

Spring-cleaning in France

The French scientific research system is ripe for reform.

A year ago, on 6 May, France elected President Nicolas Sarkozy on a 'ticket of change' that included making research a priority and shaking up the science base. His government, to its credit, has made a fair start on both. Science and higher education, long relegated to puny junior ministries, have been given a full-ranking ministry, as have ecology and sustainable development — which also puts neglected issues such as climate change and energy high on the agenda. The state has upped science funding and has begun to modernize the way research is administered.

Sarkozy's government used his post-election momentum to swiftly push through a law shifting power away from the government research organizations, such as the CNRS and INSERM, to the universities. To an outsider, the law might seem quaint: it simply gives the state-run universities greater independence to manage their own budgets, to fix their own science strategies and to hire researchers on contract, with salaries negotiated on merit.

But this is France, where a naive interpretation of *égalité* has made taboo the competitive universities of Anglo-Saxon countries, and where most researchers are civil servants on identical pay scales. Attempting to change the status quo has been a recipe for street protests, and often political downfall. Students did protest against the new law, but the movement fizzled out after Valérie Pécresse, the country's science minister, faced it down while making only minor concessions. Forty years after the protests of May '68, the French have not lost their taste for revolt, but they seem to be slowly accepting that university reform is inevitable and overdue.

The universities will also be given a greater say in the running of the 1,300 laboratories they administer jointly with the research agencies. And thanks to the ramping up of the National Research Agency (ANR), created in 2005 to award grants on the basis of competitive proposals, university labs and young researchers are also less tied to funding by the agencies, which make rolling grants directly to labs.

Nonetheless, this change in status will take years to bear fruit, as most French universities are in a deplorable state. The government has funded the reforms with an extra €5 billion (US\$8 billion), but

the cost of redressing past neglect will stymie any immediate expansion of research and the recruitment of top talent.

This means that modernization of the research agencies remains imperative. A welcome restructuring of France's fragmented biomedical research has begun with a modest reform of INSERM, the national biomedical research agency, announced in March. The agency has been transformed into eight thematic institutes, which will regroup and concentrate research now spread across the CNRS and other agencies. A similar modernization of the CNRS, expected in June, is likely to transform it into a set of distinct institutes, each managing its own labs and long-term strategy.

It remains far from clear how the revamped research agencies will cohabit with the newly strengthened universities. Scientists must be vigilant to see that the right balance is struck among the agencies, the universities and the ANR. The research agencies have many merits. Rolling lab grants provide stability and opportunities for risk-taking that are rare elsewhere — even if too few researchers are taking advantage of them. And critics rightly complain that the young ANR is too skewed towards imposed top-down state 'strategic' themes to the detriment of investigator-driven basic research.

The broad inter-agency reforms also risk distracting from more pressing and targeted ones. The reform of INSERM does little to tackle the root problem of French biomedical research, which is that fixed pay scales and slow recruitment procedures make it almost impossible for France to compete in the highly competitive international job market. The softly-softly approach of introducing more flexible recruitment practices via the back door of the universities is not enough here.

So far, Pécresse has played a sensible opening game for the government, slowly moving her pawns forward to avoid confrontation while making reform a *fait accompli*. She may succeed where so many have failed. But sooner or later she needs to push forward a queen. ■

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The gathering storm rages on

Two years on, a National Academies report on US competitiveness struggles to make an impact.

It is not often that a US senator talks about science, and even more rarely that she claims to bear good news. But that's the message Kay Bailey Hutchison, a Republican senator from Texas, tried to deliver last week to a restless crowd in a hotel ballroom in Washington DC.

The occasion was a look-back at a major 2005 report from the US National Academies on the state of science and engineering in America. Called *Rising Above the Gathering Storm*, it warned that the United States could soon lose its worldwide lead to other nations that have been investing aggressively in science and engineering education and research. Hutchison called the report a "wake-up call. Even in Congress, we got it".

But did they? Last August, Congress did respond by passing the America COMPETES Act, which vowed to double the physical sciences research budgets at such key agencies as the National Science Foundation, the Department of Energy's Office of Science and the National Institute of Standards and Technology. But in the United

States, legislation saying that budgets ought to be increased is separate from the legislation that actually increases them. And the latter promptly got lost in the government's budgetary meltdown, as Congress year after year fails to approve final numbers for each fiscal cycle until months later than expected. When the fiscal 2008 numbers were approved last December, the funding that Congress had pencilled in for the COMPETES Act — and that the agencies had been counting on — had disappeared. The resulting turmoil has forced research agencies to put major initiatives on hold, to put employees at national laboratories on unpaid leave, and to pinch pennies everywhere.

