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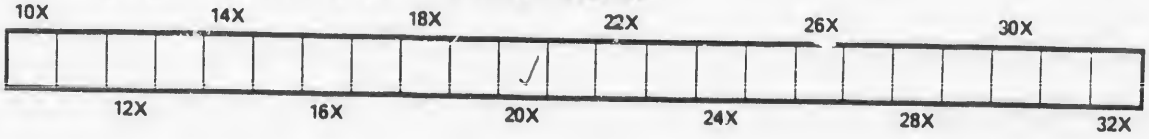
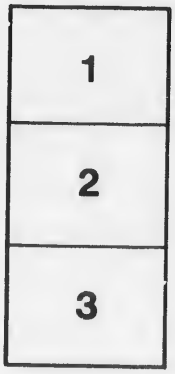




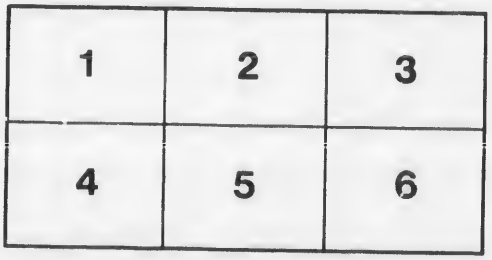
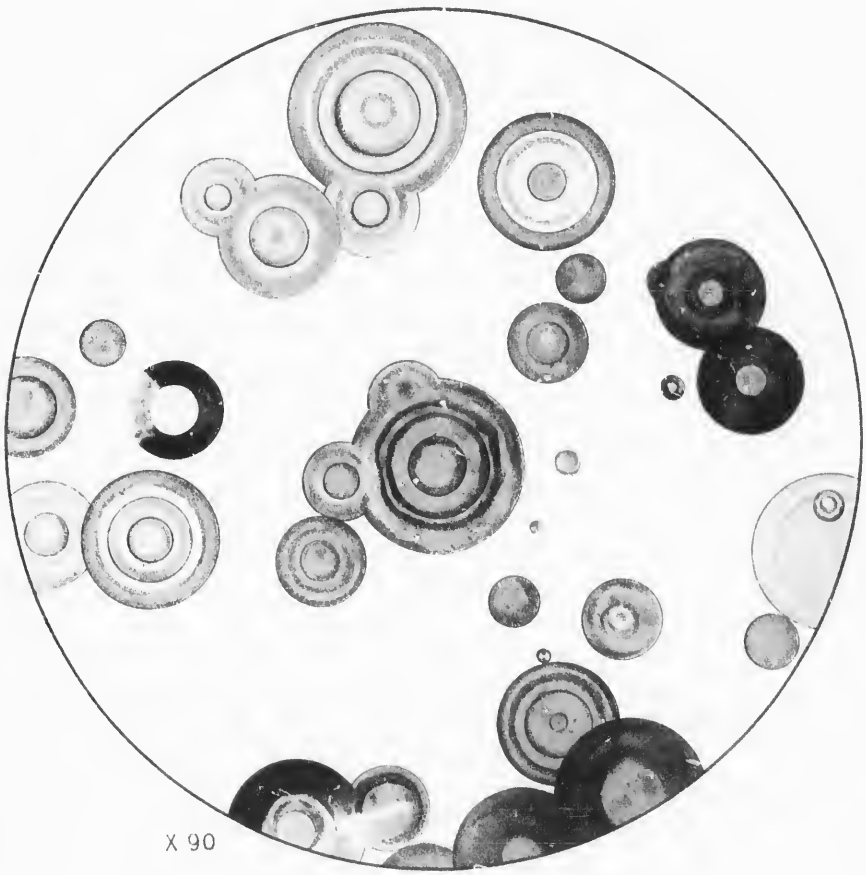


PLATE XIX.

SPOTS OF IRON OXIDE ON AMETHYST.



X 90

Mc Farlane & Erskine. Lith^rs Edin^r

ON AN

UNDESCRIBED VARIETY OF AMETHYST.

By Professor DUNS, D.D.

Read before the Royal Physical Society 21st April 1880.

The place of the amethyst in systematic mineralogy, its chemical constituents, crystallographic form, the characters of the species of which it is a variety, its colour, geognostic situations, and geographic distribution are so well known, as scarcely to call for remark. There is still some difference of opinion as to it constituents, traceable no doubt to the fact, that these are not constant, but vary in different specimens. Rose's analysis, which is that most generally received, is as follows: silica 97·50, alumina 0·75, iron oxide and traces of manganese 0·75. In a Brazilian specimen, Heintz (quoted by Dana) found traces of magnesia and soda, whose presence he thinks accounts for the characteristic colour of this mineral. Others hold this to be due to a small percentage of oxide of manganese. Amethyst occurs in veins, or lining the oft-described agate balls. "Crystals within the geodes or hollow agate balls are very often of an amethyst colour, and some are very fine" (Cronstedt's "Mineralogy," vol. i., p. 151, 1788). I am able to show to the Society, a very beautiful group of pure amethyst crystals in an agate ball from Saxony. The gem known as oriental amethyst is spinel or *dodecahedral corundum*, a widely different mineral with an amethystine hue. The constituents of spinel are alumina

74·50, silica 15·56, magnesia 8·25, oxide of iron 1·56, lime 0·75.

