explosion, These data would provide information on the change in amount of dense absorber between the source and the detectors and thus on the change in configuration of (he pit caused by the implosion, The key to this diagnostic scheme was to find such a gamma ray source. The fission products barium-140 and lanthanum-140 (the same isotopes that led to the discovery, of fission) provided the solution. Barium-140 has a half-life of 12.8 days and decays to lanthanum 140. which has a 40-hour half life and emits an energetic gamma ray with its decay. As the operation was finally worked out. the lanthanum-140 was extracted from a large batch of its barium 140 "parent" (obtained from Oak Ridge) and put into a compact receivcr in the center of the pit to be tested, Chemical separation and further purification of the lanthanum-140 were carried out by a group headed by Gerhart Friedlander at a tcmporary building a mile or two from the firing site in Bayo Canyon. There were then no elegant "hot cells"' nor sophisticated remote-handling apparatus. To minimize radiation exposure. The radiochemists rigged up the chemical processing equipment so that the essential operations could be performed and monitored from a distance with a system of cables. mirrors. and telescopes. The final lanthanum 140. concern tratcd into a volume of 0.1 milliliter. was then heavily shielded and trucked to the firing site, where another simple remote-control rig transferred it into the implosion test assembly. The source. implosion as sembly, and gamma-ray detectors were destroyed in the test explosion. but the barium-140 supply back at the processing site was available to serve another day: because of its relatively long half-life it could "grow in" one or more new lanthanum-140 sources for use a few days later. The RaLa implosion tests became a regular diagnostic practice: with steady improvements in tech nique and with increasingly strong sources. they were continued until 1962, when they

What Are Radiochemistry and Nuclear Chemistry?

The definition of the terms "radiochemistry" and "nuclear chemistry," and the delineation of the presumed difference between them, is a problem that bedevils the toilers in this vineyard whenever they try to tell what they do. Historically, radiochemistry appears to have been the first in line, When Madame Curie was carrying through her laborious chemical procedures to isolate and identify the radioactive elements and to establish their transformations, she was doing radiochemistry. It was not until some time later that the nature of the nucleus and its reactions became clear, In most of the early researches, chemical manipulations were essential, and by the late 1930s a recognizable body of techniques and strategies had evolved to deal with the rapidly growing list of radioactive species. And it was by such chemical manipulations that Otto Hahn and Fritz Strassmann first demonstrated the occurrence of nuclear fission. Examining the products resulting from neutron irradiation of uranium, with an atomic weight around 238, they found unmistakable evidence for radioactive barium with an atomic weight around 140; they were forced to conclude that the barium came from the uranium by a process that could only have been some kind of a splitting of the uranium nucleus. Their employment of chemical techniques to study nuclear phenomena may be considered nuclear chemistry.

Unfortunately for those who would compartmentalize science into neat bins, our subject has broadened greatly in the span of time since the discovery of nuclear fission, Nowadays, its practitioners range from the "pure" radiochemists, whose primary concern is with the chemistry involved, to some "nuclear chemists" who are concerned only with nuclear physics problems and who rarely get their hands on any radioactivity—or vice versa. In our article we occupy something of a middle ground. Those pursuits in which the chemical operations are clearly of first importance we call radiochemistry, and those in which the problems of nuclear structure and reactions are of first importance we call nuclear chemistry. If in telling our story we turn out to have been inconsistent in employing this criterion, we plead guilty and ask our radiochemist/nuclear chemist critic to cast the first stone. ■