

Where should LEP be built?

Europe's bid for a world lead in subnuclear physics in the 1990s brings CERN's future into question, writes **Robert Walgate**

EUROPEAN subnuclear physicists are brimming with enthusiasm for their next big project, LEP (see page 482), but building it will plunge CERN (the European organisation for nuclear research) into a hornet's nest of problems.

There is strong competition—tacit or not—between CERN and the West German laboratory DESY for the siting of LEP, a large electron-positron storage ring; and there is controversy over CERN costs, with large tax-free wages accounting for over half CERN's expenditure. The French, German, and British governments are insisting that the CERN budget be brought down from its present 600 million Swiss Francs (MSF) a year to 560 MSF by 1981, but LEP can only be built at reasonable speed (in under a decade) if CERN has some 600 MSF a year.

Meanwhile, the tacit international understanding that the next machines would be continental, with the USSR building a 3 TeV proton synchrotron, Europe building a 100 GeV electron-positron storage ring (LEP), and the US building Isabelle (a 400 GeV proton storage ring), has been violated with the news that the US is also looking at a LEP-like project. Burton Richter, the Nobel laureate who led the discovery of charm with LEP's progenitor, SPEAR, is reputed to be pressing the US government for an American LEP. And as the US Department of Energy is discussing collaboration with Japan on a number of research issues, including subnuclear physics, it is conceivable that Professor Richter will find Japanese money to build a LEP ahead of Europe despite US expenditure on Isabelle and Fermilab. The race is on, and as one CERN physicist put it "the first to the money will get LEP".

The future of LEP in Europe is confused by a number of factors, one of which is the rising eminence of the German laboratory DESY. "Four years ago we were nowhere", a DESY physicist told *Nature*. "Now we are on top, and physicists are clamouring to work here". The root cause is the realisation that electrons, particularly in collision with positrons, are the cleanest probes of the nature of matter on small scales. DESY is Europe's largest electron laboratory. Further, DESY has succeeded in building PETRA.

PETRA is the world's largest storage ring for electrons and positrons, with (at 19 GeV) twice the energy per beam of SPEAR (and its equivalent at DESY, DORIS). It will begin experiments on

22 October, eight months ahead of schedule, though it may take a month or two before its intensity reaches design levels. It will probe new quark combinations (like 'bottomonium') and most likely reveal new quarks ('top' is expected) and leptons. And with an experiment devised by Samuel Ting (co-winner with Burton Richter of the Nobel Prize for the discovery of the 'hidden charm' particle J/ψ) it will test the unification of the weak and electromagnetic forces proposed by Abdus Salam and Steven Weinberg. PETRA will give European subnuclear physics a world lead for five years or more.

Experience in building and running PETRA also gives DESY physicists a European lead in the design considerations for LEP. But there was not a single DESY representative on the 63-man CERN study of LEP, recently completed (CERN/ISR-LEP/78-17, the 'Blue book'). Professor Schopper, the director of DESY, argues that the best contribution that DESY could have made was to build PETRA, rather than to work on "a paper study"; and anyway the CERN team spent a long time at DESY, discussing the PETRA design. Schopper points out that several of the design points in the CERN study are a simple scaling-up of PETRA elements—the rf cavities, for example, and the vacuum tube. DESY physicists were of course spending 16 hours a day building PETRA, but the DESY absence from the study has also been interpreted as a political manoeuvre; so much so that the brief presence of several senior representatives of DESY, including the builder of PETRA, Gustav Voss, at the CERN summer study on LEP recently was seen as something of a thaw.

All this would matter little if it did not involve the future of CERN. The CERN budget is under pressure from its staff (some 4,000 people, mostly technicians) whose promotions have fallen to a low ebb, and who are, of course, keen to maintain salaries at their high level. (50% of the staff live in France, where they could earn only half the sums they cull from CERN; a study, called RESCO, is underway on the social conditions and remuneration of workers at CERN.) The budget is also under pressure from the Swiss Franc, in which CERN subscriptions and salaries are payable. The franc has strengthened from 12 SF to the £ in 1966 to 3 SF at present, quadrupling the British subscription over that



Who should CERN fear most: Chancellor Schmidt (left) or DESY director Herwig Schopper?

period. And the budget is under pressure from the other direction from the member states, who want to keep their expenditure on subnuclear physics in proportion to their other research costs. The CERN-built LEP would cost some 1000 MSF, but as a French physicist commented, "what will that mean in 10 years in pounds, or French francs, or even Deutsche marks?"

According to one influential physicist, the European Committee for Future Accelerators (ECFA), which has been charged by CERN members with producing a firm proposal for LEP, has in its hands a very delicate decision. The committee, he said, has to consider which course of action for LEP would preserve the best future for subnuclear physics in Europe. LEP at CERN's Geneva site might price itself out of the market. And CERN without LEP in the 1990s would be a dying laboratory. The question seems to be whether the focus for subnuclear physics in Europe should move for the 1990s from Geneva to Germany (though there are other contenders, notably France; only Italy has ruled itself out).

CERN defends itself strongly, pointing out that a new laboratory would need a new infrastructure, entailing extra cost; that LEP at Geneva would allow collisions between the electrons of LEP and the protons of the SPS, allowing an ultradeep probe of proton—and perhaps quark—structure; and

that the LEP tunnel, once built, could be used for many other purposes at CERN, with its complex of accelerators.

