the danger by reducing the number of weapons.

If we manage to avoid a nuclear war, there are still other dangers that could destroy us all. There's a sick joke that the reason we have not been contacted by an alien civilisation is that civilisations tend to destroy themselves, when they reach our stage. But I have sufficient faith in the sense of the public, to believe that we might prove this wrong.

Once again, I would like to thank the HRH the Prince of Asturias and His Foundation for having been granted the 1989 Award for Concord.

My wife and I really enjoyed our visit to Spain and we feel honoured to receive this award”.

<http://www.fpa.es/en/prince-of-asturias-awards/awards/1989-stephen-hawking.html?texto=discurso>

(On this page you can find the speech and also listen to it)



- 1. Hawking's speech tries to convince us about the importance to know science, even if we choose a career not related to biology, geology, physics or chemistry. Which are in your opinion, the topics about which everybody should be able to take decisions by themselves?**
- 2. Which does Hawking refer to when he talk about “to teach science without equations”?**
- 3. In your opinion, which are the most important scientific advances in last decades?**
- 4. How do these advances benefit us?**
- 5. Which are the problems that the current world suffers and science can try to solve?**