

owing to the presence of this nitrate in the soil, the chlorides, sulphates of sodium and potassium exert a solvent action on the organic matter. The potassium nitrate has a decomposition, while the solvent action of the more pronounced solvent action on the organic matter, which is intensified by double carbonates of sodium and potassium are undoubtedly intensified by the hydrolyzation and consequent production of caustic alkali. The salts of calcium exert a repressive action because of the double decomposition and the union of the calcium to formed insoluble calcium salts of the colored organic acids present as already explained. In the presence of old organic material such as occurs in the coal-bearing shale the humifying action of *either the carbonates or other salts* is entirely negligible but it undoubtedly is true that the humifying action upon fresh organic matter of the caustic soda produced by the hydrolyzation of the sodium carbonate is an important factor in the production of the black color of the black alkali spots of alkali soils.

Furthermore, the solvent action of potassium nitrate on old organic matter may be observed in the extraction of peaty soils in the determination of acidity of the soil by the Hopkins method. The potassium nitrate extract of peaty soils in this determination is always colored, due to dissolved organic material. The intensity of the color frequently is so great as to give considerable trouble in the subsequent titration of the extract with an alkali, because the change in color of the indicator can not be observed. The solubility of the old organic matter of peaty soils in potassium nitrate is certainly entirely analogous to the solubility of the old organic matter in the coal-bearing shales and sandstones which constitute the parent material out of which the soils of the "niter" areas are formed.

The color thus can be readily accounted for without the instrumentality of the bacteria, while, moreover, artificial niter spots may be produced in the laboratory on a small scale under conditions which preclude the presence of any bacterial life whatever. Three hun-

dred grams of a greenhouse soil, rich in humus, was placed in small evaporating dishes and the dish filled with a 10-per-cent. solution of sodium nitrate. The solution was then allowed to slowly evaporate by the sun's rays. When all the moisture had evaporated there was produced characteristic niter spots including the color, hard crust and the mealy crystalline condition underneath the crust due to the accumulation of the soluble salts. *These spots were likewise produced when the nitrate was added in the solid form and the moisture added with a saturated solution of mercuric chloride or a 5 per cent. solution of carbolic acid. Control samples of the same soil, in the absence of the nitrate, with or without the antiseptic, failed to produce either the color or other indications of the niter spots.* It is evident, therefore, that the bacteria play no important rôle in either the production of the nitrates or color of the "niter spots" of certain western soils.

In addition to the evidence already published, a detailed paper dealing with the problem as it affects other soils than those already discussed is being prepared and will be published later elsewhere.

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MOTTLED LIMESTONES AND THEIR BEARING ON THE ORIGIN OF DOLOMITE¹

SEVERAL examples of limestone mottled with dolomite have been described during the past few years, but R. C. Wallace was the first to attempt seriously to interpret their meaning. In a very suggestive paper entitled "Pseudobreciation in Ordovician Limestones in Manitoba"² he points out that the dolomite patches in these limestones follow fucoid-like markings suggesting algæ, and concludes that the relationship has resulted from a process of local replacement produced by the magnesia contained in algæ which were imbedded in the

¹ With the permission of the director of the Iowa Geological Survey.

² *Jour. Geol.*, Vol. XXI, 1913, pp. 402-421.

limestone at the time it was deposited. He therefore regards the magnesia as indigenous.

It has appeared to the writer that the agents which produced the mottling might be closely bound up with dolomite formation on an extensive scale, and he has accordingly given the phenomenon careful attention in connection with his studies on the origin of dolomite. In the occurrences of mottled limestones observed by him the dolomite patches follow fucoid markings similar to those described by Wallace in some instances, but in others they are very irregular and show no guiding influence. For the origin of both types it seems necessary to adopt an alternative hypothesis; namely, that the magnesia was subsequently introduced into the limestone from without, and that the mottling has resulted from the selective replacement of fucoid markings in the one case, and from the spreading out of the alteration from certain favorable centers in the other. Consistent with this view are the following facts:

1. The existence of unaltered fucoid markings containing less than two per cent. of magnesium carbonate in association with dolomitic ones.

2. The association of both types of mottling with dolomite seams and other evidences of imperfect dolomitization.

3. The graduation of mottled beds into beds which are uniformly dolomitic, both laterally and vertically.

4. The existence of every gradation between limestone showing incipient mottling and true dolomite.

Thus it appears to the writer that all examples of mottling examined by him represent an incipient stage in the process of dolomitization, and it is believed that many dolomites have passed through such a stage in the progress of their formation. Here, then, we have a clue to the origin of all those masses of dolomite with which such mottling is associated.

With regard to the time of the alteration which produced the mottling, there is convincing evidence that it took place in the majority of cases prior to or contemporaneously

with the recrystallization of the limestone. Several features lend support to this conclusion; namely, the development of perfect rhombs of dolomite showing no growth interference effects in the limestone about the borders of the dolomite patches; the occasional presence of zonal growths of dolomite and calcite; the tendency of the dolomite areas to spread out uniformly in all directions as the dolomitization proceeded rather than to develop veinlets; and the association of the mottling with imperfect dolomitization effects along original lines of weakness such as bedding planes rather than along secondary structures such as joints or fractures. It seems probable, therefore, that the mottling was produced while the limestones were still beneath the sea, and that the sea water contributed the magnesia.

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SERPENT INSTINCT IN MAN

TO THE EDITOR OF SCIENCE: In the very entertaining and instructive work by Col. Wm. C. Gorgas, "Sanitation in Panama," the author in the concluding pages of the book gives expression to certain philosophizing ideas relating to the earliest period of the existence of the human race, and makes the point that before the discovery by primitive man of fire and clothing his habitat must have been confined to that part of the earth that lies "between the tropics of Cancer and Capricorn," or within narrow limits outside of that region.

There has been much speculation concerning the focus from which the world's population became diffused over the earth's surface, and, at least as far as regards the white peoples of Europe and Asia, the consensus of scientific opinion has fixed upon some locality in central Asia as the probable focus of origin, though the exact or approximate locality seems not to have been defined.

In the writer's reflections along this line there has presented itself to his contemplation one very pronounced and mysterious mental attribute still pertinaciously clinging to the white race at least, which seems to carry evi-