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Priorities in astronomy

US astronomers are being forced to revisit their widely admired system for ranking large projects.

In the beginning, astronomers believe, our tiny Universe underwent 'inflation' — a period of growth so rapid that it separated sections of the cosmos from each other forever.

Something similar has happened in astronomy itself over the past half-century. In the 1950s, the field was a primordial ball of scientists using a handful of modest telescopes to peer at stars and galaxies. Today, thousands of them use telescopes, radio arrays, balloons and satellites to learn about black holes, extrasolar planets, star nurseries or the early Universe.

In the United States, a process known as the decadal review has guided this rapid expansion. The review is compiled by a committee, gathered under the auspices of the National Academy of Sciences, and lists which instruments should be built over the next decade, along with estimates of their cost. It has served US astronomy well, and other capital-intensive disciplines of science have sought to learn from its example. But the review process is under increasing strain (see page 386). Most projects in the 2001 review have been severely delayed, and some have been "indefinitely deferred". As the next decadal review gets under way, astronomers are wondering how to salvage its tattered credibility.

The problem arises, first and foremost, because astronomy funding's own period of inflation is drawing to a close. Budget constraints at federal science agencies, most notably NASA, have seen to that. The slowdown is compounded by the steadily growing size, and therefore cost, of the decadal review's project wish-list.

And as happened in the early Universe, the rapid early expansion of astronomy has left its component parts cut off from one another. Astronomers have organized themselves by the type of starlight they study — X-rays are one subdiscipline, infrared another. The partition made sense because each subfield requires different types of telescopes. But it has added a sectarian element to the review process, as various subpanels, organized by light type, have fought to secure the place of their field's instrument in the review document.

The need to placate these different groups has forced the review's outcome to become unwieldy. In 1972, for example, the review simply listed eleven favoured projects in rank order. By 2001, it was placing projects in subcategories of large, medium and small, and whether they were space- or ground-based, before ranking them. This obtuse system identified no less than five different projects as astronomy's 'top priority'.

Astronomers are therefore looking at ways to restore some of the simplicity that was the review's great strength. One approach may be to turn to the science. Rather than dividing astronomy by wavelength, reviewers could decide which areas of investigation are likely to prove most promising — the study of 'dark energy', for example. Researchers from each subfield could then come together on subpanels to establish which instruments could best address the problem, and how each subfield could best contribute.

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The basic idea is not without precedent: US Earth scientists are already using it in their own, inaugural decadal review. Their National Academies panel is organized by categories such as weather, climate, hydrology, natural hazards and solid Earth research, with the weather panel, for example, incorporating hydrologists, atmospheric physicists and oceanographers. It expects to produce a prioritized list of instruments, some of which will be shared by subdisciplines.

Such a change in outlook is not a panacea for astronomy. Given the budget constraints, the next review will have to make tough choices and exclude some excellent projects. But reorganizing the decadal review along scientific lines would go some way towards ensuring its continued relevance in astronomy's post-inflationary epoch. ■

A German academy

In seeking to build a credible national academy from scratch, Germany faces a tough challenge.

For historical reasons, modern Germany has no national scientific academy along the lines of the Royal Society in London or the US National Academies. It is now seeking to design one — but building a reputable academy from scratch may be more difficult than it at first appears.

Clearly, the academy's value will ultimately be measured by the quality of the reports and recommendations it produces, and by the influence it manages to yield. In a pluralistic society, no single organization can claim to be a central committee of truth. But the functioning of modern nations correlates closely with their handling of technical, medical and scientific problems. They need to receive well-considered scientific advice that has a real chance of making a difference in the political arena.

The fact that Germany is building an academy from scratch gives it the opportunity to learn from others, and to do it right. Scientific academies have sometimes carried the whiff of exclusive clubs where scientists who are usually elderly, white and male retire to indulge in arcane intellectual pleasures. It is a tough balancing act to ensure that an academy will respect experience and acquired wisdom, while also reflecting the diversity — in age, gender, background and outlook — of today's scientific community.

Germany's existing learned societies include seven regional academies, which are most active in the humanities and social sciences, and the 350-year-old Leopoldina, which represents the medical and

natural sciences in the German-language region, including Austria and Switzerland. The East German Academy of Sciences, which until 1990 was the main scientific institution in the communist German Democratic Republic, has been closed down.

