THE MINERALOGICAL MAGAZINE

AND

JOURNAL

OF THE

MINERALOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND

No. 14. OCTOBER, 1879. Vol. III.

XII.—*On the cause of the production of different secondary forms of crystals.*

By H. C. Sorby, LL.D., F.R.S.; President G.S., &c.

IT has often struck me that much more might be learned from the study of the secondary forms of crystalline minerals than we now know respecting the circumstances under which they were produced. Some years ago being chiefly acquainted with calcite as it occurs in Derbyshire, where the crystals are usually of the so-called dog-tooth shape, my attention was much attracted by the difference in the form of the crystals in Devonshire and Cornwall, where we so often meet with six-sided prisms. On reflecting on this difference I could not give any more satisfactory explanation than that the conditions under which they were formed must have been very different in some important particular. Various experiments, made both before and afterwards, sufficed to indicate at all events some of the possible causes of such a difference in the form of this mineral, but at the same time showed clearly that much special research would be required before we could draw such definite conclusions as could be desired. I feel that the facts I now propose to describe are very imperfect, but yet for a long time have wished to say something about them, if only to lead others to work out the subject more completely.

My first experiments were made with carbonate of lime. I prepared aqueous solutions of this substance in carbonic acid, and evaporated them at various slightly different temperatures. I also evaporated in a similar manner solutions containing in addition to carbonate of lime, small quantities of the carbonates of iron and of magnesia. It soon became apparent that the number of varying forms that could thus be prepared was very great, but I did not not continue the experiments sufficiently to enable me to draw any complete detailed conclusions. I however convinced myself that small differences in temperature, and the presence of small quantities of foreign substances were sufficient to give rise to very varying secondary forms in the crystals, and not only so, but that the conditions under which they were formed—for example whether at the surface or at the bottom—had also an important influence. Some of the results had a direct bearing on mineralogy, and sufficed to explain the cause of the production of certain characteristic crystals. Thus, for instance, the presence of a small quantity of magnesia, gave rise to crystals of the rhombohedral shape, so commonly met with in limestones containing much magnesia.

Some time after this I was engaged in studying the fluid cavities met in chloride of potassium, and for this purpose prepared many crystals by slow spontaneous evaporation. At first I obtained some solid, partially transparent cubic crystals, very suitable for my purpose, but afterwards, when using the same material, I was unable to obtain more crystals of the same character, which I was very anxious to do. On the contrary every time that I prepared a fresh crop, I obtained crystals differing not only from those first made, but also from one another, all of which I carefully preserved, until I had got a most instructive collection. The only explanation I could give of the facts was that during the time when I was making these experiments the temperature of the atmosphere had slowly changed, and that the production of all the various forms of the crystals obtained had depended upon a comparatively small variation in the temperature.

In preparing for microscopical purposes crystals of other substances, I have in some cases remarked no such tendency to vary, but in other cases have been completely unable to procure a second time crystals of a particular character. Thus, for example, I was once able to make some excellent thin, flat, rhombic plates of chlorate of potash, coloured with permanganate, and being most excellent spectroscope objects I was anxious to procure more of them. I endeavoured to do so over and over again, and though I prepared many hundred crystals, I could never obtain any more of the same plate-like character, nor could ascertain what had been the peculiar conditions under which they had been formed.

I cannot doubt that such facts as these must have been often noticed before, though they may not have attracted such particular attention. I cannot but think that good service might be done to the science of mineralogy by anyone who would adequately devote his attention to this kind of enquiry. The facts which I have described are so limited in their range that I feel almost ashamed to draw attention to them, but yet I think they serve to prove very clearly that, independent of the rate of deposition, comparatively small difference in the temperature of the water, and the presence of small quantities of other substances, may cause such a marked difference in the general form and character of the crystals of a substance deposited from it, as would serve well enough to explain the production of the varying secondary forms of natural minerals. Possibly this will readily be admitted, but a much more difficult question then arises, which is to correlate the known secondary forms with the unknown conditions under which they were produced. If this could be done, it would, I doubt not, be a great gain for geology, and would throw much light on many interesting questions. I see no reason why we should not learn as much from the detailed study of minerals as we have learned from the detailed study of fossil organisms.