Preparing major new US nuclear physics facilities. Top, a view of the RHIC heavy ion collider being constructed at Brookhaven. Below, the CEBAF electron machine site at Newport News, Virginia. These facilities figure prominently in a recent US Nuclear Science Advisory Committee report which examines the evolution of US nuclear science over the next five years.*

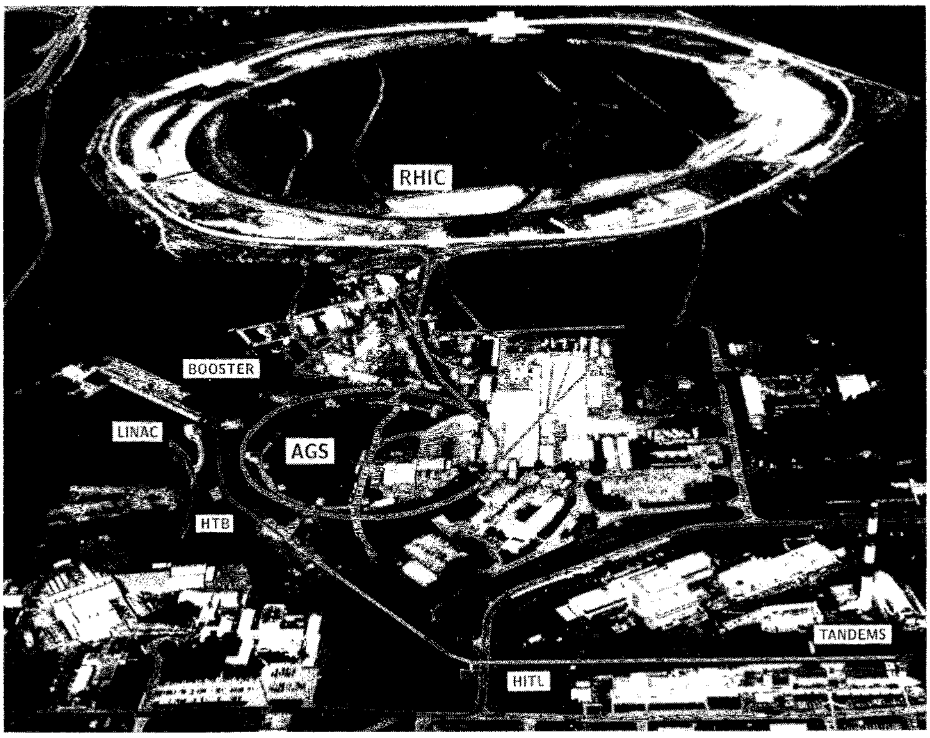
particle trigger.

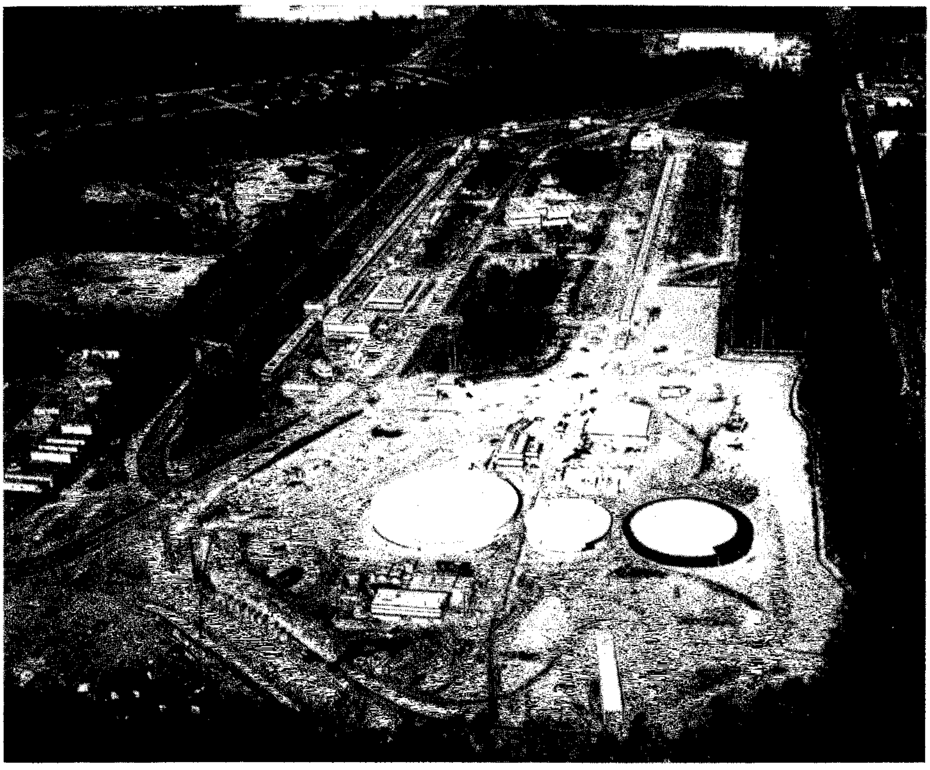
Also at Fermilab's Tevatron collider, a group in the D0 experiment is studying the use of neural networks in the muon trigger for the D0 Muon Upgrade. A neural network trigger for H1 at DESY has been under development for some time and will be tested in the current run. Several R&D projects at CERN are looking at the feasibility of neural networks for LHC experiment trigger systems.

