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America's fresh start

The next US president will lead the country back onto the world stage in many arenas, including science.

Most of America's leading scientific establishment spent this spring agitating for a 'science debate' between the presidential candidates. Not surprisingly, the debate never happened; science has rarely, if ever, been a major issue in US presidential campaigns. But its supporters shouldn't lament that fact. Many of the issues that are central to the current campaign have a strong science component (see page 442).

The most obvious example is climate change. No matter who wins, the current administration's eight-year-long pattern of denial and foot-dragging will end. Both McCain and Obama have pledged to regulate the country's greenhouse gases via mandatory emissions limits and a cap-and-trade system. Given the ongoing energy crisis, either of them may very well begin this process — Congress willing — as soon as they have taken office.

Another much-discussed topic on the campaign trail is innovation. Americans increasingly sense that their country is losing its competitive edge. Both McCain and Obama regularly talk about how re-investing in fundamental research can stimulate homegrown breakthroughs and bolster the flagging economy. And both candidates seem to be at least moderately sincere in their pledges to improve funding for the nation's basic-science agencies — although how those promises will translate to reality remains to be seen, especially as McCain has talked about a year-long freeze on all domestic discretionary spending, which would include science.

The outlook for other areas of science is even less clear. In the case of stem-cell research, Obama has vowed to lift the Bush administration's restrictions on federally funded research into human embryonic stem cells. McCain, too, voted to end such restrictions when the issue arose in the Senate, but in the heat of the campaign, he now refuses to say whether he would lift the ban as president. Instead, he emphasizes research on adult or induced pluripotent stem cells in place of human embryonic ones. This could spell dire news for the country's stem-cell biologists, many of whom have been driven overseas or into privately or state-funded parallel enterprises to continue their work.

The most worrying thing about a McCain presidency is not so much a President McCain as a Vice-President Palin. Sarah Palin, Alaska's governor and McCain's running mate, opposes all research into human embryonic stem cells. She is a creationist. And until lately, at least, she has been a sceptic of human-created climate change — a disquieting thought, as Palin recently said that energy will be "her baby" in the White House, thanks to her previous service as chair of the Alaska state oil and gas commission.

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What is still unclear is how Palin's views will reconcile with McCain's. McCain has courageously bucked his party's more parochial viewpoints in the past, as when he fought for a cap-and-trade system long before it was politically popular. But his selection of Palin as a running mate suggests a new-found willingness to pander to his party's far-right wing.

Contrast that with Obama's statement on page 448, in which *Nature* asked him about the teaching of intelligent design in science classes. It is not easy to address students' questions about evolution without falling prey to the false notion of 'teaching the controversy', as the Royal Society's director of education discovered last week in a public-relations meltdown (see 'Creation and classrooms'). But Obama could not be more clear: "I do not believe it is helpful to our students to cloud discussions of science with non-scientific theories like intelligent design that are not subject to experimental scrutiny," he wrote.

The emerging economic crisis has made a trillion-dollar bailout of US banks almost certain. Thus, much as the campaign may point to improved government attitudes toward science, researchers should hold out little hope for more funds for anything but the new president's very highest priorities. ■

Creation and classrooms

Better to confront superstition with science than to disregard the superstitious.

The headlines were damning. "Leading scientist urges teaching of creationism in schools," proclaimed Britain's *The Times* newspaper on 12 September, echoing the headlines appearing that day in numerous other British media. The stories asserted that Michael Reiss, a biologist and educational researcher, an ordained Anglican minister and (at the time) the education director of the Royal Society, had explicitly advocated that state-school biology classes teach creationism.

The reports were wrong. Speaking at the British Association for the Advancement of Science's annual Festival of Science on 11 September, Reiss had articulated — as he had many times before — a view consistent with the Royal Society's official position: when students from a creationist background raise the issue in class, the teacher should explain why creationism is not science and why evolution is. Nevertheless, on 16 September the society announced Reiss's departure, arguing that the media's misinterpretation had "led to damage to the society's reputation" (see page 441).

Nature was not privy to the conversations between the reporters and editors responsible for this story, so we will leave it to them to consider how such a gross misrepresentation could have happened, and what lessons to draw from it. Nor was *Nature* privy to the Royal Society's internal deliberations about Reiss, so we will leave it to the

officers and fellows of that body to reflect on who has done the most to damage its reputation.

