future--additional laboratories or institutes will be created for exclusive research on the transuranium elements.

There are almost unlimited possibilities for research on these elements, which already constitute nearly 20% of the total of all known chemical elements. When thinking in terms of the distant future, the tendency is to underestimate potential contributions.

As indicated earlier, estimates suggest that 500 transuranium nuclides would have half-lives sufficiently long to be detectable experimentally (longer than a microsecond). The synthesis and identification of another half dozen or so elements seems likely; this would include the discovery of Superheavy Elements and the extension of the present peninsula of elements to connect with the Island of Stability. Longer-lived isotopes than those now known will probably be found in the transactinide region especially among the early transactinide elements. (The recently discovered long-lived isotopes of lawrencium (^{261}Lr and ^{262}Lr) will make possible the detailed study of the chemical properties of this element. [67].) As a result, it should be possible to study the chemical properties of elements beyond hahnium (Element 105) and certainly of Element 106 (already possibly using the 0.9s ^{263}106).

Much more research on the macroscopic properties of einsteinium will be possible with the availability of ^{254}Es. It will surely be possible to study the macroscopic properties of fermium and not out of the question that this will be done for mendelvium. The art of one-atom-at-a-time chemistry will advance far beyond what can be imagined today to make it possible to study the chemistry of heavier and heavier elements. All of this will result in the delineation of relativistic effects on the chemical properties of these very heavy elements, which might thus be substantially different than those expected by simple extrapolation from their lighter homologs in the Periodic Table (an advanced form of which is shown in Figure 25).

And in the course of preparation of this broad range of nuclides by heavy ion reactions and the study of their decay properties much will be learned about the dynamics of nuclear matter, the exact location of shell structure, and the energy levels and spectroscopic states of heavy nuclei. This will give the theorists information to further increase the understanding of nuclear forces and structure.

Such a research program will require, for success, the availability of apparatus and equipment of increasing complexity, versatility, and power. Central will be the need for higher neutron flux reactors, for sustained operation as a research tool and to produce large quantities of transplutonium nuclides for use in the research and as target materials as a source of the presently known and expected nuclides. (Higher neutron fluxes will be especially valuable for the production of the heaviest nuclides, ^{254}Es and ^{257}Fm, springboards to the region beyond.) Higher intensity heavy ion accelerators