:rpentine hills of Thetford and Coleraine. By 1900 this area had al-:ady produced 150,000 tonnes of chrysotile fiber; by 1980 nearly 40 illion tonnes had been mined -- approximately 40 percent of the world's :tal asbestos production to that date. At present Quebec is the second ending producer of asbestos, approximately 1.4 million tonnes per nnum, and is led only by the Ural areas of Russia, where the annual pro-uction is approximately 2.4 million tonnes.

The serpentinites associated with ophiolites within the Ural Moun-ain belt of the Soviet Union account for about 95 percent of the Russian roduction, all of which is chrysotile fiber. The two principal centers f production in the Urals are the Uralasbest complex, 90 km northeast of verdlovsk, and near Dzhetygara, in the southern Urals.

Other major Type I chrysotile asbestos deposits are found in the Italian Alps, the Troodos Mountains of Cyprus, and the Coalinga area of California. The classic asbestos deposits of north Italy are located in the Susa, Lanzo, Aosta, and Val Malenco areas of the Alps. These are areas underlain by metamorphosed ultramafic rocks of the alpine-type. At present the Balangero mine, located 30 km northwest of Turin in the Lanzo area, is the only operating asbestos mine in western Europe of any significance. The mine opened in 1916 and its present production is about 160,000 tonnes of chrysotile fiber per year.

The occurrence of asbestos on Cyprus may have been known many centuries ago, but significant production of chrysotile fiber began only in the 1920's. Production is now about 40,000 tonnes per annum. The deposits are in the Mt. Troodos Ophiolite Complex, one of the best studied ophiolite sequences in the world.

Near Coalinga, California, and located in the southern extension of the Diablo Range is a serpentinite dome exposed to the surface in an area 19.2x6.4 km and extending in depth to perhaps 4.5 km. This serpentine diapir consists of highly sheared serpentine minerals, which replaced the original olivine-orthopyroxene assemblage. The diapir probably formed by dismemberment of an ophiolite peridotite by tectonic forces, the sheared melange moving upwards diapirically during subsequent orogenic events (Coleman, 1977, 1980; Mumpton and Thompson, 1975). The chrysotile asbestos is mined by several companies at Coalinga, but mining is sporadic and production is limited. Even though the ore runs up to 50 percent chrysotile (Quebec ore usually runs 3 to 6 percent), mining has lagged because of environmental controls and the shortness of the fibers (grades nos. 6 and 7). The reserves at Coalinga are tremendous; perhaps tens of millions of tonnes of short fiber are available near the surface, making Coalinga a vast resource for a type of asbestos which will be useful to strengthen plastics, tiles, etc.

Type II deposits of southern Africa

Whereas most of the chrysotile mined in the two major asbestos producing countries, Canada and the U.S.S.R., is from serpentinized ultramafic rocks within ophiolite sequences, almost all of the southern African production comes from Archean ultramafic stratiform complexes. These are generally associated with the ancient greenstone belts on the Rhodesian and Kaapvaal Cratons (Anhaeusser, 1976). Within the African greenstone belt, and particularly in the Lower Ultramafic Unit, a number of layered differentiated ultramafic pods and sills are developed which contain chrysotile fiber of economic importance. While age, stratigraphic, and genetic relationships of these Archean ultramafics are quite different from those of the ophiolites, both contain peridotite assemblages, including dunites, which have altered to chrysotile-bearing serpentinite.

South Africa and Swaziland. Here the two largest producers of chrysotile asbestos are the Msauli and Havelock mines, situated approximately 30 km southeast of Barberton, South Africa. The Havelock mine is situated just over the Transvaal border in Swaziland. These deposits are included within the Swartkoppie Formation, which straddles the Swaziland-Transvaal border. This formation includes green and gray schists, banded cherts, and a number of serpentine pods or lenses positioned in the same stratigraphic horizon. The serpentinized ultramafic inclusions are considered to represent parts of a once continuous or nearly continuous differentiated sill emplaced penecontemporaneously with the remaining Swartkoppie rocks and conformable with the latter (Anhaeusser, 1976). The other active chrysotile mines in South Africa occur in ultramafic bodies similar to those in the Msauli-Havelock area. Deposits located in Barberton Mountain Land of South Africa occur in the Stolzburg, Koedoe, Handsup-Mundt's Concession, Kaapsehoop, Kalkkloof, and