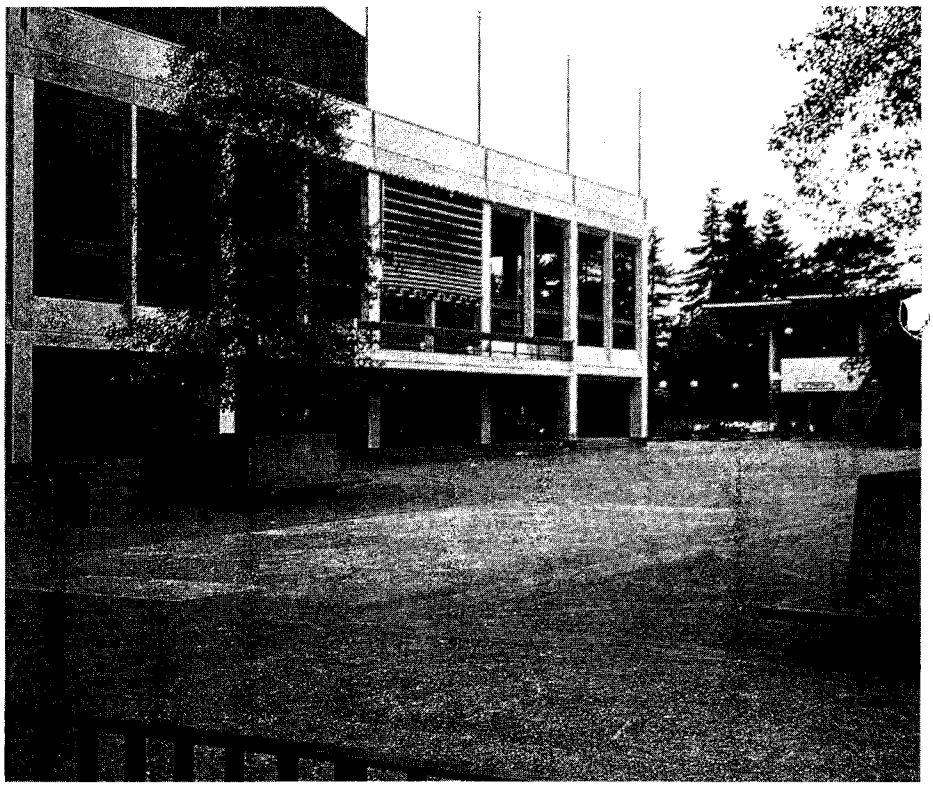
New nuclear physics at Berkeley Conference



The Zellerbach Auditorium at Berkeley, where the plenary sessions of this year's international nuclear physics conference were held.

(Photo C. Ekström)

One of the highlights of the summer was the International Conference on Nuclear Physics, held at Berkeley in August. These big meetings — the previous one was in Tokyo in 1977 — provide a periodic focus for the nuclear physics community, Among the 980 participants at Berkeley, there was a party of Chinese physicists, the first time there has been a major Chinese involvement at such a meeting. After plenary sessions in the morning, most afternoons were devoted to parallel sessions, and for the many people following more than just a highly specialized topic, there were the inevitable conflicts of interest.

In his closing remarks, Herman Feshbach of MIT summed up the Conference as having highlighted 'new' topics — new nuclear degrees of freedom, new reaction mechanisms, possible new forms of nuclear matter, new aspects of weak interactions in nuclei, new nuclear symmetries, etc. These new phenomena or ideas contrast sharply with the conventional nuclear spectroscopy which dominated the field until quite recently.

During the Conference, there was much speculation on possible new forms of nuclear matter — pion condensation, the transition of nuclear matter to quark matter, nuclear phase changes, transitions from weak to strong nuclear couplings, etc. While as yet there is little experimental evidence to go on, future studies with high energy heavy ion beams (such as are planned for example at Berkeley, Darmstadt, Dubna and Tokyo), or using antiproton beams in the LEAR ring at CERN, could provide some firm guidelines.

Superheavy nuclei, a highly controversial topic of a few years ago, was this time conspicuous by its absence. There appeared to be very few new results to report on this front, and all the speculation seems to be dying down.

