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A unifying force

The questions to be explored at the Large Hadron Collider offer a chance to rekindle public interest in the fundamental principles of the Universe in which we live.

The Large Hadron Collider (LHC) that is nearing completion outside Geneva, Switzerland, is a testament to two of the greatest human qualities: a fascination with the workings of the Universe and an ability to cooperate to achieve shared goals. After the machine — now the centrepiece of Europe's particle-physics laboratory, CERN — goes into operation next year, it should allow experimentalists for the first time in decades to blaze paths into areas on which settled theory stands silent (see page 269).

The physicists exploring this new world will do so as a unified global community. Although CERN is broadly a European achievement, in which the continent can take great pride, the LHC and its attendant detectors have received contributions in cash or kind from more or less every country with the capability to participate in this sort of frontier science. The LHC therefore sets a new high-water mark in disinterested global cooperation.

But it is important to distinguish disinterested from uninterested. The nations of the world are not investing in the LHC because they necessarily expect to see returns similar to those physics delivered in the twentieth century (most obviously and terribly in the realm of nuclear weapons). At the same time, it is becoming apparent that such investments in physics no longer elicit quite the thrill that they once did among the general public.

Interest in the advances made at the LHC's immediate predecessors — the Large Electron Positron Collider at CERN and the Tevatron at America's Fermilab — drops off fairly steeply as one leaves the precincts of high-energy physics. Although the public likes the idea that scientists are making fundamental progress, the advances made in particle physics can seem increasingly far removed from ideas that resonate in the common imagination. In the first half of the twentieth century, the nucleus, relativity, the quantum and the uncertainty principle were quickly imbued with cultural meaning far beyond their scientific context. Gauge symmetries and the Higgs boson have yet to acquire such broader, symbolic importance.

Many physicists will consider it fanciful to suggest that they should — not least because the meanings that became associated with such concepts outside the realms of physics have often been far removed from, or in direct contradiction of, their scientific meaning.

At the same time, it is hard to ask people to spend the large sums needed to explore the frontiers of particle physics if they do not have some sense of investment in the questions that it asks. Here, the LHC offers an opportunity to re-establish a resonance between particle physics and the broader culture in which it sits. There is a strong case that the Universe is made up in large part of 'dark' matter and energy, quite unlike constituents that we can observe directly (see pages 240 and 245). It is possible that observations made by the LHC's detectors will speak directly to the nature of these, perhaps even producing in the laboratory some of the dark matter that seems to dominate the spiralling and clustering of galaxies.

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The discovery of the hidden constituents of the Universe is a grand task, and has an imaginative appeal worthy of the global effort under way at CERN. And an ever stronger bond between the study of fundamental forces and particles on the one hand, and the structure and history of the Universe on the other, bodes well for the future of particle physics in other ways, too. Magnificent though machines such as the LHC are, they will necessarily be few and far between. It is important to have alternative ways forward that are less resource-intensive. Particle-flavoured astrophysics offers many opportunities along these lines, as do small-scale experiments looking for phenomena such as neutrinoless double-beta decay (see page 232).

CERN's grandeur comes in part from the paired missions of unification that it is embarked on — a theoretical unification of the phenomena of physics and a practical unification of the scientific aspirations of the world. Unifying the very large with the very small adds to the excitement generated, and should unite the imaginations of the world, helping to restore the prized position our culture has reserved for fundamental physics. ■

Transmission lines

Field trials of AIDS prevention methods are as essential as they are politically awkward.

More people than ever have access to effective AIDS treatments. But the virus will never be contained without more effective measures to prevent transmission — and the need for measures that can be initiated by women is especially urgent.

Unfortunately, the run-up to this year's International AIDS Society (IAS) conference in Sydney, Australia, has been dominated by negative research results concerning female-initiated prevention. But scientists and advocates should keep working resolutely together to make sure that testing of such methods continues apace.

The vast majority of new HIV infections in Africa, where the pandemic is most severe, occur through heterosexual transmission. But women are often powerless to negotiate the use of condoms — by far the best way to prevent infection. This is the impetus behind the clinical trials now testing alternative female-initiated prevention techniques. These include microbicides — gels or creams applied to the vagina to block infection; barrier methods, such as diaphragms;

and methods that can be used by both men and women, including preventative drugs.

