February 10, 1881.

THE PRESIDENT in the Chair.

The Presents received were laid on the table, and thanks ordered for them.

The Right Hon. Mountstuart Elphinstone Grant Duff was admitted into the Society.

The following Papers were read:—

I. "On the Influence of the Molecular Grouping in Organic Bodies on their Absorption in the Infra-red Region of the Spectrum." By Captain W. DE W. ABNEY, R.E., F.R.S., and Lieutenant-Colonel FESTING, R.E. Received February 5, 1881.

(Abstract.)

The authors describe the apparatus used by them in their research and their plan of mapping the absorption spectra, the results being given in wave-lengths. The source of light for obtaining a continuous spectrum was the incandescent positive pole of an electric light, the electricity being generated by an M. Gramme machine. The light was passed through tubes containing the fluid, and the absorption spectra photographed in the infra-red region.

The absorptions they met with they class as follows:—

1st. General absorption at the least refrangible end of the spectrum.

Lines .. { Fuzzy.
Sharp.

Bands .. { Both edges sharply defined.
One edge sharply defined.
Both edges less sharply defined.

The authors next discuss the causes of the different absorptions met with in various fluids. From experiment they show that a large number of lines which are formed in hydrocarbons containing no oxygen are common to substances containing hydrogen and no carbon, and that in carbon tetrachloride and carbon disulphide, no lines or bands are to be met with. By this eliminating process they deduce the fact that the presence of lines is due to the hydrogen in the bodies.

They show that the termination of the bands in liquids containing carbon, hydrogen, and oxygen corresponds with the position of these hydrogen lines. It therefore appears to them that the bands are in reality a blocking out of radiation between two hydrogen lines. By increasing the thickness of the fluid in front of the slit, the bands may be widened to another hydrogen line, each hydrogen line acting as a stepping-stone, or they may remain constant if both edges are defined, or they may be obliterated by general absorption. On the other hand, lines may be spread out to bands as the thickness of liquid is increased. When the thickness of the fluid is diminished the lines may disappear, and the bands become lines, or the bands may remain constant though fainter.

The authors then point out that each radical has its own definite absorption in the infra-red, and that such a radical can be detected in a more complex body. It also seems possible that the hydrogen which is replaced may be distinguished by a comparison with other spectra. They next point out coincidences between some of the lines obtained, the absorption spectra of the hydrocarbons, and the spectra of bodies containing no carbon with solar lines, from which they reason that at present it is not safe to infer that such lines in the solar spectrum are not necessarily due to water. Whether the lines mapped are due to hydrogen or not, it is perfectly evident that every organic body has a definite absorption spectrum which connects it with some series. The paper closes with an appendix giving tables of the bands and lines found in the following substances, of which also there are maps :—

Methyl iodide.
Ethyl iodide.
Propyl iodide.
Amyl iodide.
Phenyl iodide.
Ethyl bromide.
Amyl bromide.
Methyl alcohol.
Ethyl alcohol.
Propyl alcohol.
Isopropyl alcohol.
Isobutyl alcohol.
Pseudobutyl alcohol.
Amyl alcohol.
Diethyl ether.
Amyl ether.
Ethyl nitrate.
Ethyl oxalate.
Ethyl sulphide.
Aldehyde.
Paraldehyde.
Formic acid.
Acetic acid.
Propionic acid.
Isobutyric acid.
Valerianic acid.
Glycerine.
Benzene.
Phenyl bromide.
Benzyl chloride.
Nitrobenzole.
Aniline.
Dimethyl aniline.
Turpentine.
Olive oil.
Acetoacetic ether.
Diethyl acetoacetic ether.
Benzylethyl ether.
Methyl salicylate.
Cinnamic alcohol.
Phenylpropyl alcohol.
Dibenzyl acetic ether.
Allyl alcohol.
Allyl sulphide.
Anethol.
Citraconic anhydride.
Water.
Nitric acid.
Hydrochloric acid.
Sulphuric acid.
Ammonia.
Chloroform.