Note on the colours of some alluvial Diamonds.

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IN 1906 the present writer gave a brief account[1] of the interesting alluvial diamond field which is situated on the borders of the Somabula Forest in Southern Rhodesia. The area is not of very great economic importance, but it has nevertheless yielded to date about 10,500 carats of diamonds (valued at over £45,000). These are extracted from thick beds of gravel which, as described in the paper referred to, generally consist of well-rounded pebbles in a matrix of sandy clay.

The diamonds themselves are almost invariably of a green shade in the rough state, though it may be as well to mention, before going on farther, that this colour is entirely lost[2] in the course of the usual process of cutting and polishing to fit them for use in jewellery. The writer did not at first attach any particular significance to this last fact, or indeed to the colour itself, except as a peculiar characteristic of the locality. When, however, a rather rich patch of gravel was opened up which yielded some forty or fifty colourless or almost colourless stones and no strongly coloured ones at all, the question was rendered of greater interest. It was evident that whatever sorting process had been at work during the deposition of the diamonds among the other constituents of the gravel, colour could not have been the determining factor in their distribution. Moreover, when another section of the workings was entered upon a certain number of yellowish and brownish stones were found. A little consideration showed that there seemed to be a definite relation between the colour of the diamonds and the character of the matrix in which they were embedded, and this idea gained considerable confirmation from the fact that several diggers at work on the Ngamo section of the gravels, some ten miles away from the main Somabula workings, independently volunteered a similar statement about the area in which they were at work.

[1] F. P. Mennell, Geol. Mag., 1906, pp. 459–462.

[2] The colours when cut are those known as 'blue-white', 'Cape-white', &c.

The ordinary run of stones come from gravel in which the matrix is a sandy clay containing a very small amount of iron oxides, and their colour, which ranges from a mere tinge of green to a dirty deep green like that of an ordinary beer-bottle, would seem to be due to the impregnation of a thin surface layer of the crystals by ferrous salts. The uncoloured diamonds came from a working in which the finer material of the gravel consisted almost entirely of a very pure clay, nearly white in colour, and capped by a seam or 'false bottom' of pinkish clay, which would obviously tend to prevent any downward percolation of iron-bearing solutions. The yellowish and brownish stones were not found until the extraction of a certain amount of gravel strongly impregnated with iron oxides and sometimes assuming an almost lateritic character. Some of the stones (both brown and green) that were examined[1] showed cracks, and along these, as might have been expected, the colouring matter had obviously permeated to a much greater extent than elsewhere, so much so as to give them the appearance of being spotted with small inclusions.

It may be emphasized here that although the colour is entirely lost during cutting operations, which involve the complete removal of the natural surface of the stones, it is certainly not due to a mere coating or incrustation upon them. No effect is produced on the rough stones by the prolonged immersion in hydrofluoric acid to which they are subjected for cleaning purposes. Moreover, during some experiments in mechanical separation by means of a fused mixture of potassium and lead nitrates the colour also remained quite unaffected, although fears were originally entertained that the stones might be completely destroyed.

The permeation of colouring matter even for a very small distance into such a hard and compact substance as the diamond may perhaps seem almost incredible, and it may further be objected to the suggestion here put forward, that the diamonds from the Vaal river and other South African alluvial diggings seldom or never show any similar coloration. This is a fact which must certainly be faced, though it may be pointed out that the Somabula gravels are undoubtedly much older than even the high-level gravels of the Vaal, as they are quite unconnected with any present-day river system. The length of time which the diamonds have lain in the gravels may well be an important factor in the problem. It is very interesting in this connexion that the diamonds which have several times been recorded from the ancient (Archaean)

[1] All the diamonds extracted during several years' work on the field were seen by the writer.

conglomerates known popularly as 'banket', both at Johannesburg and near Klerksdorp in the Transvaal, were all green in colour. I have personally seen several specimens and can testify to their close resemblance to the darker Somabula stones. They differ, however, in the very important respect that they remain of a fine green shade when cut. The time factor may well therefore come into play.

Though green stones are extremely rare in the other South African alluvial deposits, such a colour is not unknown either in India or in Brazil. In the former country such stones are known as 'banspat' or 'bamboo-leaf' diamonds, and are very highly prized by the native princes and other wealthy persons. They are mounted and worn in the rough state owing to the loss of colour on cutting. In Brazil green stones are uncommon. They favour certain special localities as a rule[1] and are noteworthy owing to the fact that, though their colour is, as usual, superficial, they are, when cut, the finest stones known in the trade.

It is of interest to note that Sir William Crookes[2] has succeeded in colouring diamonds by means of radium. This colouring is also superficial, being due to the α-rays, which penetrate to the same extent as in the formation of a pleochroic halo in a mineral like mica.[3] It is unlikely that radio-active processes have any influence in colouring the stones already described, though I much regret that owing to the fact that I do not now possess any specimens, I have been unable to put the matter to the test of experiment.

In spite of all the objections which readily occur to one, it still seems at least a good working hypothesis that the coloration of the green diamonds found in alluvial deposits is due to infiltration from without (presumably of iron compounds) after the stones were deposited in the gravels where they are now found.[4]

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[1] See, for instance, F. H. Hatch, Proc. Cambridge Phil. Soc., 1913, vol. xvii, p. 68.

[2] Sir W. Crookes, Proc. Roy. Soc., London, 1904, vol. lxxiv, p. 47.

[3] Sir W. Crookes, Phil. Trans. Roy. Soc., 1914, ser. A, vol. ccxiv, p. 436.

[4] It is, of course, assumed that they were originally derived from ultrabasic rocks, as in all cases where they have been found *in situ*.