necessity of investigating the physiological action of poisons on locusts, in order to find possible substitutes for arsenical compounds, which have certain disadvantages.

Apart from the very fruitful discussions during the meetings, the Conference provided a unique opportunity for entomologists of various countries engaged in locust research for the personal exchange of experiences and ideas. These informal discussions occupied all the intervals between meetings, and their value for those working of necessity for years in the wilds of Africa must be very great.

The Conference demonstrated very fully that the international investigations on the locust problem are following the only possible way to its solution. The value of international co-operation in this work has now become so obvious, that it was decided to make the next Conference still more comprehensive. Accordingly, it was suggested that the Egyptian Government, which has invited the Fourth Conference to meet at Cairo in 1936, should be asked to extend the invitation to all the countries of the world suffering from locust invasions. The Fourth Conference will, therefore, mark a new period in the international attack on the locust problem. B. P. UVAROV.

Two Types of Diamond

SIR ROBERT ROBERTSON'S recently published résumé of his researches on the two types of diamond* is one of the most fascinating detective stories of modern science. It has the advantage that though the circumstances of the crime are laid bare step by step, the real criminal escapes, to be dealt with, we hope, in the sequel.

The diamond has been studied for longer than any other natural stone, and its unique character had always been taken for granted. But it has been left for Sir Robert Robertson to discover that there are two types of diamond fundamentally different in many important respects.

The original observation was that one of the diamonds he had obtained from Prof. W. T. Gordon differed from all the others by not possessing the characteristic infra-red absorption of diamond at 8 μ. Abnormalities in the absorption of diamond had been noted before, in one case by Miller so far back as 1862, but their significance had not been realised. Sir Robert, however, with his collaborators, Dr. J. J. Fox and Dr. A. E. Martin, proceeded to examine many of the physical properties of diamonds and showed that the absence of the 8 μ band was completely correlated to striking differences in a number of physical properties, while in many other properties no differences whatever could be observed.

The characteristic differences are shown in the accompanying table taken from the paper. In electron diffraction, Raman spectrum, triboluminescence, dielectric constant, refractive index, colour and specific gravity, no differences were observable. There is no doubt that structurally both types of diamond are substantially alike. The observed differences are, on one hand, those affecting reaction with radiation, that is to say, electronic; and on the other, refer to the perfection of the crystal texture, crystals of Type 2 showing by their lamination and small primary extinction of X-rays that they are of a more marked mosaic pattern than those of Type 1. The two types of difference would appear to be closely correlated, but at first sight in a most unexpected way, because from the electronic point of view crystals of Type 2 would seem more perfect than those of Type 1, while from the textural point of view the reverse would appear the case. On the whole, however, the rarer type of diamond, Type 2, seems to be the normal type, as its properties agree more closely with prediction. The 8 μ band should be an inactive one and no compound containing only carbon single valency bonds should have ultra-violet absorption higher than c. 2200 A. The presence of an 8 μ absorption and complete absorption at 3000 A. in Type 1 diamonds suggests strongly the effects of an abnormality similar to that produced by strain or impurity.

	Type 1.	Type 2.
Occurrence . . .	The common type	Rarer.
Form	Derivatives of cubic system	Derivatives of cubic system, but with fine parallel laminations.
Isotropy	Considerable anisotropy between crossed nicols	Nearly isotropic.
Infra-red absorption-persisting at −170° C.	At 3, 4·1, 4·8 and 8 μ	At 3, 4·1 and 4·8μ No band at 8 μ.
Ultra-violet absorption	Not complete until 3000 λ; sequences of bands near this W.L. increasing in intensity down to − 170° C.	Not complete until 2250 λ. Faint absorption and diffuse bands near this W.L., disappearing at − 100° C.
Photo-electric conductivity . .	Small with even high voltages	Present with small voltages or none.
X-ray pattern . .	Normal. Ratio of intensity of 111/222 usually small	Normal. Ratio of intensity of 111/222 usually large.

The Type 2 diamonds in any event show properties of the greatest physical significance. The most fascinating are the photoelectric properties not shown in Type 1 owing to the heavy absorption in the activating region. Here the work of Gudden and Pohl has been confirmed and extended.

There are three types of reaction of diamonds of Type 2 to light of different wave-lengths. For

* "Two Types of Diamond." By Sir Robert Robertson, Dr. J. J. Fox and Dr. A. E. Martin. *Phil. Trans.*, A, 232, 463; 1934.

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wave-lengths 2000–2400 A. (optimum 2300 A.) a normal photoelectric response is produced, but the diamond after illumination at this wave-length is left in a peculiar condition—photo-electrically activated. For a time after exposure a current is given even in the dark, but this decays with time to a constant value. Even after some days, however, much larger currents can still be obtained by illuminating with red light (optimum 5850 A.) and this current lasts as long as the light is maintained. Light of intermediate wave-length, 2400–5000 A., however, though itself producing a simple photoelectric effect on an inactivated diamond, destroys in one already activated both the dark current and the capacity for restimulation return to their ground state when disturbed by light of intermediate wave-length—deactivation.

