

Reflections on Teaching and Learning Physics

Science on TV can only ever mean one thing

“So the gamma ray bursts were not coming from the area of the Milky Way. They were coming from all over the night sky. To Paczynski this could only mean one thing.”
(Horizon, 2001)

I recently watched a programme about volcanoes on television. I thought this was good television – interesting, visually engaging, exciting. It was, I suppose, a good example of science on television, as it would have both informed viewers and entertained them. It certainly linked to the science being taught in the school curriculum, and students should be encouraged to watch such programmes. Yet, as a teacher, I always seem to have some reservations about the science I see portrayed in television documentaries.

What makes me slightly uneasy is the very authority of the medium: television is now able to ‘show’ us exploding back holes, retreating glaciers, moving continents and all sorts of other phenomena that are too large, too distant, too slow or just too dangerous for us to experience directly. And the quality of the computer-generated-image (CGI) graphics make some of these scenes seem as realistic as the footage of the scientists explaining their ideas.

This high quality is certainly a technical achievement, and no doubt essential if such programmes are to maintain the interest of young people used to the latest ‘video games’ and the special effects used in many TV dramas and films. Yet I find some aspects of the ‘realism’ of TV science makes me uneasy. I find some of these simulations a little too engaging.

When watching a fictional programme one needs to temporarily ‘suspend disbelief’ and enter into the imaginary world created by the script-writer and director in order to get maximum enjoyment from the programme. In a science fiction programme we may have to ‘accept’ ray-guns, matter transportation, telepathy, inter-species mating, faster-than-light travel and other such fancies to ‘buy into’ the programme. More informed viewers have a better idea of which of these notions are rather fantastic, and which are reasonable extrapolations of current science and technology. However, hopefully, all of the audience knows that these are fictional characters and scenarios. No matter how ‘realistic’ the scenes of fleets of spaceships, human explorers on planets in ‘another quadrant’ of the galaxy, or of invading aliens in London streets, we know they are not real.

Documentaries are different. They tell us about things that are considered to be real. At one time science documentaries were largely ‘talking heads’ plus the occasional low quality animation. But nowadays audiences expect more, and so science on TV has to match those expectations. The film-makers response includes the use of quality graphics, ‘interesting’ (i.e. irritating for those over eighteen) photography and editing, and restaging events.

The inclusion of reconstructions using actors (perhaps showing a scientist looking excited on seeing their results; or driving home after a frustrating day at the bench) inter-cut with interviews of the actual scientists, often add little to the information provided, and seem designed to keep the attention of easily distracted viewers. Other reconstructions seem potentially confusing. When watching the documentary on volcanoes I ‘saw’ carbon dioxide spreading from a volcanic lake to suffocate villagers in their sleep. Here a ‘teaching model’ was being used. However, there was no attempt to point out that the simulation represented carbon dioxide as a visible gas for visual impact. I can imagine that some viewers now believe that carbon dioxide has the appearance of mist.

Some of the simulations using CGI are very impressive. Indeed these are sometimes so impressive that I have found myself having to consciously note that I am watching a simulation not a film of an actual event. My reservations here relate to how science builds models of the world, which are often partial and sometimes quite tentative. When teaching we try to be careful to emphasize the status of the ideas we present. Some scientific principles and theories are well ground in evidence, but others – like the big bang or the causes of major extinctions – are really feasible explanations based on our current understanding.

Yet, with some exceptions, TV science tends to gloss over this central feature of science: the provisional nature of our knowledge. A high quality CGI sequence showing an exploding star or major comet impact changing earth climate is only ‘realistic’ if it includes details: details that are often little more than good guesses. This was a criticism of the otherwise excellent programmes on ‘walking with dinosaurs’: that the viewer is not given clear guidance on which features of the science shown are generally accepted as based on robust evidence; and which are the programme makers filling in the detail to give quality images and a good story.

Perhaps a good exception here is the archaeology series ‘Time Team’. Although this series certainly has its share of detailed reconstructions of buildings and activities which are underdetermined by the available evidence, it also shows the scientists finding that evidence, being puzzled, disagreeing over it, constructing hypotheses, and sometimes (shock!) even changing their minds when new evidence is found. An attentive viewer is left with a fair view of the tentative nature of the work. Yet many other science programmes seem to feel they must present a tidy, finished version of the science. Perhaps they need to do this to get their programmes made: perhaps it is the commissioning editors who will otherwise tell them to come back with a new proposal when the science is done and the answers are actually known?

Yet it is this notion of certainty in TV science that most concerns me, and undermines the efforts to teachers to help students appreciate the nature of science and the excitement of fields where so much is still to be learnt (often those most likely to feature in documentaries). The approach is summed up by the phrase that ‘this can only mean’. This is a favourite expression of science documentary makers (as in the motto at the head of the column), but is seldom close to being justified by any single scientific observation or measurement. Even when the scientists themselves are suitably tentative in their language, the script may present their ideas as being definitive,

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“NARRATOR: The ferns and the pines could only mean one thing.

RUBEN CUNEO: And this is suggesting [sic] that the dry conditions we had at the beginning of the mid-Jurassic are changing to, you know, more humid conditions by the end of the mid-Jurassic.

NARRATOR: As the super-continent split up the hot, dry world of the early dinosaurs changed into a lush, forested one.”

(Horizon, 2002)

I find this deliberate transformation of the likely and possible into the certain and absolute devalues the worth of otherwise excellent programmes.

I would like to see this change, and science programme makers take responsibility for planning programmes that help science teachers communicate to students a more realistic view of the development of scientific understanding. However, I am not optimistic, as science documentaries seem to have become a mature genre where there are now expectations about what should be included, and how the story should unfold. In this sense I fear that science documentaries have become like the Galapagos Islands, the subject of another excellent recent TV series. The Galapagos Islands follow a set cycle of being formed over a geological hot spot, drifting away with the moving tectonic plate, and being subject to a succession of ecological development. Not only does science know this, but also that it will never change. As the documentary definitively informed me, this has *always* happened, and it *always* will do.

references

Horizon, 2001: ‘The Death Star’, broadcast, BBC2, Thursday 18 October 2001, transcript available at <http://www.bbc.co.uk/science/horizon/2001/deathstartrans.shtml>

Horizon, 2002: ‘The Mystery of the Jurassic’, broadcast BBC2, Thursday 28 March 2002, transcript available at <http://www.bbc.co.uk/science/horizon/2001/jurassimysterytrans.shtml>

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