The misreporting surrounding Reiss has provided a propaganda gift to creationists everywhere. So in the face of such confusion, it is encouraging to hear the unequivocal stance of one of the US presidential candidates, Barack Obama, on the issue (see page 448 and 'America's fresh start'): creationism and intelligent design should not be included in a science curriculum. But scientists and science teachers must also grapple with the central challenge that Reiss was addressing: how to respond to students who have been steeped in, or confused by, scientifically nonsensical creationist beliefs when they ask about those beliefs in science classes?

Those who argue that allowing discussion of creationism in a science class gives it legitimacy, and that students who ask about it should be firmly directed to take their questions elsewhere, are misguided.

Eugenie Scott, executive director of the National Center for Science Education in Oakland, California, and a long-time advocate for the teaching of evolution, points out that in the real world, any such shut-up-and-take-it-elsewhere response from the teacher will inevitably be perceived by the student (and his or her classmates) as a humiliating personal put-down. It will obstruct rather than encourage enquiry and understanding. It will also invite complaints from outraged parents.

What is more, it will squander what experienced educators like to call 'a teachable moment'. All too often, that moment is the one opportunity that a school has to engage resistant students and introduce them to what science has to say.

At such a moment, a much more effective approach is for the teacher to follow the route Reiss advocated: deal with the question without ridicule, but make it clear that in science, theories must be testable to be valid. 'You ask if Earth is 6,000 years old, and why the descendents of Adam and Eve have no relation to the lower animals? So how can we test those hypotheses, and what does the evidence say?'

This is a difficult and minefield-laden path for teachers to follow. For an example of just how delicate, see a 23 August report in the *New York Times* of how a teacher in Florida tackled such challenges (see http://tinyurl.com/48374f). In particular, it requires that the teachers have a confident knowledge and understanding of evolution, so that they can seize on those teachable moments competently. The sad news, according to surveys, is that too few biology teachers have such an understanding: evolution is not always taught well at the universities and colleges where teachers learn their biology. And that's in the developed world; in poor and developing countries, teachers often receive no training in evolution at all.

Biology graduates who have not encountered up-to-date evidence of evolution in action — in fossils, in microbes, in genomes — have been ill-served by their training. Higher education in general, and biology departments in particular, are at the front line of the battle between creation and evolution too. ■

Pathways to security

Self-regulation is a good first step — but synthetic-biology companies still need independent oversight.

Regulators have been slow to deal with 'dual use' biological agents such as proteins, DNA or whole organisms that are generally used for benign research, but that could also be used to inflict harm. The reasons are many — not least being the complex way in which these substances behave and interact with their environment — and the result has been a regulatory patchwork.

For example, many countries have tried to regulate the firms that produce made-to-order DNA sequences by requiring permits for export. But the paperwork required is so onerous that the companies often just discard their non-domestic orders — so information about the customers looking to acquire these sequences is lost. And oversight of domestic sales is comparatively lax.

This month, the Industry Association Synthetic Biology (IASB), a consortium of gene-synthesis companies located mainly in Europe, agreed to a series of actions that might provide a more robust solution to the bioterror problem. Several of the US companies in the market have reportedly indicated their willingness to comply. The agreement calls for member companies to develop a database of suspicious or potentially dangerous DNA sequences. The association did note the potential danger of centralizing these data, even though they are already publicly available. But the benefit, argues the IASB, is that an open-source collection will be much easier for experts to keep updated, complete and correct.

Meanwhile, the agreement calls on IASB member companies to share information about the screening processes already in use so that standard practices can be adopted. The firms have said they are willing to cooperate on this effort in a non-competitive way; the report they produced includes ideas for better policing, including a pattern-recognition approach that would be more adaptable to what most predict will be a rise in the number and variety of DNA sequences requested.

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These steps, and other proposed elements, are the beginnings of a code of conduct for the industry. The reward for this voluntary practice would be an unofficial stamp of approval from the IASB that could signal to customers (and potentially the funders of customers) that this business is worth dealing with. Although such a code of conduct is useful and welcome, compliance and enforcement will be paramount. There have been, and will probably continue to be, companies that are not interested in cooperating with any industry group, and that are happy to operate in the unregulated grey area. The ultimate hope is that customers will put economic pressure on those non-compliers to fall in line, or else lose all but the most disreputable business.

But that is just a hope. As the recent meltdowns on Wall Street have indicated, industry self-policing can sometimes fail dramatically. When bad business practices can have grave effects for the public, regulators should be firm and proactive. The IASB has taken laudable first steps in providing government regulators with guidelines they can build from. Now, the regulators need to act. ■