The Conference banquet was graced by no fewer than seven Nobel prizewinners — Glenn Seaborg, Luiz Alvarez, Aage Bohr, Ben Mottelson, Owen Chamberlain, Edwin McMillan and Emilio Segrè. Alvarez, in a memorable after-dinner talk, put forward some relatively new ideas on how the dinosaurs could have been wiped off the face of the prehistoric earth (see panel).

A memorable confrontation occurred at the Conference proper, held in Berkeley's Zellerbach Auditorium, when Marcos Moshinsky's talk on the relative merits of different nuclear collective models provoked an intense discussion with fellow experts Igal Talmi (as chairman of the session), and Bohr. In the same session, devoted to nuclei with large angular momentum and deformation, there were some good presentations on the properties of nuclei with very high spin, where angular momenta of up to 30 units are now encountered regularly. This provides an effective continuum of nuclear spin states and seems to be opening up a new field of study.

The present status of giant resonances and of the distributions of charge and magnetization in nuclei was systematically reviewed in terms of multipole contributions. Accurate measurements of charge and matter distributions were reported, in addition to direct evidence, coming from isomer shift measurements, that fission isomers are in fact shape isomers.

The subject of heavy ion reactions seems to be in a very formative stage, holding out much promise for the future. New heavy ion projects are using knowledge gained from particle accelerators, and there are also signs that the detector techno-

logy developed for particle physics experiments could soon be exploited further in the nuclear physics area. Other new techniques, involving lasers for example, are extending the range of experiments which can be carried out.

Overall, the Conference paid a lot of attention to topics and phenomena which only a few years ago would have been considered exotic. With many novel ideas being put forward and with new projects afoot, a lot of fresh ground could have been covered by the time of the next meeting, scheduled to be held in Florence in a few years.

We are grateful to Bjorn Jonson and Curt Ekström of the ISOLDE collaboration at CERN for helping us prepare this report.

When dinosaurs walked the earth...

Geologists (among them Luis Alvarez' son) have analysed layers of rock that were laid down at about the same time as the dinosaurs ceased to exist, some 65 million years ago. Neutron activation analysis reveals unusual concentrations of heavy elements such as iridium, possibly indicative of intense meteorite activity.

The evidence suggests that this was due to just one huge meteorite, about 10 km diameter, which hit the earth and produced a thick dust cloud, blocking out the sun for several years. As a result, vegetation withered and animals died, so that eventually there was no food left for the biggest animals of them all, who starved to death. No vertebrates heavier than about 25 kg appear to have survived. Some smaller animals, the ancestors of the mammals, fared better as they could eat decaying vegetation and insects. As the dust cloud dispersed, plant life restarted from the remains of the root systems, and evolution continued, although highly affected by the meteorite catastrophe.

Computing Conference at Bologna

From 9–12 September a Europhysics Conference on Computing in High Energy and Nuclear Physics, organized by the Computational Physics Group of the European Physical Society, was held in Bologna, attracting some 150 participants. Its purpose was contact and exchange of information between experimental physicists (from both fields of research) and computer experts (on whom the successful outcome of the research has become increasingly dependent). Proceedings of the Conference will be published as a special issue of Computer Physics Communications.

Review papers by Leon Van Hove and M. Macfarlane set the research scene in high energy and nuclear physics respectively, and there were papers by B. Giraud, D. Ponting, Z. Szymanski and K.J.F. Gaemers which brought out some of the many areas of theory where the power of large computers is essential for solving the present problems. On the technical side, G. Franke, M. Masetti and M. Regler made the link with experiments showing the crucial role of computers in all stages of data acquisition and analysis.

The continued rapid evolution of computer hardware and software is keeping experimenters on their toes, not only in terms of improving their present techniques, but sometimes radically rethinking how to approach the task of data reduction. Progress was very evident in areas of mass storage, on-line systems, programming languages, large-scale data transmission, etc. Mervyn Hine reported on the first experience in the high energy physics field with high speed data communication by satellite—the STELLA project.

The trend towards 'decentralization' of computing power was very clear. More and more tasks are being undertaken by the local computer at the experiment, thanks to the growing power and falling costs of microprocessors and the growing skill in making use of them. It seems probable that we are in the early days of this trend and it is also probable that the abilities which are emerging, spurred on by the needs of physics, will find many applications in other fields.

Despite the decentralization trend, the large central number-crunchers are not exactly short of customers. On the contrary, the demand on the central systems continues to grow.