

New Scientist and Greenpeace Science Debates

Science, technology and our future: the big questions

Technology: taking the good without the bad

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Professor Ian Pearson, Futurologist, British Telecom



Ian Pearson: Let it go on the record that I enjoy technology. I have worked in technology and trying to invent new technology. I normally get to talk a little bit about all the fantastic advantages in the new technologies that are going to come along and how much they will improve humankind. Tonight, I'm not going to do that. Tonight, I'm going to focus instead on those things that are starting to worry me.

What is really worrying me this evening, and probably for the last 6 months I haven't really slept properly, is that there's a growing gap between our technological capability and our underlying scientific understanding. It used to be that new science came along and then we'd figure out how to make use of that and develop new technologies. Now the new technologies don't actually require, very often, any new science to be done so it's like we've been given this huge chemistry set but a big warning on the side: not for children under 16. But we're still toddlers and this chemistry set is quite capable of doing very, very clever things but we don't really understand the science underneath it. We don't know what's safe and what's not but we've still got all of these chemicals and all of these different tools so we can do very, very clever things with the technology of the future without necessarily understanding

some of the science underneath, and that strikes me as a very, very dangerous thing indeed.

So, the technologies I'm going to point out as being particularly dangerous over the next hundred years, and I'm not the first person to point this out, (there's other people much more eminent than myself such as Bill Joy a couple of years ago in Wired Magazine did this very, very well indeed), is nanotechnology, artificial intelligence and biotechnology. The benefits that they will bring are beyond doubt. They will bring enormous benefits to mankind. They will solve an awful lot of the major problems that we're facing on a day-to-day basis but they are going to be very, very dangerous indeed.

We're going to see, to be quite blunt, arise, an exponential rise in the numbers of technologies, which are capable of bringing about human extinction. I plotted a graph recently over the probability of human extinction against time and, up until maybe 30 or 40 years ago, there were only 2 or 3 different technologies that could have caused human extinction. We've been living with the threat of nuclear war through most our lifetimes. It's not happened yet but it's still there in the background, but that's really been the only manmade technology. We could always be wiped out by an asteroid strike or a comet strike but it hasn't happened, fortunately. But now we're inventing lots of new technologies, which, if they go far enough, could do just as much damage and we don't really understand the fundamental science to defend ourselves.

Looking in turn at those, artificial intelligence, well, I'm a prime culprit; I'm working in the field of artificial intelligence. I have a prototype software design for something, which will have a trillion neurons and run at a million times the speed of biological neurons so it might be 50,000 million times smarter than the human brain. Target date for that is 2010. So that's a potentially significant technology. You've all seen Terminator. The only thing that's not feasible in the film Terminator is that the people win. If you're fighting a war against technology, which is 50,000 million times smarter than you are, you probably will not win.

We already are looking at the possibility of crime software evolving automatically on the network. Peer-to-peer networks and all these things with lots of wonderful things you can do such as searching for extra-terrestrial life and so on, but we can also use that for evolving criminal software and I'd be surprised if the Mafia aren't already using peer-to-peer architectures and evolving genetic algorithms and so on to

develop criminal software and encrypting that so that they can disguise it on lots and lots of different machines across the net and there's very little that we can do to police that.

We can also in the future use artificial intelligence in various weaponry systems and that's exactly how the film Terminator eventually came about. There is already a network up there called Skynet. We have already had serious discussions during lunchtimes at BT as to whether the network might actually become spontaneously conscious. These are not science fiction problems anymore. These are real science problems and engineering problems that people like us in BT are worrying about on a month-to-month basis.

Nanotechnology – we've all heard of the 'grey goo' problem, that self-replicating nanotech devices might keep on replicating and replicating until the entire world has been reduced to sickly goo and a lot of people have said that's totally unfeasible. Well, maybe it is unfeasible but, supposing you were to put some of these devices inside bacteria and given a certain amount of self-replication capability and design them deliberately to use as weapon systems and so on, just how much devastation could you do with that? I don't think we really know the answer to that. And not knowing the answer is almost as bad as saying the answer's terrible because we really don't know, you know, whether human extinction is in the bag as a potential consequence of that technology.

Certainly in biotechnology, we've really got a big problem because biotechnology's converging with nanotechnology and IT. Another of my projects is trying to put chips inside the human skin, which will allow us to connect to the nerves in your hand and send biological nerve signals across that link. When you're away on a business trip you'd be able to send your partner an orgasm by e-mail! This will be a tremendously fantastic technology in the future but the potential for big brother is obviously very, very large. Once you start mixing nanotech with organisms and you start feeding nanotech-enabled bacteria and stuff like that in the environment and we start getting the biotech companies to work on proteomics and so on and inventing new bases along with the adenine, cytosine, thymine and guanine, there's no reason why we can't develop a whole suite of different bases and start putting those inside bacteria, inside of cells. We can really go an awful lot further than Borg in Star Trek in this line of technology and those superhuman organisms might not like us very much so we might again face extinction.