It has been a long, difficult slog to get any of these methods into effective field trials, making the recent negative results doubly disappointing. In January, two trials of the microbicide cellulose sulphate were stopped when an interim analysis suggested that the product might make women more vulnerable to HIV. The product was the third microbicide to fail in efficacy studies and the second that seemed to increase the risk of HIV. And on 12 July, a team of researchers in South Africa, the United States and Zimbabwe reported that latex diaphragms used with condoms did not protect more women from HIV than condom use alone. On 25 July, investigators of the failed cellulose sulphate trials are expected to unveil their final data analysis at the IAS meeting — a step that will very probably spell the end for that particular product.

Looking forward, there is tension in the field over how best to conduct the next microbicide trials (see *Nature* **448,** 110–111; 2007). The danger is that further bad news will see funders lose their appetite for research on female-initiated prevention methods, so there is tremendous pressure to avoid more failures. This field has always been a difficult sell for policy-makers in any case: as long-time advocate Lori Heise of the Global Campaign for Microbicides says, it's about "women, vaginas and sexuality" — not topics that government officials especially want to air in public.

But developing and testing such measures will take a long time. There is no HIV vaccine in sight, either, but researchers seldom consider abandoning the quest for one. Product development is even more difficult than usual for female-initiated prevention methods, because testing them requires dealing with issues related to intimacy, cultural expectations and interpersonal relationships. It is hard for researchers to navigate these types of issues. Some see a more thorough investigation of all the circumstances surrounding a proposed intervention as a way around this. In a declaration circulating ahead of the Sydney meeting, which begins on 22 July, hundreds of scientists are calling for 10% of all HIV programme funds to be dedicated to such approaches.

"Women, vaginas and sexuality are not topics that government officials want to air in public."

But there is already a paucity of funding for proven prevention methods, according to a June report by the Global HIV Prevention Working Group. And a study released last week found that large-scale prevention programmes are the most cost-effective (E. Marseille *et al. BMC Health Services Res.* **7,** 108; 2007). It is clear that more resources should be directed at delivering the methods that work and at improving communication with the communities involved, to ensure both that existing prevention methods are used and that future trials will be conducted in optimal circumstances.

Dedicated researchers already know this. The principal investigators for a trial of a new microbicide gel containing the antiretroviral drug tenofovir, for instance, had extensive discussions with women before setting the dosing schedule for their drug. Such preparation is just as important as continued support for the search for good, female-initiated HIV prevention methods. With dedicated work on both fronts, researchers and advocates can be confident of finding the solutions that will control the pandemic and help women stay healthy. ■

Dedicated to science

Hands off the Commons Select Committee on Science and Technology.

What's in a name? That's one of the questions political leaders have to consider when they allocate titles to, and divisions between, government departments. The process is echoed when parliaments or other representative bodies set up committees to keep an eye on the activities of those departments.

Every nation has its own approach to this, and some parliaments, including those of France and Germany, struggle to exercise much oversight at all. The UK House of Commons and the US House of Representatives have each, in very different circumstances, evolved committees that look expressly at science and technology questions. These committees perform a valuable role. By virtue of their very names, as well as their briefs, their remit centres on scientific and technological facts. Their staff and their members tend, on the whole, to be interested in such facts. These days, with the 'reality-based community' under steady attack from those who prefer to base their positions on dogma rather than on hard information, that's a rare blessing.

It is true that other committees, which sometimes have more heft, also consider issues related to science and technology. The Committee on Energy and Commerce in the House of Representatives and the Defence Committee at Westminster, for example, are both highly influential. There is an argument that discourse on scientific questions is best conducted where it matters most. But the reality in these more heavily politicized surroundings is that such discourse often does not take place at all.

It has been reported that the British government would like to wind up the Select Committee on Science and Technology and place its responsibilities in a new committee with a wider remit, dealing also with education and innovation, in line with an ongoing reorganization of the government's own departments (see page 236). This plan is doubly troubling because in Britain, where parliamentary committees are young and not especially powerful, the executive branch of the government can dictate the committee portfolios. Gordon Brown, the new prime minister, can informally tell the Leader of the House what is to be done, and it will happen.

It just seems too convenient that the science and technology select committee sometimes sheds light on inconvenient truths (such as the technical feasibility of politically attractive schemes for identity cards). There is no requirement — procedural, constitutional or in terms of precedent — for select committees to map directly on to particular government departments. If Brown wants intelligent and proactive oversight by parliament, as he has professed to do in his first few days in office, he should leave the House of Commons Select Committee on Science and Technology well alone. ■