

SPECIAL METALS AND USEFUL MINERALS

Palladium.

It is worth more than gold! What is Palladium? One atom with 46 protons. Where does it come from? God, if you consider suns exploding into supernovas to be such an expression of wonder. Where is it now? In your car, the catalytic converter. Palladium is a catalyst that allows unburned exhaust to be converted to carbon dioxide and water. Drip, drip, drip. You've seen it in the tail pipe. And it does so without flame. But more carbon dioxide? Palladium is used primarily in gasoline-powered automobiles. Platinum (with 78 protons in its nucleus) is usually used for diesel vehicles. Want some? Go to Russia or South Africa.

RARE EARTH MINERALS

God seems to have made a lot of interesting stuff out there. Lanthanum (57 protons), Cerium (58), Praseodymium (59), Neodymium (60), Promethium (61), Samarium (62), Europium (63), Gadolinium (64), Terbium (65), Dysprosium (66), Holmium (67), Erbium (68), Thulium (69), Ytterbium (70), Lutetium (71).

What makes these elements similar is what makes them all different. For each proton added, there is an additional electron. But in this rare earth series, the new electrons are applied to interior orbital shells. The outer shell of each continues to look the same, even if their magnetic properties are different. You know, the Neodymium magnets on your refrigerator. Use Terbium for shape-shifting and Cerium for movie sparking effects. Erbium in fiber optic cables, and

Europium in phosphorescent paint and compact fluorescent bulbs. Use Gadolinium and Holmium in MRI scans.

Where is all this valuable stuff? China. The United States used to be the leader in production. Australia is ramping up, but China has provided more than 90% of the world's production of rare earth minerals over the last ten years. Recently, the United States Geological Service announced that these rare earths, along with 34 other minerals, were critical to national defense and the economy. And no, Palladium was not one of them.

THE FLUORSPAR DISTRICT

Fluorspar (for use with steel, aluminum, and uranium fuel) and Barite (cement and petroleum) are on the list and found in Kentucky. How so? Rock in Kentucky is sedimentary in nature, and Barite (Barium sulfate, $BaSO_4$, Barium has 56 protons) can precipitate out of oceans. But generally not Fluorspar (also known as Fluorite, Calcium Fluoride, CaF_2 , Fluorine with 9 protons). But in Western Kentucky, these two minerals are found in igneous hydrothermal intrusions (dikes or sills) within significant faults in the basement rock there. There, in the resulting veins in the stone, you will also find Lead, Zinc, and Silver. This area, our Little Hawaii, is found just upriver from Paducah, near Marion, the county seat of Crittenden.

The first commercial mine in this "Fluorspar District" was the Columbia Mine, opened in 1836. I have "mined" Fluorspar there myself, in the abandoned "tailings" of the original operation.

Silver was the first object of mining there, then later Lead and Zinc ore. Fluorspar, which forms beautiful, large, colorful crystals, was just thrown aside. It

wasn't economically valuable until the development of Open Hearth steel furnaces using Fluorite as a flux to remove impurities. Ironic, since such furnaces replaced the Bessemer Method of steel production perfected by William Kelly at the Suwanee Furnace, just a little farther west in Kentucky. Find Fluorine today in Teflon, Gore-Tex, toothpaste, and fluoridated water. Fluorescence was named after Fluorite, which can emit light in the darkness. But that is actually caused by traces of Europium mixed in with the Fluorite crystals.

ANDREW JACKSON

Born in the Waxhaw settlement of the Carolina Mountains in 1767, the seventh President of the United States (1829-1837) was a "populist" President. He faced down southern states in the nullification crisis, dismantled the Bank of the United States, paid off the National Debt, and expelled Native American Tribes from areas east of the Mississippi River. Think of the Cherokee People and the Trail of Tears. In 1818, he also negotiated the purchase of land in Kentucky west of the Tennessee River from the Chickasaw Nation.

Jackson was 51 years old then, and must have done some exploring in the area. For just north of "The Jackson Purchase" were all of these exotic rock faults and igneous mineral veins. In 1836, now President and aged 69, he became one of the owners who opened the Columbia Mine. Silver from Galena and Zinc from Sphalerite deposits.

Jackson could have searched for Palladium if he wanted real value. But there wasn't any in those veins. And no cars to make it valuable.