Over at DESY, Professor Schopper is at pains to protest that there is no competition between his laboratory and CERN; but other DESY physicists see it differently. "We are planning moves like a chess game", said one. And DESY can afford to sit tight for the moment: it is in a strong position, technically and politically. On the technical side, pressure from physicists for the highest possible energy favours DESY. High energy means large ring size to reduce the synchrotron radiation losses from the circulating electrons (and so keep down the power bill). But the CERN site is restricted by the Jura mountains to the north. DESY's presently favoured site, in a national park 40 km south of DESY near Hamburg, is not so restricted.

However, an early CERN study of a 100 GeV machine (LEP-100) was abandoned. The 'Blue book' argues that there will be many difficulties in handling electron beams at 100 GeV. The summer study concluded that "improving the energy [beyond 70 GeV] requires far more knowledge of a theoretical and technical nature before a realistic design may be settled upon"; but Schopper says that such conclusions are premature, and based on a too-pessimistic interpretation of work on the problem at DESY. In principle DESY should know, but it is not easy to disentangle physics from politics on this point.

The present half-cost LEP planned by CERN is a project for 70 GeV beams (LEP-70), with a possibility to upgrade to 100 GeV if superconducting rf power cavities become feasible. One of the key tasks for LEP will be to produce the intermediate vector bosons, which have masses and properties such that the neutral Z^0 could be produced with single beam energies of about 45 GeV, while the charged W^+ and W^- would need 80 GeV. The Higgs bosons, which are essential to the unification of the forces, and hold the key to the masses of the quarks and leptons, require the highest possible energy. LEP-70 is not therefore the most comfortable machine for physicists — 100 GeV would be better—although there will be a cornucopia of treasures on LEP-70 from the "resonance" in the interaction at the Z^0 , which should yield a thousand-fold increase in interaction rate.

ECFA is just beginning studies of the machine parameters for LEP, under the chairmanship of Professor Antonino Zichichi—who intends to be entirely "Galilean" in his considerations. In other words he wants his committee to come up with the physi-

cists' perfect proposal, without regard to politics. That study is due at the end of 1979 for presentation to ECFA and to CERN Council. It will be interesting to see whether it more nearly approaches LEP-70 or LEP-100. ECFA will then have to juggle with site and politics to come to its recommendation.

John Adams, CERN's machine-building director-general, said in Geneva recently that he would like physicists to reach agreement on a site "by the end of next year". He added "If the physicists can't decide where to put the thing they can't blame governments for delays". And there are further battles to be won at governmental level.

Germany lost the fusion project, JET, to the UK, and might welcome a new international laboratory. Professor Schopper insists that any extension of

DESY would be "fully international", with contributions from no country ruled out (including Japan). And the small countries at CERN will not be happy with the closure of CERN's low energy synchrocyclotron and the intersecting storage rings, as will be necessary if CERN is to build LEP within its 600 MSF ceiling. The Scandinavian countries, in particular, make good use of the synchrocyclotron for nuclear physics, and the intersecting storage rings are now ready for nuclear physics experiments with light nuclei.

CERN's problems with LEP are manifold, and it is no wonder that before John Adams gave his recent talk at CERN on "steering LEP" to an enthusiastic audience of physicists his colleagues told him, "And for God's sake be cheerful".

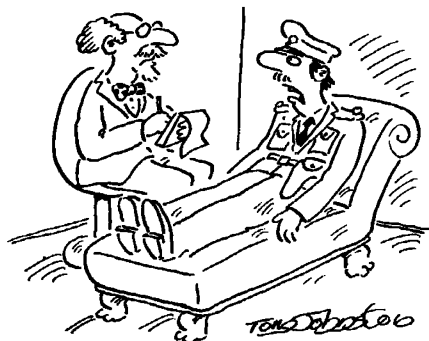
Robert Walgate

Argentina— where thought is a crime

DR CLAUDIO BERMANN, a professor of psychiatry held incommunicado in Cordoba prison in Argentina without specific charges since April 1976, was released last month, following pressure from the US National Academy of Sciences' Committee on Human Rights, the Israeli embassy in Buenos Aires, and international human rights groups.

Dr Bermann was released into the custody of an Israeli representative only when he was actually aboard the aircraft bound for Israel. On arrival in Israel, he avoided any formal contact with the Press, apparently fearing for the safety of fellow-prisoners still in custody. It was, however, possible to learn informally some interesting sidelights on the position of psychiatrists in Argentina, and, in particular, the reason why so many psychiatrists figure in the lists of political prisoners and 'disappeared persons'.

"Thought is a crime there," explained a friend of Dr Bermann's cynically. More particularly, psychiatry which, as a therapeutic discipline, aims at establishing the autonomy of the individual, is seen by the present regime as potentially subversive—an opinion which draws some substantiation from the fact that, until 1973, the Argentinian Federation of Psychologists did, as a matter of fact, have a large number of members whose political leanings were leftist or liberal. Freudian psychology is banned from the universities (where it is seen as a Marxist subversion unlike the Soviet Union where it is condemned for being anti-Marxist!), and, according to



"I keep thinking I'm two psychiatrists!"

another expatriate psychologist, university teaching in psychology goes no further than the writings of St Augustine and St Thomas Aquinas.

Furthermore, said the same psychologist, difficulties can arise in the therapeutic situation. A psychiatrist might attempt to treat a patient's anxieties by presenting the current regime as an unpleasant, unavoidable fact of life, which one must somehow learn to live with. Further there are reports of members of guerilla groups actually receiving treatment from psychiatrists without the psychiatrist actually knowing anything about this side of their activities—a proposition which seems at first glance somewhat unlikely, but which, within a group therapy context, is quite feasible.

Acting on suspicion of some such link between psychiatrists and guerillas, the Argentinian authorities have, according to Dr Bermann and his friends, been putting pressure on practising psychiatrists to betray their professional confidentiality, and, in some cases, it would appear that *agent-*