nature
www.nature.com/nature
Vol 457 | Issue no. 7232 | 19 February 2009

Collective responsibilities

China should stop discouraging scientists from setting up learned societies.

The spread in China of unproven stem-cell therapies for conditions such as epilepsy and spinal cord injuries has left the nation's health authorities concerned. There is no clear evidence that these treatments work — nor that they are killing people. Of the thousands of patients from China and abroad who have been treated, some seem to think that they have been helped, even if only modestly, and many more are ready to fork out thousands or tens of thousands of dollars to try out the treatments. Are the clinicians taking advantage of people desperate for a cure? How can the government — and the potential patients — make sense of this?

One obvious place from which to seek guidance would be the national stem-cell society. But China doesn't have one. A group of scientists, including many of the country's most prominent and internationally established researchers, are trying to create one.

The Chinese authorities, however, tend to have an aversion to congregations— especially those such as the Falun Gong, which they believe pose a threat to the country's stability. So the Ministry of Civil Affairs keeps a tight hold on who is allowed to organize in any formal sense. As a result, China's stem-cell hopefuls must go through the slow process of planning and applying to become a 'level 2' society. That means they have to convince an established society to take them on as an appendage, which will dramatically reduce their ability to function effectively. A level 2 society doesn't control its own purse strings and decisions have to pass through the parent organization.

Yet, as the example above illustrates, allowing scientists to draw together can only benefit China, both by helping scientific progress and by assisting with the challenges faced by the Chinese nation.

It is not just the government that needs to rethink its approach: the researchers themselves need to pursue newer forms of social organization. Scientists in the south often don't know what is happening in the north and vice versa. Most of the current learned societies do not function well. Annual meetings are often a matter of pomp, with elite researchers showing up to swagger about and form cliques based on pedigree rather than scientific views. Introducing graduate students to the broader community is a low priority. Constructive criticism is more likely be taken as grounds for breaking off relations than as insightful advice. Many scientists simply don't bother to go.

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Sometimes 'megaprojects' draw researchers together. But the planning meetings for such packages can be more like dividing the spoils than building the most constructive research programme.

China's science loses competitiveness because of these failings. Stronger societies would pave the way for better communication and more productive collaborations, and would allow a platform for feedback of scientific criticism. That, in turn, would provide a body of honest reviewers with whom funding bodies could consult. Too often, instead of listening to a variety of voices to get a representative view from 'the community', funding bodies listen only to certain well connected scientists. Strong domestic scientific societies have the additional benefit of being reference points for constructive contact with scientists and societies elsewhere. And they can also act as advisory bodies to the government.

Gone are the days of small research communities in China. Science has grown significantly, to China's credit and benefit. For the country to benefit more fully, networking by its researchers likewise needs to be allowed to flourish. ■

Identity crisis

It is time for all involved to tackle the chronic scandal of cell-line contamination. Funders first.

Some 40 years after it was first recognized, the use of contaminated and misidentified cell lines in biological research remains a growing problem. But it is a problem that has a simple solution: routine, cheap, DNA profiling of laboratory cultures. It is now time to implement that solution. To do so, scientists need the funding and motivation to verify the cell lines in their possession, as well as a curated electronic database of authenticated DNA profiles against which they can compare their results.

Thousands of biology labs use cell lines, yet many do not know that between a fifth and a third of the lines in common use may not be what they seem. In the past 25 years, numerous studies, as well as the experience of cell-culture repositories in the United States, Britain, Germany and Japan, have found that 18–36% of cultures contain a misidentified species or cell type. The effect of using such cells varies depending on the project involved. When the lines are used as a source of biochemicals, for example, the misidentified lines are innocuous. Deployed in the study of a general cellular process, they can have minor drawbacks. But on the rare occasions that the cell lines are thought to reflect the properties of a particular tissue, cancer or disease state, the outcome can be severely damaging as funding and research get driven into work based on false premises.

To make matters worse, papers are still published that contain unwarranted conclusions derived from misidentified lines. It is ironic that many researchers who are obsessed with using only the highest-quality chemicals and biologics from the most trusted suppliers don't think twice about using cell lines known to be misidentified.

Cell repositories do carry out quality-control assays on deposited lines, although the tests performed vary. Even a venerated panel of

60 tumour lines at the US National Cancer Institute was found to have some that were either HeLa (the first human cancer cell line) or subcultures of one another.

