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Why EPIC should not be squeezed out

DURING April the Science Research Council (SRC) will have to announce some sort of a decision on the future of proposals to build a new high energy physics facility at the Rutherford Laboratory. The machine under consideration is a 14+14 GeV electron–positron intersecting complex called EPIC, and would replace the 8 GeV proton accelerator NIMROD and the 5 GeV electron accelerator NINA—Britain's present major machines. Support for and participation in CERN at Geneva would not be affected by the EPIC proposals.

Almost all accelerators at present in operation generate particles which are fired at stationary targets. As a result of conservation of momentum and of special relativity, most of the energy is wasted in propelling the products of the collision forward. A 400 GeV proton, for instance, fired at a stationary proton provides only 28 GeV of useful energy to the centre-of-mass system. This somewhat underpublicised characteristic of conventional accelerators becomes even less attractive when electrons are the projectiles, and least attractive when electrons are fired at electrons (or positrons). To produce the same 28 GeV in the centre-of-mass system of a conventional electron–positron machine would require 800,000 GeV! Hence high energy physicists have increasingly turned to colliding-beam systems in which two beams of particles travel in opposite direction around a ring and collide at regular intervals. The observer in the laboratory frame of reference then gets full value for money.

But why study electron–positron interactions at all? The scientist not conversant with high energy physics might with some justification ask in an innocent sort of way whether everything hadn't already been thrown at everything else, judging by the great bulk of *Physical Review* and the extraordinary sameness of the titles of papers therein. Apparently not; the more work that is done on protons, for instance, the more complex their substructure seems to be and the more inappropriate proton–proton experiments become for the elucidation of that structure. "It is rather like throwing two watches at each other in order to discover what their internal layout is" was how one high energy physicist described such experiments. But if the trend is then towards using simple particles (electrons are still mercifully believed to be point-like) as probes of complex particles, much more has to be learned about the forces on these simple particles—notably electromagnetic and weak interactions.

The scientific case for EPIC looks good, but scientific cases are hardly the only ingredient at present in decision making in science, particularly where the subject in question is indisputably a 'big science'. The Advisory Board for the Research Councils (ABRC) has recently warned that big science is in for a relatively lean time, and thus the EPIC proposal, which would involve 2,000 man years of staff effort and a capital investment of £25 million to get into operation by 1980, looks particularly vulnerable.

It would obviously make a positive decision much easier if the international dimension were more clearly known. Are there prospects for bilateral or multilateral deals involving cost sharing? It is difficult to assess this at the moment, as other countries, particularly Germany, are also interested in EPIC-type machines, and it is probable that if Britain says no, Germany will build.

The omens are not good. EPIC will be coming up for consideration at the same time as the Northern Hemisphere Observatory proposal; more and more often those involved in big science will find themselves in competition for limited money. It would be easy, and wrong, for the ABRC (which is likely to make the decision) to adopt a Buggins' turn attitude and let the astronomers have their observatory at the expense of EPIC because the astronomers didn't get their last big request, the Mark VA radiotelescope.

It would be equally wrong for the decision to be made in an atmosphere of antipathy to big science in which requests for large sums of money were rejected on some sort of principle that very fine work is being done by people who do not make inordinate demands on resources and it is time to cut the big boys down to size.

Finally, it would be wrong to turn down EPIC on the basis that high energy physicists are an isolated elitist bunch of people who have had a good run for their money, who don't do anything that anyone else can understand and who aren't within sight of any success which is going to provide benefits for the world-at-large. There is some force to these criticisms; high energy physicists are increasingly aware of the alienation between themselves and other scientists and of their general failure to have communicated the intellectual excitement of the subject to a broad audience. Even so, it would be grasping at a convenient but not relevant excuse to make a major decision for this reason.

Morale in the scientific community has never been lower, as job prospects diminish, governmental interest in science touches rock bottom and students turn away from science as a career. A very necessary step to restore some confidence is investment in large-scale long-term projects, and EPIC is just such a one. High energy physics shows strong signs of moving into a period of great excitement, and Britain's previous investments mean that there is much expertise in the field. Support for EPIC would show in an unambiguous way that those who make decisions in British science are aware of the need to restore confidence in pure science as an intellectual exercise, and are prepared to fight for it in high places. □