nature

www.nature.com/nature

Vol 452 | Issue no. 7186 | 27 March 2008

1917–2008: A Space Optimist

Arthur C. Clarke's technological prescience deserves to be honoured; his endless optimism needs to be cherished.

It took an unusual mind for a Londoner living in 1944 to see the V2 rockets bombarding the city as a cause for hope. But the intellectual milieu of the time, enriched as it was by the cosmic visions of the likes of Desmond Bernal, J. B. S. Haldane and Olaf Stapledon, produced a few such optimists. Freeman Dyson, a brilliant young mathematician then working on the more traditional bombardments crossing the North Sea in the other direction, saw his hope in the opportunity costs: enemy resources spent on inefficient rockets could not be spent on more effective fighter aircraft. Arthur C. Clarke, then a young radar engineer and soon to be a budding science-fiction author, saw his hope in the fact that, en route from mainland Europe to England, the rockets were passing through outer space, and the technology required for travel to other planets was thus at hand. Legend has it that when Clarke and his friends from the British Interplanetary Society heard a V2 while drinking in a pub, they stood and cheered the space age that was about to begin.

Such optimism comes from an ability to look beyond the obvious, an ability that served Clarke, who died on 19 March, as both a writer and a prognosticator. Clarke, who founded his writing in rigorous science, foresaw not just the technology of the geostationary communications satellite, but also the effect that such distance-denying technologies would have in drawing the world together. As he said with typical optimism to the dignitaries signing the agreements in 1964 that created the Intelsat system: "You have just signed the first draft of the Articles of Federation of the United States of Earth." But he did not just see upsides: in 1960, he published in *Playboy* a wry little piece on decadence and satellite-delivered porn called "I Remember Babylon".

Wryness was a frequent tool. But Clarke's aim in his writing was mostly to inspire wonder, specifically the wonder of transcendence — the wonder in gazing into a featureless artefact and reporting back, stunned, "My God, it's full of stars!". In that moment from *2001: A Space Odyssey*, as in many other instances, Clarke showed his readers the wonder of the scientific threshold about to be crossed, the cosmos about to be joined. Yet he did so with a humanity that insisted that his readers were not insignificant in the face of such immensity — or rather, that their insignificance did not diminish them, perched as they were for ever on the shores of what was to come.

The book's technological vision of lunar cities and men bound for Jupiter, magnificently realized in film by Stanley Kubrick, was flanked by just such shores — the dawn of human consciousness in the ape–man Moonwatcher, the space-age Odysseus's return through the pit of stars to a home about to be utterly changed. Moonwatcher or moon-walker, Clarke was saying, we are always on the brink of the beginning, always in some way pre-historical. Seeing the whole dazzling day to come in the first thin cord of the Sun was his great delight.

In the 1970s, Dyson, by then a luminary of mathematical physics, explored the possibilities of life running off into the furthest reaches of the future. It was an idea to stir Clarke's soul. As he wrote in response:

> "[Not for] billions of years, will the real history of the universe begin.
>
> It will be a history illuminated only by the reds and infrareds of dully glowing stars that would be almost invisible to our eyes; yet the sombre hues of that all-but-eternal universe may be full of color and beauty to whatever strange beings have adapted to it. They will know that before them lie ... years to be counted literally in trillions.
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> They will have time enough, in those endless aeons, to attempt all things, and to gather all knowledge. They will be like gods, because no gods imagined by our minds have ever possessed the powers they will command. But for all that, they may envy us, basking in the bright afterglow of Creation; for we knew the universe when it was young."

It is a rare gift — although one potentially shared by any scientist — to find satisfied joy in being poised before the transcendent, filled with hope by the wonders that the intellect, rather than blind faith, promises to those who explore it. Clarke devoted himself to passing on that gift, and we should cherish it. ■

Critical journalism

Science coverage is on the wane when public scrutiny of science is more important than ever.

Watch five hours of US cable news, and on average you will see around 35 minutes on election campaigns, another 36 minutes on US foreign policy, and 26 minutes on crime — but only about one minute on science and technology, slightly more on the environment, and only a little over 3 minutes on medicine and health care. This is not just an issue with cable: science fares little better in other forms of television, radio, or print news, according to the Pew Research Center's *The State of the News Media 2008* report, released on 17 March.

It would be a mistake to get too alarmed about this analysis. Science news in the United States has indeed been squeezed to around 2% of the total since the events of 11 September 2001. But it was never that high, hovering around 4–6% from the mid-1970s until 2001. And the drop does not reflect a falling public interest in science, as much as the media's increased emphasis on foreign policy, war and the homeland: the diversity of US news coverage has decreased across the board since 9/11.