There are an awful lot of new routes where we might be facing extinction as a result of this and Borg-type organisms, you know whether they're genetically modified or whatever it might be, that might be a problem for Greenpeace today but, compared to adding extra bases to the traditional organic ones, that problem is really minuscule. I think Greenpeace will be facing much, much bigger technological threats in the future and we hope that they will defend us against some of those threats.

So development will make an awful lot of these technologies. Eventually they will become routine and that's very, very difficult today, in fact, it's impossible today. Sooner or later we'll conquer the problems and eventually they become quite routine and what we're effectively doing in the hundred years' timeframe is giving every teenage school kid a big red button on their bedroom wall which says, destroy the world. We're giving that technological capability in such a small way that you can't possibly police it. The devices might be physically very small. The technology might be quite routine and largely automated. We must assume that in the future there's this big red button saying 'destroy the world' on every teenager's bedroom and tonight millions of school children will go to bed in a suicidal frame of mind, wishing they could take the whole world with them and destroy it all. That's a heck of a threat to humanity.

So it's very, very difficult to police but fundamentally we don't know how to make defence mechanisms against that. We don't have enough basic science in the background and that is a really big problem, with peer-to-peer architectures and encroachment technologies. You can hide these things across the net. You can do all sorts of different things to make them difficult to police and I really don't think we have the scientific know-how to defend ourselves against these. So the new technology will obviously bring an awful lot of undoubted benefits with us but we really must ask whether it's worth getting all these benefits if the price is potential human extinction or extinction of every single organism on the entire planet in some of these cases and I don't think it probably is worth that. So maybe we should try and hold it back somehow and maybe give us a little bit more time to do the basic R & D.

I don't actually think that it's possible in practice to slow it down. So what we need to do is accelerate the scientific research and to try and get some extra tools. But there are some things we can do to slow it down a little bit perhaps. For example, the Internet allows people to link together across the net in network communities and when you do that, it's possible for Greenpeace or Friends of the Earth to send a

message to every single environmentalist around the planet and, within a matter of minutes or an hour at the most, every single one of these people has got this message coordinating their activities together and leveraging their economic muscle against the big bad corporations who might bring about these new technologies. And that is a very, very powerful potential weapon and you can't fight against it because these people distribute it right across the planet whereas your company is in a single building in a single country somewhere.

So it's a very asymmetric threat but because it's asymmetric and because it's so powerful, I think that puts the onus on groups like Greenpeace and Friends of the Earth and other environmental groups to be a lot more scientifically based in the way that they use their power. I think, at the moment, I support Greenpeace to the ends of the earth in some of their campaigns such as defending the whales and preventing people dumping nasty toxins and stuff out at sea without worrying too much about the environment. A lot of the campaigns of Greenpeace and Friends of the Earth, other environmental groups too, are beyond reproach but I think that the records of the greens is somewhat tarnished. I think there are some areas where science seems to go against the greens and there are some areas such as nuclear power for example, where there seems to be an enormous amount of emotion behind that in some of these environmental campaigns.

Now, I had cancer about 12 years ago. My father used to work in Sellafield just around the time of the nuclear link. Those two might link together. I'm no great fan of nuclear power but I've also seen all of the statistics that 1.5 million people very year are killed by diseases caused by particulates from using fossil fuels and, of course, almost all of the global warming is probably caused by spreading fossil fuels. Now, when you look at all of the statistics, there may be a few thousand people killed every year by the odd nuclear accident. Millions of people a year are definitely killed by global warming and particulate poisonings and stuff. I think maybe that Greenpeace and Friends of the Earth haven't quite got the balance quite right and I think that, although they deserve a great deal of praise for some of the things that they've done to defend the environment, a lot of ways scientists have previously failed to get any support for their activities, I think that they deserve a certain amount of the blame for things like global warming and particulate poisoning and stuff as well.

So I think that in the future what we really need is a great deal less emotionalism in our environmental groups and a great deal more objective science in our environmental groups and then a lot more people will support them. I for one support

Greenpeace emotionally. I want to defend the environment. All sane people do. But I don't agree with Greenpeace on every single one of their campaigns where sometimes the science is a little bit dubious and I think what we need to do as a community is to make an awful lot more objective science, not funded by the Monsanto's or the BT's who have a particular axe to grind and want to get a particular answer and not funded by the Greenpeaces who also might have a particular answer that they particularly want to satisfy their dogma or whatever it might be, but we need more objectivism in order to get the actual thing which is best for the environment. Otherwise, we're in real trouble. ¹

So, we all want to defend humanity. We all want to defend the environment. The problems facing us in the future are getting bigger and bigger. I think if we don't all club together and get some proper science done, I think the future is very bleak indeed. Let's make it work, Ladies and Gentlemen. Thank you.

¹ "Greenpeace was not able to respond to these comments during the debate, but needless to say we disagree that this is a choice to be made. The UK, indeed the world, has a huge renewable energy resource which could be exploited rapidly and effectively if the political will were there to make it happen. If there is a "trade-off" between nuclear and polluting fossil-fuelled power it is because successive Governments have failed, and the present Government continues to fail, to have the vision and will to develop a sustainable energy system based on safe green power generation and wise, efficient energy use."