In the general problem of the differences of the two types of diamond, Sir Robert is able to put forward a partial solution. Correlations can be found between the inactive 8 μ band and the ultra-violet band system observed in diamonds of Type 1 at low temperatures. This leads to the hypothesis that the strain to which these diamonds are subjected (shown by their strain bands between crossed nicols) allows atomic and electronic frequencies, otherwise forbidden, to be effective in absorption. How this occurs is not clear; but then we know practically nothing of the atomic conditions produced by strain in crystals.

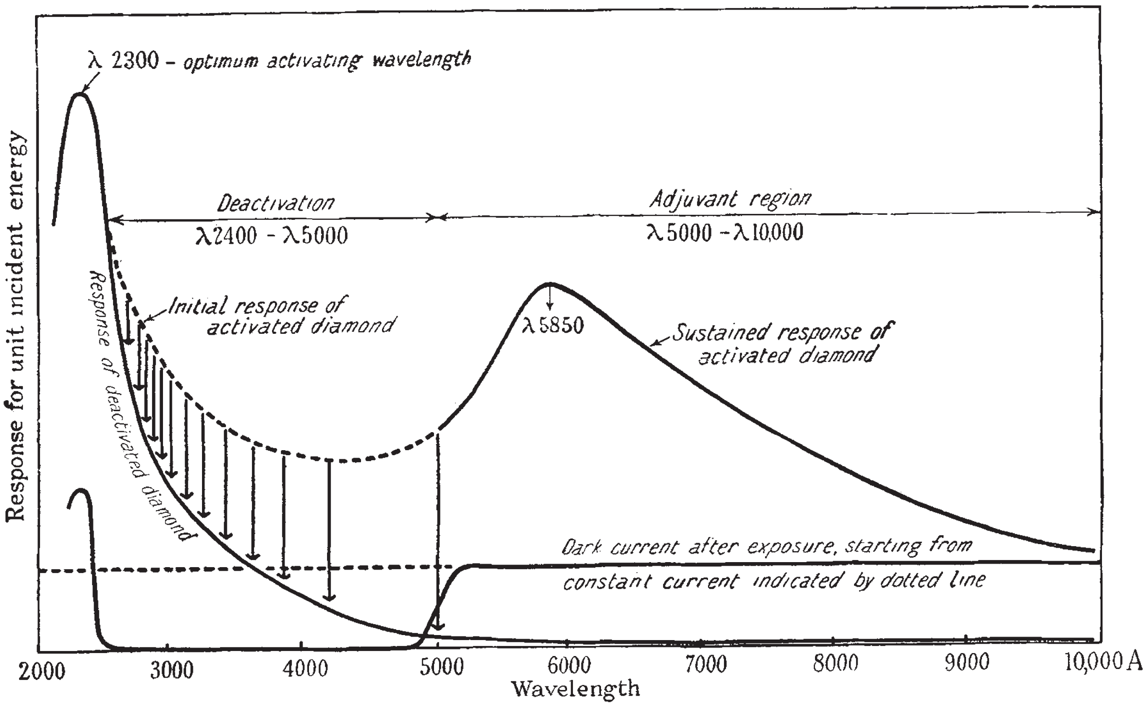

FIG. 1. Diagram showing effects of radiation on diamonds of Type 2, indicating activation, deactivation, adjuvant effect and dark current.

by red light. The general nature of the phenomenon is shown in Fig. 1 reproduced by permission of Sir Robert Robertson from the recent paper by Sir Robert and his collaborators.

A further remarkable feature of some diamonds of Type 2 is the production of currents without applied voltages. On illumination with activating light, certain parts of the diamond acquire positive, others negative, polarity and yield currents indefinitely as long as the illumination continues.

The explanation of these complex phenomena is still somewhat obscure. The activating light clearly is able to move some electrons to meta-stable levels where they have a certain limited mobility yielding a small dark current, and a much greater current when lifted to still higher levels by red light. They can, however, only

The differences brought out may have considerable geochemical implications and may help to throw light on the vexed question of the origin of the diamond. G. Friedel has shown that the strain bands of diamond are probably due to the fact that diamonds have passed through a transition point from another cubic form at 1855° C. (at atmospheric pressure). Now diamonds of Type 2 do not show these bands. Therefore, either they have been formed below the transition temperature, or, having passed through it, they have been able to recrystallise. This may have been assisted by the strain for which the evidence is shown by the slip planes of the Type 2 diamonds.

There is room for much further experiment and plenty already for the theorist to explain in the new chapter on crystals opened by Sir Robert Robertson.

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