The Pew Center's numbers offer another reason not to be gloomy:

the Internet is overtaking television as the public's main source of science news. This means that a larger global audience can now access, on demand, a great diversity of science coverage from media outlets around the world. Moreover, the public are no longer just passive consumers of information. The Internet is now the first place people go to look for more information on a scientific topic, such as stem cells or climate change. Thanks to the Internet, in short, one could argue that the overall state of science communication is better now than at any time in the past.

Yet there is no reason to be complacent. As the media industry moves online, some shakeout is inevitable. Straight news is becoming a commodity, which will be dominated by fewer players. Independent science desks and media can have a future in this environment, but only if they move up the food chain and provide proactive, deeper, must-read analyses instead of me-too articles reacting to the latest press releases.

In that context, perhaps the most worrisome finding in the Pew report is that this type of resource-intensive science coverage is precisely the most threatened: as the newspaper industry responds to falling circulation with sweeping cuts, science desks are among the first to suffer.

Media executives should pause to rethink these cuts to science desks and coverage on two counts. One is that this choice is often influenced by the widespread notion that science is of comparatively little interest to readers. According to Pew Center data, however, around two-thirds of all those who search online for news are after science and health news — second only to the weather — with technology coming third, ahead of politics and business. That trend is confirmed in reports published this past December by the European Commission.

Another, and more important, reason to sustain high-quality science journalism is that, in this context as much as any other, the media have a responsibility (with rewards in audience response) to fulfil their watchdog role. Many contemporary societal issues are both science-related and complex. Science reporters are essential for keeping tabs on government at every level, ensuring that decision-makers listen to the best experts and scientific evidence available. They should also be in the front line of countering the misrepresentation of science, whether by anti-science groups, multinational corporations, or politicians — or indeed, by scientists and their institutions hyping their own work to gain fame and funding. ■

A reprogramming rush

Stem-cell research is in danger of falling foul of haste.

In the most recent of his series of stunning articles on induced pluripotent stem (iPS) cells (T. Aoi *et al. Science* doi:10.1126/science.1154884; 2008), Shinya Yamanaka made a couple of small mistakes. Happily, he has since given plausible explanations for the mistakes, and has effectively argued that they do not affect the article's central conclusions — thus heading off worries (and one unsubstantiated accusation) that the errors signalled deeper problems with the article.

Still, the incident illustrates why there is cause for concern as scientists hop on the iPS bandwagon (see page 406). The very existence of such carelessness by the leading light of iPS cell research, a scientist known for his thorough, careful work, shows how much the race mentality has taken over the field. The paper was published online a mere five and a half weeks after it was submitted. Other key articles in the field show similar signs of being rushed for publication. One biotech company recently announced its iPS cell results without even bothering to publish (see *Nature* **452,** 132; 2008). And authors have been pushing journal editors to speed up peer review — under the threat of taking the paper elsewhere — which puts even more pressure on the small circle of reviewers sufficiently versed in iPS cell science.

Competition is good. Indeed, it is a major reason why iPS cell research has flourished since 2006, when Yamanaka first showed that a handful of genes can reprogram a cell to a pluripotent state. Nonetheless, the fast-moving fields of science are showing some unpleasant tendencies. Researchers are cutting corners and making mistakes. They are making over-hyped promises that will probably be broken. And they are neglecting other valuable fields of research. All this has already been seen in iPS cell research.

Hype may also carry researchers away from their mission and raise the spectre of fraud. Indeed, as Alan Trounson, head of the California Institute of Regenerative Medicine in San Francisco recently told *Nature Reports Stem Cells*, "excessive" media attention on iPS cell research could "separate science from reality" in the same way it did during the therapeutic-cloning scandal surrounding South Korea's Woo Suk Hwang. "Cool heads and a close connection with the lab should prevail in order to ensure science progresses truly by reliable evidence," he says.

The errors in Yamanaka's article are unfortunate — not least because they play into the hands of those who want to tarnish the science or the scientists. The criticism of Yamanaka's article came from an anonymous source who seemed bent on a personal attack. From the address "Reprogrammer Yamanaka" on 29 February, the e-mailer sent an account of Yamanaka's mistakes to journal editors, science journalists and scientists, scolding Yamanaka for his "embarrassing inconsistencies" and calling on him "to either retract their paper or provide meticulous and thorough new analysis".

Yes, this attack was overly dramatic. And yes, Yamanaka owned up to his mistakes with commendable speed and honesty. But even so, this incident should be a wake-up call.

Post-Hwang, scientists and journals undertook much soul-searching about what went wrong. Some came to the bad-apple theory — that Hwang was just an anomaly. Most, rightly, saw it as a deeper problem that could affect any field of science. In the aftermath, many researchers vowed to redouble their efforts to guard against honest mistakes (usually attributed, as Hwang did at first, to the rush to submit articles), as well as against the whole spectrum of selective presentation of data, manipulation of images and outright fraud. iPS cell research may be the first substantial test of these efforts. ■