dropping of a previously uplifted region. Basalt later covered much of the SRP, partially burying the much more voluminuous rhyolite (Idavada Formation and equivalent units). The orientations of flow-controlled streaks in welded rhyolitic ash flows at the southern margin of this area diverge from eruptive centers now buried near the center of the SRP. Several considerations suggest that these centers are calderas which collapsed when the rhyolitic magmas erupted. Many of the basaltic shield volcanoes between the Snake River and the southern margin of the SRP form arcuate arrays with diameters of 15-45 km. This geometry suggests the basalt volcanoes mark zones of vertical displacement at the margins of buried rhyolitic calderas. In southwest Idaho, the Idavada-type rhyolite extends south of the Owyhee Mountains, whereas the topographically-depressed western SRP extends north of these mountains. This divergence suggests the nature and origin of the eastern and western SRP are different. The western SRP is probably a large graben, perhaps related to the parallel system of the NW-SE trending faults in central and eastern Oregon, whereas the eastern SRP probably manifests the regional down-dropping that followed the time-trangressive linear volcanism which progressed from extreme SW Idaho or NW Nevada to Yellowstone Park.

THE SIXTY MILE FORMATION: A SLIDE BRECCIA OF YOUNGER PRECAMBRIAN AGE, GRAND CANYON, ARIZONA

Breed, William J., Department of Geology, Museum of Northern Arizona, Flagstaff, Arizona 86001

The Sixty Mile Formation is a rock layer in the Grand Canyon deposited after the Kwagunt Formation of the Chuar Group (Precambrian), but before the Tapeats Sandstone (Cambrian). It was most likely formed during the tectonic activity that resulted in the folding and faulting of the Younger Precambrian rocks. The Sixty Mile Formation is present only on top of Nankoweap Butte and in Sixty Mile and Awatubi Canyons in the axis of the syncline present in those canyons. It should be considered in all probability a slide-breccia deposit.

HEAT FLOW STUDIES OF THE SNAKE RIVER PLAIN

Brott, Charles A., Blackwell, David D., Department of Geological Sciences, Southern Methodist University, Dallas, Texas 75275; Mitchell, John C., Idaho Department of Water Resources, Statehouse, Boise, Idaho 83707

A heat flow study of the Snake River Plain has been initiated with the objectives of evaluating the geothermal potential and the regional geotectonic setting of the Plain. Over 50 wells have been logged for temperature-depth information and a multi-hole drilling program is in progress. Observed gradients range from approximately 40°C/km to over 150°C/km and preliminary heat flow values range upward from approximately 2.0μcal/cm^{2}sec. There are numerous areas with anomalous heat flow values (2.5 to over 4.0μcal/cm^{2}sec). A preliminary conclusion is that the regional heat flow in the Snake River Plain is above the average of the regions of high heat flow of the western United States. Differentiation of heat transfer due to regional aquifer systems known to be present in the Snake River Plain and that due to crustal and mantle heat sources is still uncertain; however, the heat flow data furnish constraints for evaluation of the aquifer systems and on the mode of formation of the Plain. Preliminary conclusions are that the crustal and/or mantle component of heat flow must be higher than the surrounding areas of the Northern Rocky Mount Range Province and that large areas of the P potential.

UPPER EOCENE PORPHYRIES IN THE COLORA HISTORY OF THE WEST MARGIN OF THE FRO

Bryant, Bruce, Marvin, R. F., Mehn C. W., U.S. Geological Survey, D Denver, Colorado 80225

Potassium-argon ages of biotite from zonite, and porphyritic quartz monzon southeast of Breckenridge, Colorado, and 43.8±1.5 m.y., respectively, and mineralization in that part of the Co of late Eocene age. Fission-track ag and sphene from the porphyries are co limits of analytical uncertainty, ind cooled quickly. The zircon ages are than the biotite ages.

The Breckenridge-South Park regi part of an infold of sedimentary rock the Front Range uplift. Previous wo region was first uplifted in Late Cre moved as much as a thousand metres o before deposition of Tertiary basin from a bed of crystal tuff about 1,5 the fill gave an age of 53.4±2.0 m.y K/Ar whole-rock age of 56.8±2,6 m.y. the base of the fill as reported by deposition of the fill locally to a km, the rocks were folded and cut by rocks along the west margin of the F thrust over the adjacent sedimentary in the north. The porphyries were e thrusting, which must have ceased be probably before 49.4 m.y. ago.

