

Report praises field but suggests slow-down

The mandate of the committee on high-energy particle physics in the United Kingdom, established on 22 March 1984 under the chairmanship of John Kendrew of Oxford University, was to report to the Advisory Board for the Research Councils (ABRC) and the Science and Engineering Research Council (SERC) on British participation in high-energy physics. It was to concern itself especially with research carried out under international auspices and to consider possible reallocation of the resources, in whole or in part, to other areas of science. Excerpts follow:

"... [M]embers of the public, and even scientists outside the field, are not well informed about the aims of particle physics. ... [T]here is also a widely held view that the cost of [particle physics] has been continually increasing. ... [I]n fact, the proportion of the SERC budget devoted to particle physics has fallen over the past decade from 33% in 1975-76 to the present figure of 20%."

"The importance that we attach to international collaboration ... led us to take it as a boundary condition that ... the UK could not reasonably withdraw from CERN membership before the end of the construction of the new machine (LEP) at CERN, i.e., before December 1989. ..."

"Most particle physicists accept that it is unrealistic to expect that similar large machines will ever again be constructed simultaneously in different geographical regions, and that all future plans should therefore be considered in a global context."

"No one who has any acquaintance with this field of science can see it as other than enormously exciting, exhilarating and intellectually rewarding. ... [B]ut we would not support the contention of some witnesses that particle physics should be regarded [as] the most fundamental study imaginable."

"UK physicists have been involved in many of the major advances in experimental particle physics of the past two decades, including for example: 1) neutrino physics, using the Gargamelle and Big European Bubble Chambers, which measured the electric charges of quarks and proved that the net number of quarks in a nucleon is three ...; 2) ... the work of the European Muon Collaboration on the EMC effect; 3) the discovery of the gluon in the experiments on PETRA at DESY; 4) the discovery of the W and Z and of the top quark on the SPS proton-antiproton collider."

"The interest shown in particle physics by students is a strong argument for research in this field continuing in the UK. ..."

"... [Theorists] would be severely handicapped by a UK withdrawal from experimental particle physics. ..."

"Member states have recently shown their confidence in the administrative abilities of the present Director General [of CERN] by extending his normal five years appointment for a further period to cover the LEP construction. ... However, CERN has evolved rapidly ... [and] we think the time is ripe for a review of its administrative structure."

"[I]n discussions with heads of Research Councils and in testimony from the CVCP [Committee of Vice-Chancellors and Principals] and the Royal Society, we have found evidence of considerable under-funding of important areas of scientific and engineering research. ... We were particularly impressed by the evidence from the CVCP that long-term damage is being done to university research by the high rejection rate of top quality research proposals, and also by the critical state of laboratory instrumentation. ... The damage extends to areas covered by all the Research Councils and is having an effect not only on university research, but also on teaching."

"... [W]ith the present resources available for science in the UK, and taking into account other areas of research that are under-funded or even having to be forgone, the current level of expenditure by the UK on particle physics cannot be justified and should be reduced as rapidly as possible. Indeed, at any realistic level of the SERC budget the proportion now taken up by particle physics is too high. ... [W]e recommend a progressive reduction in the UK total expenditure on particle physics that would be modest up to 1988-89, but would then increase to at least 25% by 1991."

"We ... believe that irrespective of the present acute financial situation the overall level of expenditure on [particle physics] is too high, and therefore that the pace of major capital expenditure at CERN should be reduced by extending the periods between upgrades or between new machines. Indeed, we believe that in view of the high cost of the research, and the possibility of new techniques being developed for accelerating particles, it would not be counter to the long-term interests of the field if the pace could be reduced worldwide and not merely at CERN."

development than to civilian research. "A 2% transfer from defense research and development to civil basic research in the next five years would ... completely transform the position and prospects of the Research Councils and of basic research in the universities," she claimed. "I believe that we must be blunt," she said. "A crisis is facing science."

From meetings with members of Parliament's science committee, Kendrew himself is optimistic that strong representations will be made to the Prime Minister about science. Kendrew considers a re-evaluation of the defense research budget a real possibility, as does Butterworth, science director at CERN.

The world context. Interested observers in the United States remain worried about the British situation. SLAC's Richter feels that the British have "an opportunity in particle physics," but he fears that they will "fritter it away. ... I see British science policy do this again and again. They can surmount any opportunity," Richter said.

An important underlying consideration in Kendrew's thinking and in his committee's report is the conviction that it will no longer be possible in the 1990s for different countries or groups of countries to build similar large machines concurrently. Behind the recommendation for a 25% cut is a calculation that either the Superconducting Super Collider will be funded, in which case the Europeans will want to cut CERN contributions anyway to have funds to participate in the SSC project, or CERN will build something like the proposed Large Hadron Collider in the LEP tunnel, in which case funds will be forthcoming from a larger group of countries.

Richter and Lederman are in agreement that wider participation in CERN is quite within the realm of possibility. But for that to happen, CERN would have to take on non-European members, which would require revision of the CERN convention and would involve the sacrifice of CERN's identity as a uniquely European institution.

In any event, it is not likely that expanded membership or affiliations could make up for reduced European contributions within the time frame envisaged by Kendrew. Butterworth points out that there would be little incentive or opportunity for teams from additional countries to get involved in CERN between 1989 and 1991 because the experiments that are to take place at the initial energy are already well organized. In Schopper's estimation, there would be room for extended membership in the event of a LEP upgrade or a new, large project.

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get. In fact," *The Times* noted, "domestic expenditure on particle physics has been cut in half in real terms over the past ten years, and our subscription to CERN has been cut by a third."

In a Parliamentary discussion of science policy on 14 June, the science spokesman for the Labor Party, Jeremy Bray, took note of the fact that the United States, West Germany and France all make substantially greater commitments to civilian basic research than the UK. The absence of well-coordinated policy-making machinery

in the UK had "left nuclear physics to be reviewed on its own by the Kendrew committee," Bray said.

Trevor Skeet, a Tory who chairs Parliament's science committee, agreed that "the United Kingdom could gain from a simplified structure for funding the science budget." He observed that both Germany and France have special ministries to administer basic science.

Judith Hart, a Laborite, was critical of the fact that more government money goes to defense research and