This crisis of identification can be solved by analysing repository cell lines using DNA fingerprinting — short tandem repeat (STR) assays — and making the 'authenticated' profiles available in a database. Some of the cell-line profiles in the American Type Culture Collection, for example, already have their STR profiles listed. The German DSMZ cell repository performs DNA profiles for every line, but has also reported that 29% of its human tumour line deposits are cross-contaminated. It costs between \$20 and \$400 to fingerprint a cell sample (depending on country and circumstance), and some predict that the \$2 STR analysis is not far away. At that price, what lab could not afford to regularly recheck its cultures?

In an open letter in 2007, Roland Nardone of the Discovery Center for Cell and Molecular Biology in Washington DC, and his colleagues brought the issue of misidentification to the attention of Michael Leavitt, until recently director of the US Department of Health and Human Services. This moved the issue forward: by the end of the year the National Institutes of Health (NIH) formally recognized in a public notice that "misidentification of cell cultures is a serious problem". However, the notice went on to state that "it would be impractical for the NIH to require application of particular methods in all grant applications", and put the onus on peer reviewers to quality-control their colleagues' research proposals and manuscripts.

This merely capitulates to the status quo. Four decades after the problem came to light, it is time for this cavalier attitude to be jettisoned. Repositories need to authenticate all of their lines, and the NIH and other major funders must direct support accordingly. The STR profiles should be lodged in a global database that provides tools for readily comparing a culture's fingerprint with authenticated profiles. The funders should motivate investigators by encouraging the inclusion in grant proposals of expense estimates for cell-line verification, in recognition that this quality assurance will increase the costs of research. The community, in turn, should accept that it makes sense to verify cell lines routinely.

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Once this research framework is sufficiently established, major funders will be able to require the validation of all immortal cell lines in order for investigators to retain funding, and journals should (and *Nature* will) require that all lines used in a paper were verified before publication. ■

Overhead hazards

How to keep Earth orbits usable.

"Space is big," the British humourist Douglas Adams once observed litotically. "I mean, you may think it's a long way down the road to the chemist, but that's just peanuts to space." And yet, in all this vastness, there are now some regions so crowded that it is possible for a pair of satellites no bigger than compact cars to collide by purest accident, with no malice aforethought, as happened 800 kilometres above Siberia on 10 February (see page 940).

The fact that humans have managed to spread traffic hazards beyond the confines of their planet is humbling. It is also a serious problem — one that could severely hamper scientific research, weather forecasting, commerce and the national defence of various nations. It needs to be sorted out.

There are two complementary ways of doing this. One is for all satellite operators to abide by debris-minimizing rules such as those promulgated by the UN Committee on the Peaceful Uses of Outer Space: depressurize fuel tanks when you are finished with them, take steps to make sure that batteries don't explode, shut down flywheels after the mission is over and, most crucially, drive low Earth orbit satellites to a fiery atmospheric death when they have fulfilled their tasks. The fact that there is no clear way to enforce such practice does not mean that the international community should not try to insist upon it.

The other response is better tracking, which would allow satellites at risk to manoeuvre out of the way of each other. The military establishments in both the United States and Russia track objects in orbit. The Americans make some of their data available to the world at large; the Russians, to their shame, do no such thing. But the shared US data, although better than nothing, are more crude than those that the military keeps to itself. Better data would allow better decision-making by satellite operators weighing evasive action.

The US military has various reasons for not providing the very best data to all who ask for them. To do so would reveal the capabilities of the US surveillance systems — and perhaps their blind spots — in uncomfortable detail. It would also make the targeting of anti-satellite weapons easier.

One solution would be to release the data to a trusted intermediary with the analytical power to look for potential collisions and alert operators when things look bad. Another would be for the US military to do something along these lines itself. It already provides such services for some high-value missions by NASA and some allies. Expanding the service would make sense. If the US national security apparatus were to reduce the number of future collisions by letting third parties know of the risks, it would be improving the survival chances of its own spacecraft as well as everyone else's — and no one has more valuable assets in low Earth orbit than America's soldiers and spooks.

In the long run, an independent tracking system with its own data sources would be the ideal solution, and to its credit Europe has made some moves towards developing such a thing. But on the world stage this does not seem to be a priority. The problem is that by the time it becomes one — maybe two or three collisions down the line — the threat may have been ratcheted up far enough to be considerably less tractable. Every time two objects in orbit collide, they create more debris that can lead to more collisions. The way things are going, this will be one of those problems where the need for action becomes truly obvious only after it is too late. ■