The Science of Optics in the Service of Chemistry.

THE Indian Chemical Society held its ninth annual meeting at Patna on January 3, 1932, when Prof. B. K. Singh, the retiring President, delivered a very interesting address. Dr. Singh prefaced his address with a brief account of the origin and development of the Indian Chemical Society during the years 1924—1932. The increase in the number of fellows (from 101 to 360), subscribers, and exchange journals, the larger size of its own journal and the Society's general financial conditions all showed a steady progress. The Society conferred its honorary fellowship on two eminent scientists, Prof. A. Sommerfeld and Sir C. V. Raman and arrangements have been made to present to Sir P. C. Ray, in celebration of his 70th birthday, a commemoration volume with an address, as a token of esteem and love from the Society. The President concluded this part of the address with an appeal for funds for the permanent housing of the Society and the provision for a whole-time paid editor.

The main address was a lucid exposition of optical methods in the service of chemistry which contained an excellent summary of the Professor's own work carried out at Ravenshaw College, Cuttack, on the optical dispersion of organic compounds. Refraction, absorption and optical activity have been studied by chemists for over a century and have rendered signal service to the progress of chemical theory. During the early days of spectroscopic work, the interest of the chemist lay chiefly in the assignment of spectral lines to elements and compounds responsible for them. Bunsen, Kirchoff and Herschel were among the notable pioneer investigators in this field. The material to be examined is introduced into an arc or into a condensed spark and the spectrum photographed over the wave-length range 7000–2000 Å. Spectroscopic methods for quantitative analysis have been an attractive field of research by chemists since the days of Hartley in 1884. The most satisfactory methods in this field are due to de Gramont and Meggars who utilized the variation in intensities of spectral lines. The methods are of special value when estimating abnormally small quantities of material. The absorption curves of substances have been widely used in elucidating the structure of compounds. They form a very important source of information we possess on questions of structure.

Raman spectra, the most recent discovery, promise to provide more accurate knowledge of the structure of molecules than any other spectral method. On passing a beam of mono-chromatic light into a liquid and observing the scattered light, in addition to the simple line frequency present in the original beam, Raman found a number of very faint lines, the frequencies of which are related to the frequencies of vibration of atoms in the molecule which does the scattering. Raman spectra have been observed with gases, liquids, crystals, or glassy solids. One of the many interesting results arising out of the application of Raman spectrum is the detection of the inhomogeneity of hydrogen.

The phenomenon of optical activity depends upon the property which certain substances possess of imparting a twist to the plane of the polarization and was first discovered by Arago in 1811. Biot's pioneer work on the optically active organic compounds led to the discovery of molecular disymmetry by Pasteur. It was recognized by Biot quite early that optical dispersion is a more characteristic property of substances than optical rotatory power. He divided active substances into two types according as they obeyed the law of inverse squares or showed deviations from it, but it was not long before he began to suspect that his law was not rigorously exact. In 1898, Drude making use of the electronic theory of radiation expressed the variation of rotatory power with wave-length by means of the general formula $\alpha = \Sigma \frac{k_n}{\lambda^2 - \lambda_n^2}$. Lowry showed that these equations are adequate to determine the exact forms of the dispersion curves. He called the dispersion simple when one term of Drude's equation is sufficient and complex when two or more terms are employed. Drude's equation applies only to transparent media and not to absorption regions studied by Cotton in the region of the Cotton effect. The experimental determination of optical dispersion has been rendered easy by the introduction of new sources of light such as the enclosed mercury and cadmium arc lamps. For work in the ultra-violet region, the methods of Lowry and of Cotton and

Descamps are the most noteworthy. Lowry has also developed a method for the infra-red region, using a Nernst lamp to illuminate the infra-red spectrometer which carries a thermopile in its eyepiece. A large number of secondary alcohols, oxymethylene camphors and their condensation products with aromatic amine compounds show simple dispersion proving that the type of dispersion is independent of the number of asymmetric carbon atoms. The dispersion of camphor, monoacetyl *p*-phenylene-bis-amino camphor and other derivatives of camphor is complex and show the three characteristic anomalies—an inflection, a maximum and a reversal of sign. One more example of the importance of optical methods in chemistry is the recent announcement of Kuhn, Braun and Freudenberg of instances of successful asymmetric synthesis by application of circular dichroism. By exposing the ethereal solutions of racemic ethyl α-bromo-propianate and α-azido-propionic acid, to light λ=2800-3000 Å, optically active substances have been obtained. Though the range of activity obtained is small, the fundamental problem of asymmetric synthesis appears to have been solved in principle.

B. S.

Research Notes.

A Manometric Analysis of the Metabolism in Avian Ontogenesis.

J. NEEDHAM has determined by manometric methods (*Proc. Roy. Soc. Lond.*, Ser. B. **112**, No. 775) the normal respiratory quotient of the chick embryo in the first week of its development and finds that for the first two days the respiratory quotient is more than unity while from the second to the sixth day, it is nearly one. After the sixth day it tends to fall to 0·6. The action of certain reagents on the respiratory activity of the blastoderm, the embryo and the yolk-sac has been determined. It is found that flouride has an inhibiting action on the respiration of the embryo only in higher concentrations while the respiration of the yolk-sac and the blastoderm is affected even by lesser concentrations. The inhibition, however, is reversible, by addition of lactate. The action of iodoacetate is similar even with milder doses. Only partial inhibition without any change in the respiratory quotient is noticed with phenyl-methane. Malachite green and cyanide are comparatively very strong in their action.

The Solubility of Water in Granite Magmas.

THOSE interested in the study of the volatile constituents of magmas, which are known to play an important part in volcanology, ore-deposition and other igneous phenomena, will welcome the paper on "The solubility of water in Granite magmas"—recently published in the *American Journal of Science* (Dec. 1931). The author believes that many debatable problems of volcanology will be readily solved if we know how water dissolved in magmas behaves at different temperatures and pressures. A detailed account of the experimental work done in the investigation of this problem has been given in the paper and data are presented on the solubility of water in granite glass as a function of pressure from 500–4000 bars at 900°C. and as a function of temperature from 600°–1200° at 980 bars. Reasons are presented for considering the possibility that granite magmas may have had a relatively high water content.

Electro-Optics: Part Absorption in the Region of Soft X-Rays

[F. G. Chalklin and L. P. Chalklin, *Compt. Rend.*, 1932, 374.]

RAY has measured with $K\alpha$ (Cu), Ni $K\alpha$ some diffuse rays with lowering of frequency corresponding to the spectral terms of the absorbent.

Lines similar to those obtained by Ray have been obtained by Majumdar who employed monochromatic radiations $K\alpha$ (Ni), $K\beta$ $K\alpha$ (Fe) the absorbents being nitrogen, carbon and aluminium. Further Bhargava and Mukerjee by passing $K\alpha$ (Cu) through paraffin have obtained a diffuse line whose frequency is less than that of the incident radiation by $\Delta\nu$. R. This effect has been attributed to partial absorption of quantum by an atom of hydrogen from which an electron has been completely expelled. These savants by passing the $K\alpha$ (Ag) radiation through a foil of Ni have also observed a sharp discontinuity on the short wave-length side. The difference between the $K\alpha$ of silver and