METALLIC SPHERULES AND A MICROTEKTITE SUPPORT THE INTERPRETATION OF A BURIED IMPACT CRATER BENEATH PANTHER MOUNTAIN IN THE CENTRAL CATSKILL MOUNTAINS, NEW YORK.

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Introduction: Panther Mountain is located in the Catskill Mountains, a region of flat-lying Paleozoic sedimentary rocks that forms the eastern edge of the Allegheny Plateau. It is a circular mass, 10 km in diameter, located immediately west of Phoenicia, New York, and rises 800 m above the valley floor. The mountain is defined by an anomalous circular drainage pattern, vividly shown on Landsat images, that invites a geological explanation. Initial work included photogeology (Landsat and stereo airphotos), surface geologic study, shallow seismic refraction profiling, gravity and magnetic measurements, and gravity modeling [1].

Pervasive fluvial cross-bedding in the terrigenous strata of the region made it impossible to determine whether the feature is slightly domical, slightly basinal, or unwarped. However, it was clear that high joint density accounts for the greater erosion that produced the circular valley.

Gravity mapping defined a crudely-circular negative anomaly with a relief of 6 mGals, most anomalous for an area of flat-lying stratigraphy 3000 m thick. A measured gravity profile was satisfied by a computed profile of a shallowly-buried (~1 km) complex impact crater with a diameter of 10 km and a central uplift of brecciated and shattered rock ~1 km in thickness. The modeled crater, a syndepositional structure, would pass through the Middle and Lower Devonian section. The relatively high joint density that is responsible for erosion of the ring valley is attributed to the influence of the buried crater rim on the geometry of sedimentation, especially factors of differential compaction and cementation. The failure of fracture-controlled linear valleys north and south of Panther Mountain to extend across the mountain mass is explained by absorption of the regional stress energy by impact-produced brecciation below.

Investigation: The only direct access to subsurface information is provided by the 2000-m-deep Herdman gas test well located near the northern edge of Panther Mountain. The hole, produced by a percussion drill, yielded mainly 1–2-mm size rock cuttings. Such cuttings are customarily bagged for every 3–4-m depth interval, and used to construct the stratigraphic section. Before study, however, each bag of cuttings is placed in a liter beaker of water, stirred vigorously, and decanted, to remove the fine-grained “dust” fraction.

Some 600 bags of such washed cuttings were painstakingly searched for spherules and microtektites, using a binocular microscope with zoom lens. Thin sections were made of selected grain mounts to search for planar deformation lamellae in quartz and other features of shock metamorphism.

Observations: Seven magnetic spherules, measuring 0.2–0.8 mm were found at the depth interval 573–578 m in the Herdman well, and three at 902–904-m depth in the Armstrong well, 12 km to the west. A pale brown microtektite with gas bubble hollows was identified at 627–630 m in the Herdman well. No impact features were recognized in the thin secitons.

Interpretations: The washing of the samples probably removed most microtektites that might have been present, as well many of the very small spherules. The magnetic spherules found in the Herdman and Armstrong wells fall in the same stratigraphic interval and thus appear to represent the stratigraphic position of impact, which happens to be at or near the Middle-Upper Devonian boundary. The microtektite could also have originated at this position and become dislodged from the wall when the drill bit had reached the lower levels.

Future Work: Microprobe analyses will be made of representative spherules. Cuttings from several more distant deep gas test wells will be examined for further evidence of impact.

References: [1] Isachsen Y. W et al. (1994) *Northeastern Geology, 16,* 123–136.