Further Studies:

Angular Distributions, SU(3), Quarks, and All That...

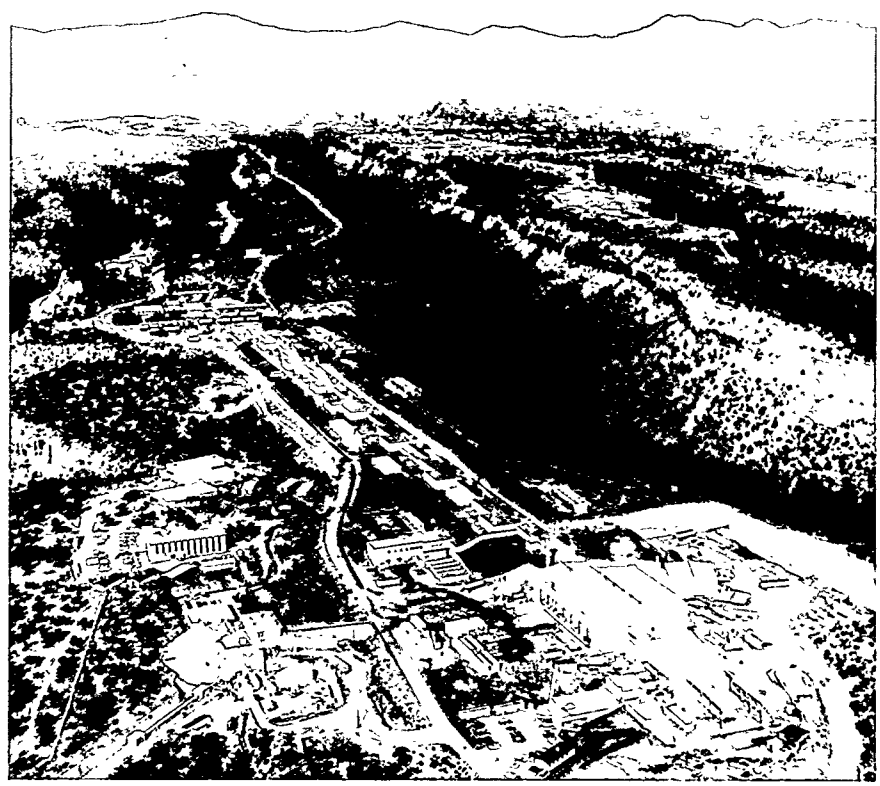
Our Chicago group then proceeded to study the angular dependence as well as the energy dependence of these reactions. Partial wave analysis of the data was done, first using only S and P waves. Later, at Los Alamos, Fermi and Nick Metropolis did the first computer-based analysis, which could require energy continuity of the several partial wave amplitudes. Indeed the $P_{3/2}$, $I = 3/2$ partial wave amplitude showed a resonant behavior at about 180 MeV.

Murray Gell-Mann, then at Chicago, developed the ideas of a deeper underlying symmetry governing the pions and nucleons and the then quite new "strange" particles, the Λ, Σ, and so on, as they came to be known. In Gell-Mann's scheme, the pion-proton "resonance" became the "delta" particle, an I-spin quadruplet, belonging to a decuplet representation of the new symmetry, SU(3). A long and exciting search for new hadrons or strongly interacting particles and resonances was on.

In the sixties, Gell-Mann and George Zweig put forward the idea that underlying the SU(3) symmetry of the strong interactions were three constituent particles, or quarks. Our friend, the delta, posed a puzzle for the scheme, in that the Δ^{++} particle was to be made of three u quarks, all with $S_z = +\ ½$, $T_z = +\ ½$ in a symmetric space wave function, that is, three identical fermions in a totally symmetric wave function. How could this jibe with the Pauli principle? A new quantum number, color, was invented to solve this problem. The theory of colored quarks and gluons, QCD, has been a success.

The New Generation Accelerator:

Recent Discoveries

In 1961, a conference on sector focussed cyclotrons was held at the University of California at Los Angeles. The possibility of 500- or 600-MeV proton beams of much higher intensity than those of the synchrocyclotron was discussed. Its applications to nuclear physics were evident. Louis Rosen became convinced that a new-generation accelerator would revitalize nuclear science. He persuaded me, Don Hagerman, Ed Knapp, and others to join in the design and building of the Clinton P. Anderson Meson Physics Facility, called LAMPF. An aerial photo shows the site. The buildings housing the one-half-mile long, 800-MeV proton linac are visible, and the experimental area is in the foreground. Today, a

Aerial photo of the Clinton P. Anderson Meson Physics Facility, LAMPF.