Another application of neural networks under study is in adaptive control systems for accelerators. A group at SLAC recently simulated how a neural network control system could be trained both to emulate and control a section of beamline.

These new artificial intelligence techniques could go on to play an important role in the acquisition and analysis of experimental data for the coming generation of proton colliders.

From Bruce Denby and Clark Lindsey (Fermilab) and Louis Lyons (Oxford)





US nuclear physics funding

Because of restrictions in the federal budget, US science spending is coming under close scrutiny, with strong implications for the evolution of the nation's physics research. Recently the Witherell subpanel of the Department of Energy's High Energy Physics Advisory Panel (HEPAP) submitted recommendations on how the US research scene could evolve pending commissioning of the SSC Superconducting Supercollider (June, page 3).

While high energy US thinking is dominated by plans for the SSC, for lower energy studies the goals are less clear-cut, and the funding agencies involved – the Department of Energy (DOE) and the National Science Foundation (NSF) – requested the Nuclear Science Advisory Committee (NSAC) to advise them on the implementation of a long range plan (through to 1997) for nuclear science.

This called for the traditional three budget scenarios – a low one, with constant real dollars; a middle one, with constant inflation-corrected dollars; and an upper one with a real 2-3% annual growth above inflation. NSAC appointed a subcommittee under John Schiffer of Argonne to come up with the recommendations.

On the DOE side, presentations covered the RHIC heavy ion collider being built at Brookhaven, the CEBAF electron source under construction at Newport News, Virginia, the KAON beam factory plan at the Canadian TRIUMF Laboratory in Vancouver, and the LAMPF meson physics facility which came into operation at Los Alamos in 1972. On the NSF side, presentations were heard from university labs.

The report was accepted by NSAC in April and sent on to the DOE and NSF. The Schiffer subcommittee endorsed the scientific priorities of the previous (1989) plan and laid out a modest base budget scenario through to 1997 which would permit essential scientific goals to be achieved.

For DOE, this base budget scenario corresponded approximately to a 2% increase in funding, although some interim years overshot this modest increase. For NSF, the base budget foresaw 2% growth.

The DOE section of report recommends that the construction of the new major facilities, CEBAF and RHIC, be completed without further delay to start their important research in a timely fashion. It also supports the Canadian KAON project, however construction funds could only be liberated towards the end of RHIC construction.

A phaseout of the Los Alamos Meson Physics Facility, LAMPF, threatened in the Congressional Budget for the next financial year, would affect what has been the major US nuclear facility for two decades. During this time its research has been scientifically productive, exploiting its beams of protons, mesons and leptons and providing fresh nuclear physics insights.

At present, some first-rate and intellectually challenging experiments utilizing unique LAMPF features are almost ready to start and are likely to produce significant results in the next few years. Experiments like MEGA and LSND will have fundamental impact, while other research using LANSCE intense neutron beams have opened up new horizons in nuclear parity violation.

For the intellectual integrity of the field and for reaping the benefits of major investments in money and manpower, the Subcommittee strongly recommends that means be found to keep the LAMPF facility operational until 1995. After that, its future would depend on the support from the numerous areas outside nuclear physics where LAMPF has made an impact, and on possible new nuclear physics initiatives.

(For nuclear physics, the Congressional Budget Submission for Financial Year 1993 includes increased construction spending for RHIC, while that at CEBAF naturally decreases as the end of construction nears. The document also suggests terminating the Holifield Heavy Ion Research Facility at Oak Ridge and the Fast Neutron Generator at Argonne, together with completion of experiments leading to an orderly shutdown of the Bevalac at Berkeley as well as LAMPF at Los Alamos.)

Even a modest budget growth of 3% would allow one of several attractive new initiatives to be started in the next five years. However if there is no real growth, and if the continuing CEBAF and RHIC construction pace is maintained, the LAMPF programme would have to be terminated abruptly, with no chance of an 'orderly phaseout', and with a serious loss of science and of a recent investment in new experimental capabilities, the report contends.

With a declining real budget, existing goals would be seriously compromised, the report continues, seriously damaging the research vitality of the field. LAMPF phaseout would be have to be accelerated and KAON participation abandoned, with the base budget reduced by roughly $150 million over five years. In addition, research funds would be cut by $40 million, operating budgets would be limited, and RHIC construction stretched until 1998. Such a scenario would not provide the nation with the appropriate scientific return on the major investments in facilities and skilled manpower already in place, says the subcommittee.

The NSF summary broadly mirrors the DOE findings.

Whatever happens, the nuclear physics scene in the US will look very different by the year 2000, but the way this change comes about will not please everybody.