DEFORMATIONAL ORE STRUCTURES IN THE "J" VEI COEUR D'ALENE MINING DISTRICT, IDAHO, AND T

Caddey, Stanton W., Kennecott Exploratio Research & Laboratory Division, Salt L

The "J" vein is a deformed lead-silver vein within the Revett Quartzite Formation of th west end of the Coeur d'Alene mining distri

Ore fabrics were found to exhibit struct metamorphic terrains. These ore textures scribed in other parts of the district by (1973). Ore structures include schistose torted lenses of chalcopyrite and tetrahed and angular to subrounded fragments of vei rock. The harder gangue and wall rock fra the sulfide matrix of galena showing evide and rotation. Galena schistosities were p and subsequently annealed into very fine-g some rare instances, late-stage accretiona

During this study, methods of structura order to reconstruct the deformational his

surrounding areas of the Northern Rocky Mountains and the Basin and Range Province and that large areas of the Plain have geothermal potential.

UPPER EOCENE PORPHYRIES IN THE COLORADO MINERAL BELT AND THE HISTORY OF THE WEST MARGIN OF THE FRONT RANGE UPLIFT

Bryant, Bruce, Marvin, R. F., Mehnert, H. H., and Naeser, C. W., U.S. Geological Survey, Denver Federal Center, Denver, Colorado 80225

Potassium-argon ages of biotite from monzonite, quartz monzonite, and porphyritic quartz monzonite from east and southeast of Breckenridge, Colorado, are 49.4±1.7, 43.0±1.5, and 43.8±1.5 m.y., respectively, and show that intrusion and mineralization in that part of the Colorado mineral belt are of late Eocene age. Fission-track ages of zircon, apatite, and sphene from the porphyries are concordant within the limits of analytical uncertainty, indicating that the rocks cooled quickly. The zircon ages are 5 to 10 m.y. younger than the biotite ages.

The Breckenridge-South Park region lies in the south part of an infold of sedimentary rock at the west margin of the Front Range uplift. Previous work has shown that the region was first uplifted in Late Cretaceous. Erosion removed as much as a thousand metres of Cretaceous rocks before deposition of Tertiary basin fill began. Biotite from a bed of crystal tuff about 1,500 m above the base of the fill gave an age of 53.4±2.0 m.y. comparable with the K/Ar whole-rock age of 56.8±2.6 m.y. for an andesite near the base of the fill as reported by Sawatzky in 1969. After deposition of the fill locally to a thickness of more than 3 km, the rocks were folded and cut by faults. Precambrian rocks along the west margin of the Front Range uplift were thrust over the adjacent sedimentary rocks in South Park and in the north. The porphyries were emplaced after the thrusting, which must have ceased before 43 m.y. and probably before 49.4 m.y. ago.

DEFORMATIONAL ORE STRUCTURES IN THE "J" VEIN AT THE BUNKER HILL MINE, COEUR D'ALENE MINING DISTRICT, IDAHO, AND THEIR EXPLORATION SIGNIFICANCE

Caddey, Stanton W., Kennecott Exploration Services, Geochemical Research & Laboratory Division, Salt Lake City, Utah 84104

The "J" vein is a deformed lead-silver vein-type orebody. It occurs within the Revett Quartzite Formation of the Belt Supergroup near the west end of the Coeur d'Alene mining district, Idaho.

Ore fabrics were found to exhibit structures reminiscent of those in metamorphic terrains. These ore textures are similar to those described in other parts of the district by Waldschmidt (1925) and Siems (1973). Ore structures include schistose galena, attenuated and contorted lenses of chalcopyrite and tetrahedrite, folds, boudins, rods and angular to subrounded fragments of vein quartz, siderite, and wall rock. The harder gangue and wall rock fragments were scattered through the sulfide matrix of galena showing evidence of flattening, stretching and rotation. Galena schistosities were produced during deformation and subsequently annealed into very fine-grained "steel" galena. In some rare instances, late-stage accretionary textures were observed.

During this study, methods of structural geometry were applied in order to reconstruct the deformational history. It was found that ob-