Large, presently non-commercial, resources are known both within and outside of the United States. Because present commercial interest focuses upon selected elements and because the elements do not occur in the same fixed ratio at every source, large surpluses of some elements develop incidental to production of others.

The rare earth elements while closely associated in nature have a variety of useful properties unique to each. The technology of efficiently separating the elements into essentially pure forms has received much attention but is not well developed and is complicated and costly. More effective separation techniques would permit fuller use of the elements and help balance their use pattern.

All of the useful properties of each of the rare earths are not well understood. Their potential as alloying elements and a variety of other applications is not developed. An improved understanding of these properties would open a large area of new application and product development and might demonstrate how singly or in some combination the elements might substitute for other materials that are in less abundance or are more costly.

Secondary recovery, presently receiving some attention, will become increasingly significant as the employment of the rare earth expands.

Rhenium

Production rate is wholly dependent upon the recovery of molybdenum, with which it is associated in nature (see section on molybdenum). Recovery is relatively inefficient (about 35 percent), and much of the rhenium escapes to the atmosphere in the present sequence of operations. Increased demand would probably encourage an improvement in recovery but present technology suggests that it would be very costly and an immediate incentive (market) is lacking. Because the future demand is promising and for the sake of conserving a limited commodity, some means of limiting this loss should be developed.

The properties that rhenium imparts to superalloys and refractory metal alloys are the subject of considerable ongoing research. For the moment designers tend to design around rhenium to avoid its high cost.

Rubidium

All current domestic supplies are derived from residues remaining from a plant that formerly processed lepidolite for lithium compounds. Elsewhere rubidium issues as a byproduct in the processing of pollucite for cesium. Other potential sources are thought to exist but are of little immediate commercial significance. Costly extraction techniques limit uses. Moreover, in most current applications other elements, like cesium, can be substituted with minor inconveniences. For the immediate future, the element would be classified as a subject for laboratory rather than significant commercial concern. Its properties merit study.

Sand and Gravel

Sand and gravel resources of the United States and the world are, in a sense, inexhaustible. However, from a practical standpoint the geographic distribution and quality often do not match well with market patterns or requirements and promises to match even less well in the future. These are large volume commodities of low unit cost. Local demand is proportional to local construction activity and unrelated to national patterns. Transportation is a significant incremental element in costs. Land-use conflicts are pronounced in the industry and promise to increase. Major markets are in metropolitan areas and the sources of the products are feeling the impact from adverse zoning and regulations against noise, dust, unsightliness, and pollution.

Water supplies present a problem with the increased demand for washed aggregate. Adequate supplies are no longer assured and, in addition, the accompanying problem of waste water disposal is raised.

Scandium

The present knowledge of primary scandium sources indicates that if the demand increased to the pound lot level, from the present gram lot level, no means of meeting that demand is foreseen. While the element occurs in trace amounts with a number of other substances of commercial interest, no important