

Spurr has excited makes for scientific progress. The spirit of sarcastic hypercriticism, intolerance and quibbling over words is destructive of all patience and all good feeling among scientific men, and this spirit is all too rife at present in the United States Geological Survey. It is to be feared that the Washington atmosphere of dogmatic officialism has somewhat affected Dr. Ransome's discussion.

T. A. JAGGAR, JR.

THE OXIDATION OF PYRITE.

DISCUSSION OF PAPER BY A. N. WINCHELL.

Sir: Last June I noted Mr. Winchell's paper on pyrite and before realizing it was to be discussed or questioned, I suspected that the conditions under which the experiments were performed would seldom be approached in nature. The comparison of conditions of experiment with nature has not yet been made, and would be difficult on account of the endless variety in nature. Mr. Read's discussion apparently questions some of the assumptions regarding the analogy of experiment and nature, but gives no more evidence either way than Mr. Winchell gave in the first instance.

The problem, as stated by Mr. Winchell, is "to determine the conditions under which the process of oxidation may occur, and the approximate rate at which it proceeds." He found that under the conditions he selected there was some oxidation, and he measured the rate. But it occurred to the writer that experiments might be performed very simply, and at the same time with all necessary care, to test other conditions and other pyrite. So the following results are offered, not as a correction or criticism, but as a different case.

Near the surface of the ground, where oxidation seems to be rapid, the conditions may not be those of constant circulation of water, but a mineral will be alternately wet and dry. It was thought possible that oxidation would be more rapid if this natural condition could be imitated. Glass crystallizing dishes were

weighed and a known amount of pyrite spread over the bottom of each dish, exposing it well to air. These were barely covered with distilled water as often as they became dry. The exposure lasted just twelve months, but the wetting was neglected for three months of the summer field season. As the air of the building was not always very pure, the dishes were kept outside as much as the weather permitted, and in the shade. They were covered with a large glass and a blank was carried beside them to correct for any dust accumulation.

The samples used were as follows: (1) Marcasite, well crystallized in tufts, Cuba, Wis.; (2) Pyrite, fine cube, Jersey Shore, N. J.; (3) Pyrite, pyritohedron, Elba. Each sample was ground to pass a 20-mesh sieve and was caught on an 80-mesh sieve. The powder was washed in hot diluted hydrochloric acid till the reaction for iron could no longer be seen, and then rapidly washed in water, alcohol and ether and dried. Each was very pure FeS_2 . The part not weathered was kept well stoppered and dry. After the year of treatment, fresh samples were weighed from the original and the difference between the dry and weathered samples is evident from the table below. The samples all gained considerably in weight after ex-

No.	Grams Used.	Iron Soluble in HCl.		Sulphur Soluble in HCl.	
		In Original.	In Weathered.	In Original.	In Weathered.
Blank.	0	Per Cent. 0.00	Per Cent. 0.001	Per Cent. 0.00	Per Cent. 0.001
1	15	0.005	0.021	0.003	0.024
2	5	0.006	0.032	0.001	0.033
3	15	0.002	0.010	0.002	0.012

The pyrite apparently oxidized is as follows:

No. 1	0.032 per cent.
No. 2	0.057 per cent.
No. 3	0.015 per cent.

Mr. Winchell's more elaborate and continuous method gave 0.067 per cent. which is not far from one of the simpler tests here reported. The results, however, do not lead to much further clarification of the problem, indicating a variation not yet accounted for. The samples were treated identically, as far

as possible, but results vary with the material. There is still no evidence of rapid oxidation, as all results are slower than that of Mr. Winchell. The smaller amount of material should not effect the value of the result.

FRANK F. GROUT.

THE LOCALIZATION OF VALUES AND THE OCCURRENCE OF SHOOTS IN METALLIFEROUS DEPOSITS.

Sir: I have read with much interest the opening remarks of J. D. Irving, also the article by Mr. Sales, recently issued in the discussion which has been inaugurated in *ECONOMIC GEOLOGY*.

I believe that the result of bringing together a series of articles by different observers on this subject will prove of great value, not only to those interested in the science of ore deposits, but will be of intrinsic value to those engaged in exploiting mineral occurrences.

The distinction made by Irving between "Shoots of Occurrence" and "Shoots of Variation" appeals to me as the solution of a long-felt want in classification which I have personally felt the need of in describing cases of secondary enrichment in primary ore shoots.

The bringing together of carefully observed data in regard to the form and distribution of ore bodies can not fail to prove helpful to those engaged in field work.

It is to be regretted that a more definite nomenclature with regard to the shape of such ore bodies than that at present used is not available, as the vernacular terms, such as "pockets," "nests," etc., afford no idea whatever of shape, when sought to be applied for correlation purposes.

With regard to the phrase "Pay Shoots" and the general adoption of this term, I think that while it is a very useful one to express local profitable conditions—from a purely commercial point of view—yet it can hardly be applied universally to indicate mere differences between all masses of ore, which carry a higher content of ore mineral than the adjacent material and the low grade material by which they may be surrounded. The