STRUCTURAL CONTROL OF ORE DEPOSITION IN THE WISCONSIN-ILLINOIS LEAD-ZINC DISTRICT

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Recent studies conducted under a grant from Northwestern University have developed certain facts, hitherto inadequately recognized, that bear upon the direction of movement of the ore-depositing solutions in the Wisconsin-Illinois lead-zinc district.

Most earlier workers regarded the "oil rock" as a definite stratigraphic horizon, immediately above the phosphatic bed in the basal Galena dolomite. "Galena" as here used includes the Guttenberg and higher members of Kay. This phosphate horizon and the bentonite five feet below it are apparently dependable key horizons. "Oil rock" resembling that of the Platteville section occurs below both of these key horizons in mines at Dodgeville, Wisconsin. Thus the "oil rock" is a recurrent sedimentary facies, rather than a constant horizon. Its general association with ore is significant.

Superimposed on the southward regional dip are numerous small east-trending basins bearing much of the ore. Drill data, furnished by the Vinegar Hill Zinc Company, and recent detailed mapping shed more light on these basins. Strata immediately beneath the "oil rock" show dips like those of the "oil rock". Smaller basins seen underground exhibit no differential compaction. These facts suggest that even the larger basins are not attributable to unequal compaction of "oil rock", but rather to its deposition on irregular topography, with subsequent accentuation of primary irregularities by tectonic movements.

"Crevices" (vertical ore veins) were restudied. Two pronounced fracture systems trend northeast and northwest respectively, as recognized by earlier geologists. Such a pattern also agrees with the tectonic interpretation of the basins mentioned above.

Faults, though not hitherto reported, were found in the mines. Two general types occur. In the Trewartha mine (west drift), a steeply north-dipping fault strikes northeast. It offsets the bedding and an earlier fault about one foot vertically, and is marked by a conspicuous breccia zone. A more common type of fault, illustrated in the south drift of the Crawford mine, represents compressional fracturing of a bed, with relative shortening along the bedding; the plane is zig-zag in vertical section, crossing the beds, then appearing to continue parallel to the bedding, and higher still crossing the beds again. Examination of faults of this type excludes assigning them to (1) solution of underlying layers and collapse or (2) dominantly horizontal movements on steep fault planes.

The following conclusions may be listed:

1. Contrary to earlier statements the ore does not necessarily occur above shaly "oil rock".
2. Ore is commonest near (in, above, or below) "oil rock": this suggests deposition not through ponding but because of reducing action of bitumens or hydrogen sulphide in the "oil rock".
3. The basins are due to primary irregularities in deposition and subsequent tectonics, yielding the two fissure systems mentioned.
4. There are true faults definitely recognizable, offering channels for passage of ore solutions through shaly horizons. This weakens the argument which, because ores commonly occur above allegedly impervious "oil rock" and shales, assigned ore deposition to decending waters.