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The Importance of Being Ernest Rutherford

Ernest Rutherford's good friend and colleague, A. S. Eve, once playfully depreciated his immense contributions to physics by charging that he rode the crest of a wave. Rutherford responded, "Well, I *made* the wave, didn't I?" The centennial of Rutherford's birth on 30 August of this year makes this an opportune time to look at that wave.

It has long been accepted that "great men" only accelerate scientific progress a bit, but this cliché does not seem to apply to the man hailed as the greatest experimentalist since Faraday. Consider radioactivity early in this century: the significant workers could be counted on one's fingers, and none of them had the range of interests or the fertile, intuitive mind that Rutherford had. He advanced the disintegration theory of radioactivity (with Frederick Soddy, in 1902 and 1903), proposed a nuclear structure to the atom (1911), and succeeded in artificially transmuting a nucleus (1919).

Although Rutherford was no mathematical physicist, there is a notable theoretical component to each of these major achievements. He was, moreover, the leading prophet (in 1920) for the existence of the neutron (and ^2H and ^3He as well, though all this was based on faulty experimental data!). Theoreticians who worked closely with his laboratory, with varying degrees of personal influence from Rutherford, included Soddy, Kasimir Fajans, Niels Bohr, C. G. Darwin, Ralph Fowler, Neville Mott, and George Gamow. Indeed, Rutherford was as great a research director as a discoverer, and Otto Hahn, George Hevesy, Hans Geiger, H. G. J. Moseley, James Chadwick, P. M. S. Blackett, Peter Kapitza, John Cockcroft, and E. T. S. Walton are only the most eminent of his distinguished pupil-colleagues.

For almost the last 20 years of his life Rutherford was director of the Cavendish Laboratory in Cambridge, England. There, he influenced the transition from little science to big science. Kapitza, Cockcroft, and Walton were among those responsible for introducing large machines and high costs into physics, and the electronic counters of C. E. Wynn-Williams and Geiger also presaged the new look. Although these departures from the "sealing wax and string" tradition were not entirely to his taste and Rutherford disliked looking for research funds, his "boys" generally acquired the equipment needed. As president of the Royal Society and later as chairman of the advisory committee to the government's Department of Scientific and Industrial Research, he was in a position to exert considerable influence throughout the "Establishment" of science.

A number of writers have pointed out that Rutherford said that the energy of the atom would never be harnessed. In effect, the criticism means that he failed to foresee a new physical phenomenon discovered a year after his death in 1937. In the early days of radioactivity, when Rutherford recognized that decaying radioelements eject alpha and beta particles, he actually wondered if larger chunks of the atom also broke off, but no evidence for what later was called fission could then be found. Still, with Chadwick's discovery of the neutron and with the discovery of fission by Hahn, Rutherford had a connection with applications of nuclear energy. We find his presence even in the beginnings of fusion research, as when in 1934, with M. L. E. Oliphant and Paul Harteck, he bombarded deuterium with deuterons. As a major participant in the transition from classical to modern physics, it would seem that the wave Rutherford created was even larger than he may have thought!—LAWRENCE BADASH, *Department of History, University of California, Santa Barbara*