

# *STARKE MINES*

by MICHELLE ROGERS

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Du Pont has been involved in the mining of various minerals in Florida in such places as the Trail Ridge. Minerals which have been mined are titanium minerals such as ilmenite, leucoxene, and rutile.

Since the turn of the century, eight companies have mined heavy minerals in the United States. Heavy minerals are the weathering-resistant minerals with specific gravities of three or greater which are usually associated with fossil beach sands, alluvial flood plains, and recent shorelines. Major heavy mineral deposits are located along the eastern coastal plain in New Jersey, the Carolinas, Georgia, Florida, and the Mississippi embayment of Tennessee.

The Trail Ridge deposit was discovered by Du Pont geologists in cooperation with the U.S. Bureau of Mines and the Florida Geological Survey. The Trail Ridge orebody is the largest known deposit of heavy minerals in the Atlantic-Gulf Coastal Plain. The minerals occur under the southwest portion of the ridge in a narrow band about one mile wide and eighteen miles long along the Clay-Bradford County line. This deposit is believed to have formed at the height of a transgressing sea. The part of the Trail Ridge deposit being worked by Du Pont ranges from twenty-five to seventy feet deep and the heavy minerals compose about four percent of the sands. Other known deposits of heavy minerals are near Yulee, north and south of Brunswick, Georgia, Cumberland Island, and the Sea Island Chain. However, it is not possible to mine the Georgia islands because they are either too populated or they are not mineable for ecological reasons.

During World War I, Henry H. Buckman and George A. Pritchard discovered ilmenite and other heavy minerals along the northeastern coast of Florida. Production began in 1916 by a company named Buckman and Pritchard, Incorporated.

In the beginning, only ilmenite was recovered from the sands, but later when zircon and rutile began to be used these minerals were also recovered. Production from this mining expedition reached a peak in 1927 and was discontinued completely in 1929. There were no U.S. companies mining heavy minerals between 1929 and 1939 due to the depression.

After World War II, Du Pont geologists began explorations to find a domestic source of ilmenite so the Du Pont Pigments Department would not have to rely on foreign ore supplies. In December, 1947, Du Pont began a long-term lease agreement with the State of Florida Armory Board to mine and separate heavy minerals from the Trail Ridge deposit within the boundaries of Camp Blanding, Clay County, Florida. The plant was constructed in 1948, was started in 1949, and was taken over by Du Pont in 1958. Du Pont designed and built a second plant just northeast of Lawtey, Florida, on the Trail Ridge deposit and only fifteen miles away from the first plant. This new plant, known as the Highland Plant, started up in 1956. The

first titanium metal was produced by Du Pont in 1948 and the publicity of this interested others, therefore increasing the demand for new deposits of high grade titanium ores.

Yulee is also a great focus for heavy mineral mining. These heavy mineral sand deposits are located a few miles east, northeast, and north of the town of Yulee in northeastern Florida. The deposits cover around five thousand acres and are on the southern side of the St. Marys River, which divides Georgia and Florida. These heavy mineral sand deposits were supposedly first discovered in the early 1950s by Joseph L. Gillson during his heavy mineral studies of the Coastal Plain. The Yulee concentrations of heavy minerals occur in low ridges composed mainly of quartz sand. The most abundant heavy minerals in the deposits are ilmenite, zircon, epidote, rutile, sillimanite, stautolite, leucoxene, tourmaline, kyanite, and hornblende. Of these ilmenite, leucoxene, rutile, and zircon are the most important ore minerals.

All of the heavy mineral orebodies which have been mined in northern Florida have been parts of ridges formed along shorelines. For example, Trail Ridge can be cited as an example of a beach ridge built at the crest of an eroding transgressing sea. The Yulee ridges formed as part of the Pamlico barrier island of the Pleistocene age. These heavy mineral concentrations in the ridges of the Pamlico barrier island accumulated in a downdrift direction from a point where the St. Marys River entered the Atlantic Ocean.

In the mining process, dredges are used to mine the ore and gravity concentrates are then used to separate out the heavy minerals and reject the quartz tailing. Du Pont and Green Cove Springs wet mills float on the same pond as the dredge, but the ASARCO wet mill is on permanent land. Heavy mineral concentrates are pumped to the dry mills. The sands often contain grains which are coated with other materials and these impurities are removed through attrition scrubbing with caustic just before dry milling. The gravity concentrates are mixtures of titanium minerals, quartz, and heavy mineral silicates. The concentrate is then dried and the conducting titanium minerals are separated from the other products by high tension separa-

tors. Next the titanium minerals are separated from each other through magnetic means. After the titanium minerals are removed, the remaining particles must be further treated to produce staurolite, zircon, aluminum silicates, and monazite. The titanium minerals are removed first. Then, at Du Pont, the remaining heavy minerals are fed to high intensity electromagnets that remove staurolite. This is the magnetic product. The nonmagnetic materials are then pumped to spirals that concentrate the zircon and aluminum silicates. The zircon concentrate is heated to 1100 degrees Fahrenheit and then cleaned by high tension and electromagnetic separation. The aluminum silicates are treated much the same way.

Michelle Rogers is an English major from Lee County, Georgia.

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