None of these organizations can claim to speak for German science as a whole, either at home or abroad. Nor can they fulfil the advisory role undertaken by national academies elsewhere. The Deutsche Forschungsgemeinschaft (DFG), Germany's main research agency, has done some of this in the past. But as a funding agency affiliated to the government, it cannot act as the independent voice of the scientific community in Germany.

A national academy has been on the radar of Germany's scientific leaders ever since reunification. In 2004 the Wissenschaftsrat — a council of the great and the good that currently advises the government on science policy — asked the regional academies to come up with their ideas for one. Under the academies' as-yet-unpublished proposal, the national academy would comprise a 200-strong council, appointed by the regional academies. It would generate advice for the government through ad-hoc working groups with appropriate external expertise. The details of how this will be done are still being debated within the scientific community, but the outline proposal will be considered by a meeting of the German states' science ministers next month.

Operating the academy will require modest government funding. It will need enough money to establish a robust technical staff, to help compile reports and organize public outreach. The manner in which it is funded will need to be designed to ensure that the academy retains political independence. One route would be for the academy to draw its money from the budget of the (politically neutral) federal president's office. The architects of the plan have yet to iron out all of these details.

Ultimately, a successful academy will have to earn not just the backing of scientists, but the trust of large segments of the public. It will be essential for the new body to proactively seek the engagement of the public from the outset. By giving due consideration to contentious issues, the academy should benefit German society by encouraging a healthy level of scientific discourse and improved public understanding of science. ■

Reforms on drug safety

Critics of the US Food and Drug Administration have a valid point.

The US drug safety system is outdated, weak, disorganized and seriously underfunded, according to no less an authority than the Institute of Medicine (IOM). The Food and Drug Administration (FDA) has neither the money nor the muscle to police the safety of drugs already on the market, says a report released by the institute last week.

The FDA itself asked the IOM, which represents the most eminent figures in US medical research, to look into its drug-regulation process in 2004 after the withdrawal of the painkiller Vioxx, which was found to increase the risk of heart attacks and strokes (see *Nature* **432,** 537; 2004). Vioxx provided an example of what can happen when drugs originally tested in limited numbers of people in clinical trials are put to work in the real world.

Subsequent examination has confirmed that the FDA's post-market safety efforts are paltry, particularly compared with its exhaustive pre-approval drug-evaluation process. That impression is confirmed by the IOM report, which makes more than two dozen recommendations for strengthening the US drug safety system.

The IOM committee, chaired by Sheila Burke, chief operating officer at the Smithsonian Institution, notes that the current balance of priorities at the FDA reflects an earlier era, when prescription medicines were usually taken one at a time, for short periods. It is less appropriate for today's chronically medicated, rapidly ageing, multiple-pill-popping population.

Many of the IOM's recommendations focus on strengthening the FDA's approach to ensuring the safety of drugs already on the market. The committee wants Congress to give the FDA the authority to fine companies that fail to run promised studies of their drugs once they are for sale. Companies commit to carrying out such studies when a drug is approved, but all too often these promises go unfulfilled.

The IOM also asks Congress to grant the FDA power to compel companies to change drug labels when new safety concerns arise. Under current law, the FDA can request but not demand these changes, often leading to protracted negotiations with drug firms. In the case of Vioxx, it spent 14 months getting a reference to heart-attack risks added to the label, years before the drug was pulled.

The report says that newly approved drugs should carry a warning label — perhaps a black triangle — for their first two years or so on the market, to warn consumers about the limited state of knowledge on the drug. Direct advertising to consumers should also be restricted in this early period, it argues.

The IOM also proposes that a fixed, six-year term should be established for the post of FDA commissioner, in an attempt to detach it from the vicissitudes of the four-year presidential election cycle, and hence from party politics.

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Then there is the matter of money. The IOM wants Congress to give the FDA far more resources to monitor the safety of existing drugs. Rather than this being financed by the drug industry through user fees, it is emphatic that the money should come from the public purse, to make sure that the regulator is seen to be independent of excessive industry influence.

The radical changes that the IOM is recommending may face an uphill struggle in Congress. But public concerns about drug safety need to be addressed, and senior figures in both parties, from Senator Chuck Grassley (Republican, Iowa) to Senator Edward Kennedy (Democrat, Massachusetts), have the issue firmly in their sights. Congress should take some of the bold steps that the IOM report is suggesting, in order to restore the FDA's reputation for firm but fair drug regulation. ■