The variety of amethyst which forms the subject of this notice was presented to me, without any reference whatever to its scientific interest, but simply as an ornamental stone, by the Rev. Dr Paterson, New Glasgow, Nova Scotia, who had obtained it at Prince Arthur's Landing, on the north shore of Lake Superior, in August 1878. Looking at it with a good lens I remarked to Dr Paterson, the specimen is altogether unlike any I have seen. The dark red crystalline substance on the faces of the hexagonal pyramids is not deposited in a homogeneous layer, but seems to consist of innumerable spots, I should say of iron oxide. As the donor thought it must have been described, I consulted most of the leading authorities, without, however, finding any reference to this variety. In a note dated August 2, 1879, Dr Paterson says, "I find that the amethyst from Lake Superior has been analysed by Sterry Hunt of the Canadian Geological Survey, who discovered the colouring matter to be oxide of iron *before you*." On being asked for a reference, he informed me in a subsequent note, that having failed to find it, he had written to Principal Dawson, Montreal, for information. Principal Dawson, writing in the absence of Dr Hunt from town, on November 5, 1879, says—"I write now merely to state what I know as to the matter referred to. The ferruginous coating which you mention is very common on crystals of amethyst from Thunder Bay, and seems to have been simply the latest coat of quartz deposited on the crystals, and containing peroxide of iron in little rounded hollow concretions with radiating spicules. This mode of arrangement of oxide of iron is not unusual in reddish agates from Nova Scotia and elsewhere, though with various modifications in detail. I am not aware that it has been particularly described, nor that any special cause of it is known further than the general one of molecular and crystalline aggregation, which has to do duty in the explanation of an infinity of curious forms in agates and other forms of quartz. I cannot find that Dr Hunt has published any particular account of the peculiar appearance in the Thunder Bay

amethysts." A thin slice prepared for the microscope, and magnified ninety diameters, presented an appearance well shown in the somewhat coarse, but highly characteristic plate which accompanies this notice. At my request Professor Crum Brown kindly took charge of a fragment which he entrusted to Dr Gibson for analysis, who reported on the specimen as follows:

"University of Edinburgh, *March 27th*, 1879.

"*Report upon Crystal of Amethyst Quartz.*

"A qualitative examination was made with a view to determine the nature of the red colouring matter deposited underneath the surface of the crystal. The result of this examination showed the presence of iron, and the absence of copper and other heavy metals. Ferric oxide being of very common occurrence in quartz, there is no reason to doubt that it is the red colouring matter in the crystal examined.

"J. GIBSON, Ph.D."

My first impressions as to the colouring matter of the six-sided crystals of this specimen were thus verified. It might, however, be well to carry the analysis farther by testing for soda, magnesia, or manganese, having previously marked the degree of intensity of the violet blue colour of the specimen. But, apart from this, it will be seen from the pieces in the lump and in section now exhibited, that they are made up as follows: The base on which the crystals rest is a thin layer of fine vesicular trap. Above this is a mass of highly crystalline semi-transparent quartz, about an inch in thickness, thickly packed but yet showing the planes of the crystals less or more well marked, and, on the top of this a thin layer, of granular-like amorphous quartz, out of which the definitely crystallised amethyst proper seems to rise. This may or may not be generally the order of the layers, but in the specimens now before us it is well marked. The dirty red colouring matter is confined to the faces of the hexagonal pyramids—the characteristic crystalline forms of quartz—and is, for the most part, deposited in pretty separate *annuli*, ring within ring. In the specimens now under notice I have not seen any traces

of the "radiating spicules," referred to by Dr Dawson. Nor are the rings on the same plane. When examined through a good binocular they are seen to lie at different levels, a fact which seems to warrant the inference that the highly crystalline glaze, so to speak, in which they lie, consists of different layers. The spots are not in all cases perfectly circular, as may be seen by referring to the accompanying plate. It would not be profitable to speculate on the probable explanation of those molecular aggregations. I may, however, ask the Society to look at the so-called *morpholites* or clay concretions, and the dolomites from Cumberland, now on the table, as illustrating, on a large scale indeed, in a somewhat striking way, the close resemblance between them in point of form and the spots figured on the plate. This resemblance suggests a topic of great interest and of which little has yet been made. I refer to the analogies between the power of concretion and that of crystallisation. But I do not wish to make more of this resemblance than to indicate the fact. The crystalline matrix in which the spots occur has, for want of a better term, been called a glaze. Is the presence of this necessary in order to the iron oxide arranging itself in such spots? In the New College Museum is a large lump of rock crystal, on which the faces of the six-sided pyramid are covered with a layer of iron oxide, lying wholly on the surface, in the form of rough amorphous particles, and destitute of this glaze.

As I have been unable to find any published description of this variety of amethyst, and as it presents some features of considerable interest, I have thought it not unworthy the attention of the Society. The plate is an attempt to reproduce, in a rough way, the colours and the forms of some of the spots shown in the section, exhibited to the Society under the microscope.

M'Farlane & Erskine, Printers, Edinburgh.