



**Manel Porcar**

# Social reaction to new technologies

**This article looks at a classic issue. A classic issue of popular science and the philosophy of science, but also of science fiction: the social perception of the dangers deriving from scientific activities. Branches of science such as nanotechnology, nuclear energy, robotics, particle physics, and synthetic biology have in common three characteristics. The first is power. Only that which is capable of achieving remarkable things can make us scared. The second is newness. All the branches of technology that I shall analyse here have a relatively recent history –one decade in the case of synthetic biology, or six, in the case of civil nuclear energy. And the third, perhaps the most important characteristic for explaining the rejection they arouse, is the mixture of the artificial nature and the perception of a certain ambiguity –darkness– of their results.**

Almost all technological advances have aroused to a greater or lesser degree intense suspicion at the outset, ranging from mere scepticism to more direct repulsion. But the most obvious case is perhaps one that is quite recent: the rejection caused by genetically modified organisms (GMO). The debate originated by the large-scale commercialisation of genetically modified plants has served —greatly— to warn the scientific community and to enable it to foresee what the social reaction might be to other emerging technologies

Cheik, Miquel Barceló (nov 2009)  
Mixed media on cardboard, 65 x 50 cm

if information about them is not given properly. Unfortunately, this mistake has occurred in the case of GMOs: they have not been explained properly. And just as with biotechnology, any other branch of science that is new and powerful, if it is seen as being opaque, will almost definitely produce a clearly justified public rejection.

### SCIENTISTS AND ECOLOGISTS

Recently I learned of an exhibition by Greenpeace about transgenics mounted at the entrance to the Botanical Gardens of Valencia University. What was said about them made me think that we can learn a lot from the message of the ecologists most committed to the anti-GMO struggle. Not so much for the information that they give us about the danger of the different technologies (in fact what they do is publish, with debatable faithfulness, the results of scientific experiments), as for the interpretation they make of these results. It may be very harsh to put it this way, but the fact is that, in all the debates in which scientists and ecologists take part, we scientists behave like scientists and the ecologists behave... like people. In other words, the ecologists are close, cautious, they worry about the future, they ask questions that scientists are often unable to answer. What would happen if...? And in ten years' time? And in a thousand years' time? Can we be completely certain that nothing will happen? One hundred per cent? In a discussion on television between a competent scientist and an intelligent ecologist, the latter will easily win, because when he or she is asked for predictions with a margin of error equal to zero, the honest scientist will say, probably, that it is impossible to know *all* the consequences of some new technology and, above all, we cannot rule out a technology having *some* effects that are harmful to people's health. And the viewers will no doubt perceive this —mistakenly— as a warning about some imminent catastrophe.

Let me give a specific example: can we exclude the possibility that eating yoghurt with honey increases the possibilities of suffering —let's say— skin cancer? Well, a priori it cannot be ruled out (in science nothing can be ruled out *a priori*!) and, what's more, it is not easy to demonstrate that it won't happen, because medical studies like those that would be necessary to investigate the relationship between yoghurt, honey, the sun and cancer are very complex. We would have to carry out an epidemiological study, in which we would take a large sample

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of individuals who eat yoghurt with honey and we would compare the proportion of those who have suffered a melanoma with respect to those who have also suffered it but do not eat yoghurt with honey. The problem is that comparisons of this kind are often statistically very bad, because very often what is studied (yoghurt and honey, here) is associated with other lifestyle characteristics that can lead us to reach a false conclusion. For example, it is likely that if we study in detail a thousand people who habitually eat yoghurt with honey, and we compare them with a thousand who do not, we shall find that many of the former perhaps try to live life a little more healthily and therefore eat

more healthily (and that includes putting honey on yoghurt instead of sugar). But it seems logical to think that, within this pattern of healthy living, physical exercise in the open air is also included. In the sunshine. And exposure to the sun's rays increases, a lot, the possibilities of suffering skin cancer. So, we may conclude —erroneously— that there is a link between yoghurt with honey and skin cancer, when most probably it is not the case.

This example is made up, but there are some far more dramatic real ones. A few years ago, a study published in a scientific journal made the front pages of many newspapers with the following headline: women who practice oral sex on their partners are less likely to suffer cancer. Obviously this study, apart from revealing that some scientists are quite frankly twisted when choosing subjects for research, gave rise to a lot of jokes. But the example is very interesting. You only have to think a little to see some of the possible causes that have led to such an unbelievable conclusion: could it not be that the women who say that they perform oral sex (whether it's true or not) are more, shall we say, modern or vivacious? And might it not be that they visit their gynaecologist more than those who say no, oral sex, never? Because, logically, if this is so the former are rather less likely to suffer cancer, because the development of this illness can largely be prevented by periodical medical examinations and preventative operations (removing precancerous polyps, for example).

With these examples I do not mean that cause-effect relationships are impossible to establish for scientists. Not at all. It is known with complete certainty that smoking or alcohol abuse have devastating effects on health, as it is also known that massive exposure to x-rays is very harmful (unfortunately a lot of people received very high doses of radiation before its negative effects were discovered). And as for yoghurt, honey and oral sex, what we *can* say is that for the moment there is no evidence to show that they are carcinogenic, and therefore the most logical thing is to consider them not dangerous in this sense. But this conclusion could change if, in the future, new evidence is discovered that places this statement in doubt. That's how fickle science is. It accepts something until the contrary is demonstrated. Because when the contrary *is* demonstrated, it will be no problem for scientists to change the current theory.

This, however, should not make us think that anything scientists say is a transitory, and therefore arbitrary, truth. Science often gets it wrong, of course, but it gets it right even more often. You, dear reader, would not be reading this were it not for the scientific progress made in medicine: antibiotics, vaccines, surgery, therapeutic drugs... What would the life expectancy in Europe be without science? And yet, despite all this, the new technologies are regarded with suspicion, perhaps because today's society finds it hard to accept the degree of uncertainty with which we scientists are used to working.

I am now ending this article. I have spent a good while sitting in front of the computer. Does this mean that the radiation from the screen has affected me irreversibly and that, without knowing it, I am yet another victim of a technology whose negative effects have not been sufficiently studied? Well, as far as we know, there is nothing to indicate that exposure to the screen of a computer, apart from the eye and posture fatigue it entails, is particularly harmful, and therefore, probably, nothing will happen to me. Probably **||**