that freed the gold from its mother rock and brought about its concentration in prehistoric river channels forms altogether a most impressive description of continent building. Looking backward through inconceivably long vistas of time in which periods covering millions of years supplant the centuries by which we now compute its passage, the geologist pictures the uplift of the new-born mountain range by upward-forced great bodies of molten granite. This uplift was accompanied or closely followed by the formation of veins and seams of gold-bearing quartz, and the resulting highland was then planed down by erosion caused by rainfall and the action of streams of water.

Tracing the long course of this early history the geologist now finds that toward the end of what is known as Tertiary time—a comparatively recent geologic period—volcanic forces that had long been quiescent vigorously reasserted themselves. Flows of rhyolite, a volcanic rock, pouring from many craters, filled valleys that were covered with gold-bearing gravel, deeply burying the gold and causing the formation of new stream courses.

The geologic events thus outlined long preceded the period of human history in which these metal deposits were mined. In 1849 an army of gold seekers invaded the Sierra. They worked first along the present streams, but gradually the metal was traced to the old Tertiary river beds on the summits of the ridges and to the quartz veins, the primary source of all the gold in the Sierra Nevada. Millions of dollars in gold were produced annually up to the seventies of the last century, but the gold-mining industry has slowly diminished, until now less than $1,000,000 is produced annually, the decline being due to the prohibition of hydraulic mining and the exhaustion of the richer channels suitable for drift mining.

The total output of gold in California is estimated at $1,200,000,000 to $1,500,000,000, about one fifth of which has been derived from quartz veins, $300,000,000 from the Tertiary gravels, and the remainder from the Quaternary deposits.

SPECIAL ARTICLES

ON THE DIFFERENTIAL EFFECT OF CERTAIN CALCIUM SALTS UPON THE RATE OF GROWTH OF THE TWO SEXES OF THE DOMESTIC FOWL[1]

IN connection with an extensive series of experiments on the effect of feeding various organ substances to growing chicks, which I have been carrying out during the past summer with the aid of Mr. W. T. Pettey, two groups were given small daily doses (Ca. 0.1 gm. to 0.3 gm.) of calcium lactate ($Ca(C_3H_5O_3)_2 + 5H_2O$) and calcium lactophosphate (a mixture of calcium lactate and calcium phosphate containing about 3 per cent. of the latter), respectively. The results were consistent, striking, and in certain particulars entirely new. A complete account of them, with detailed figures, will be published as soon as the material can be prepared for the press. In the meantime I wish to call attention, in a very brief way, to the essential features of the results. The most significant finding is that while neither of these calcium salts affects in any way, in the dosage used, the rate or amount of growth *in the male chicks*, both of them, but particularly the lactophosphate, induce a very marked increase in the absolute amount of growth and a corresponding acceleration in its rate *in the female chicks*. The dosage was begun when the birds were 29 days of age and continued until they were 171 days old, after which age there is comparatively little additional growth in the domestic fowl. At the end of this 142-day period the lactophosphate females had grown so much faster than the control females that there had been eliminated 58.4 per cent. of the normal difference between the sexes in respect to body weight (secondary sexual character). In spite of the rather large probable errors the absolute differences are statistically significant. Thus we have at 171 days of age:

Lactophosphate ♀♀ mean wt. — Control ♀♀ mean wt. $= 354.6 \pm 91.9$ gm.

The difference is 3.85 times its probable error.

The reproductive organs of the females were stimulated as well as growth. The rate of

[1] Papers from the Biological Laboratory of the Maine Agricultural Experiment Station, No. 104.

egg production per unit of time in the lactophosphate females is nearly 5 times as great as in the controls.

A further point of interest is that if a very small dose of corpus luteum substance[2] be administered to the birds each day along with the calcium lactophosphate the stimulating effect of the latter upon the growth of the females is completely inhibited.

It has been known that the internal secretions of certain organs might have a different effect upon the growth of males and females, and indeed in the present series of experiments we have seen such a differential effect following the feeding of several different gland substances. It is another thing, however, to find inorganic salts exercising such a differential effect. It furnishes one more piece of evidence of the deep-seated biochemical differences which underlie sex differences, and at the same time is in line with the medical evidence as to the great importance of calcium in the physiology of the reproductive organs of the female.

Raymond Pearl

October 31, 1916

THE PRESENT STATUS OF THE DOLOMITE PROBLEM[1]

The problem of the origin of the dolomites and dolomitic limestones has long occupied the minds of geologists and many theories have been advanced for their formation. But no one of these has been universally accepted. The chief theories which have been proposed are briefly as follows: First, the alteration theories which assume that dolomites have been formed by the partial replacement of limestones by magnesia either (1) before they emerged from the sea, through the agency of sea-water, or (2) subsequent to their emergence through the agency of ground-water. Second, the primary deposition theories which maintain that the dolomites were originally deposited in the form that they now appear, (1) by chemical precipitation from the sea, or (2) by the deposition of clastic grains of dolomite derived from the disintegration of older dolomitic limestones. Third, the leaching theories which are based on the well-known fact that during the weathering of a dolomitic limestone the lime is removed more rapidly than the magnesia, thereby causing an enrichment of the latter constituent. This leaching is supposed to take place either (1) through the agency of sea-water prior to emergence, or (2) through the agency of atmospheric water after the limestone has become a part of the land.

The marine alteration theory is by far the most widely held to-day, but the chemical precipitation theory has many champions.

The writer was led to suspect several years ago, that a careful field study of dolomitic formations would throw some light upon their origin and through the aid of the Iowa Geological Survey and an appropriation from the Esther Herrman Research Fund of the New York Academy of Sciences he has been able to examine nearly all of the important dolomites of the Mississippi Valley and the eastern United States.

These studies have furnished irrefutable evidence that the majority of the dolomites examined have resulted from the alteration of limestone. The following facts support this contention: (1) the lateral gradation of beds of dolomite into limestone, sometimes very abruptly; (2) the mottling of limestones on the border of dolomite masses by irregular patches of dolomite; (3) the existence of remnants of unaltered limestone in dolomite, and of nests of dolomite in limestone; (4) the irregular boundaries between certain beds of limestone and dolomite; (5) the presence of altered oolites in some dolomites; (6) the protective effect of shale beds; and (7) the partial obliteration of original structures and textures in many dolomites and dolomitic limestones.

Concerning the conditions under which the dolomitization took place there are many reasons for believing that the more extensive dolomites have all been formed beneath the sea prior to or contemporaneously with recrystallization and that the dolomitiza-

[2] A material which I have earlier shown (*Jour. Biol. Chem.*, Vol. XXIV., pp. 123–135, 1916) to have a retarding or inhibiting effect upon the growth of the chick.

[1] A more complete report on the origin of dolomite will appear in Vol. XXV. of the Iowa Geological Survey, which is now in press.