News of Science

Widening the Nuclear Research Resources of Universities in Britain

Britain's National Institute for Research in Nuclear Science was set up in 1957 and the first major piece of equipment, a 7-Bev proton synchrotron, is now being constructed. The aim of the new institute is to strengthen the resources of university research departments, not to replace them by a central laboratory. The universities will be able to use the laboratories of the National Institute as out-stations. Several high-energy accelerators for use in fundamental research have been constructed in Britain since the war, at the universities of Birmingham, Liverpool, Glasgow, and Oxford, and at the Atomic Energy Research Establishment, Harwell. All are working well and are the centers of active research groups, but they must be reinforced by accelerators for higher energy if a balanced program is to be pursued in the future.

Effective Training Ground

The type of accelerator needed for this purpose would not only be costly in money and manpower for construction, but would involve large operating, maintenance, and development staffs beyond normal university resources. Active research in very high energy is necessary not so much for national prestige as for the well-being of the universities as a source of young scientists. Moreover, an accelerator project is an exceptionally effective technological training ground and benefits the industrial firms which contribute to its construction as well as the people who form the design and development team.

It was for these reasons that the National Institute was founded, and although universities will still need to extend and develop their nuclear research facilities in their own laboratories, they will be able to concentrate upon those programs which can be supported there without overtaxing their present and future resources.

The membership of the institute's Governing Board includes senior representatives of Britain's universities, the Royal Society, the University Grants Committee, the Department of Scientific and Industrial Research, and the United Kingdom Atomic Energy Authority; the chairman is Lord Bridges.

Identity of Interest

The Atomic Energy Authority plays a special part, since it already possesses the scientific, technical, and service resources necessary for the support of major accelerator projects. Moreover, the Authority has always devoted a proportion of its activities to pure research in nuclear science as an essential ancillary to the atomic energy program. For example, the Atomic Energy Research Establishment at Harwell has its own high-energy research program, at present centered upon the use of the 110-inch synchrocyclotron and the study of design problems of large accelerators.

Thus the Authority has the means to produce the equipment required by the National Institute, and also has an identity of interest with the universities in making use of it. The results of the institute's work will be published in open literature, and no security clearance procedure will be applied to university staff working at or visiting its laboratories.

The first laboratory of the institute, named the Rutherford High Energy Laboratory in commemoration of Lord Rutherford's work in pioneering nuclear physics, is being built alongside the Atomic Energy Research Establishment at Harwell, but outside the security fence. The design and construction of the first accelerator, a 7-Bev proton synchrotron, is being handled by the Atomic Energy Authority at the request of the Governing Board of the institute.

Determining Factor

The choice of 7 Bev was determined by the fact that nearly all the known phenomena of interest can be observed at this energy. The machine is designed to produce a high intensity (about 10^{12} protons per second), and has been chosen to be complementary to the 25-Bev CERN (Centre Européen de Recherche Nucléaire) accelerator being built in Geneva; the CERN accelerator will give a lower intensity at a higher energy, and will be available to British physicists.

The magnet will contain 7000 tons of steel of special magnetic quality, and will be assembled on a ring of about 150 feet diameter in such a way as to leave eight straight, field-free regions between the curved portions. One of the eight straight sections will be used for the radio-frequency accelerating system, another for the injection apparatus, and the remaining six for beam extraction systems, targets for bombardment by the circulating beam, and beam control electrodes.

The steel yoke, containing the bulk of the 7000 tons of steel, is being manufactured by Joseph Sankey and Sons, Ltd., of Bilston, Staffordshire, in some 336 units each weighing about 20 tons. The steel plate is being produced on a continuous strip mill at the Port Talbot works of the Steel Company of Wales. The pole pieces and energizing coils are still being designed at Harwell, together with most of the rest of the accelerator, and contracts have not yet been placed.

A Special Building

The machine proper will be housed in a concrete building about 200 feet in diameter, with about 25 feet of earth and concrete overhead and several times this thickness around the sides. A concrete wall, 28 feet thick, will separate a portion of the magnet ring from adjacent experimental rooms, into which beams of particles will be admitted through channels. The experimental rooms and the accelerator building will be provided with cranes of up to 30 tons capacity to lift the massive particle detection apparatus and components of the machine. Excavation was started on the site in July 1957, and the main building contract was awarded in November 1957 to W. E. Chivers and Sons, Ltd., of Devizes, Wiltshire, England.

The design of accelerators is not straightforward engineering; it also involves research in physics and development work. A large team of physicists and engineers has been assembled on this project at Harwell, and various parts of the machine are now in each of the successive stages, from calculations by theoretical physicists to manufacture in industry. It is hoped that construction will be completed by the end of 1961, but long before that time the institute will be setting up teams of nuclear physicists to prepare apparatus for the initial research program.

T. G. Pickavance, *director*
Rutherford High Energy Laboratory,
National Institute for Research in
Nuclear Science,
Harwell, England