Many of the *Gathering Storm* authors in Washington last week were understandably furious. Broken promises are demoralizing, to say the least, and make it impossible for agencies to plan or manage coherently. Still, many of *Gathering Storm*'s best ideas could be implemented without waiting for Congress to collectively grow up and show financial responsibility. These ideas include bolstering programmes to train maths and science teachers; getting more students to enrol in advanced courses in high school; providing special funds to help young scientists start their own labs; and making it easier for foreign-born scientists to enter the country. Such measures would still

require action from Congress, the president, or both. But they might very well be faster and easier to implement than the kind of major national commitment outlined in the America COMPETES Act.

In addition, it is important for supporters of the competitiveness initiative to remember that they, too, have a responsibility, which is to keep on communicating to legislators and to the American public at large why America COMPETES is more than just a 'Full Employment For Physical Scientists Act'. As David Ferraro of the Seattle-based Bill & Melinda Gates Foundation pointed out at the conference, the hotel ballroom was an "echo chamber": Americans elsewhere don't necessarily buy the notion that pouring money into research is the best way to spend their tax dollars. Indeed, some researchers argue that the statistics showing that the United States is falling behind have been misinterpreted (see H. Salzman & L. Lovell *Nature* **453**, 28–30; 2008).

So, while the *Gathering Storm* goals are worthy ones (see *Nature* **437**, 1208; 2005), supporters would be well advised to broaden their message beyond the usual suspects. Members of Congress are not going to stay on target for long when their constituents have other pressing issues, such as the economy or the war in Iraq, on their minds. ■

Bountiful noise

Whether in music or in nature, noise can be full of riches. The trick is to recognize the treasures.

Laughter and hisses — that's how a London promenade concert audience greeted the world premiere of a revolutionary musical composition in 1912. The response was hardly unusual, given that audiences of the day were regularly having their assumptions challenged by composers bent on redefining Western music. But unlike other dissonant masterpieces of that era, such as Igor Stravinsky's *The Rite of Spring*, the *Five Orchestral Pieces* of Arnold Schoenberg still come across to many as little more than noise. There are reasons for that, as a series of essays on science and music launched in this issue will make clear. But then, as other articles in today's issue illustrate, 'noise' has its treasures too.

Schoenberg's composition deliberately defied all the prevailing standards of music. It was, in his own words, "devoid of architecture or construction, just an uninterrupted changing of colours, rhythms, and moods". But it did have an expressive purpose, he insisted: "The music seeks to express all that swells in us subconsciously like a dream." Indeed, for today's sympathetic listener, the musical elements are distinctively recognizable and the emotional charge is tangible. Yet the language is still a challenge.

Of course, as Philip Ball explains in an Essay in this issue (see page 160), even more traditional music defies all attempts to explain its function in terms of mathematical or cognitive 'naturalness'. Subsequent essays in the series will highlight both the universalities in music — for example, how a mother's lullaby and rocking during early childhood are thought to lay a foundation for humans' aural and physical responsiveness — and music's diversity: the range of cultural conventions in such apparently fundamental elements as

pitch scales and perceptions of rhythm. Essayists will also describe, for example, the challenges in acoustics of allowing audiences to hear music to its best advantage.

Drawing on musicology, statistics, cognitive and evolutionary biology and acoustics, the series will help us understand why most of Schoenberg's music is more challenging than that of his contemporary and champion, Gustav Mahler — let alone the music of Johann Sebastian Bach. But it will also remind us that none of these disciplines has yet been able to answer the fundamental question: why does music have such power over us? Nor can they explain how avant garde composers in the 1950s were able to take noise itself and make something new and true with it. Anyone who has performed Karlheinz Stockhausen's *Kontakte*, for example, which pioneered much subsequent electronic music by presenting manipulated electronic noise amid the sounds of percussion and piano, will tell you that the piece has an incomprehensible power. Anyone with an open musical ear who has listened to György Ligeti's *Atmospheres* for orchestra will say the same.

The average listener isn't the least worried that musicologists and scientists cannot explain why we enjoy music. What matters is that its true bounties are recognized, and then explored and analysed. That applies not only to noise-like music, but also to nature. In that spirit, we can celebrate the fact that seismologists have begun to recognize and unpick the value of the ambient hum of the planet (see page 146). And we can enjoy the positive benefits that noise seems to have on living cells (see page 150).

Above all, what matters is that analysis strengthens rather than weakens humankind's sense of wonder — even as the natural terrain of exploration gets messier and as great composers make understanding music even more challenging. ■

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