

elongated shape and stand up vertically with respect to the retina at the very centre where they are most crowded together. In that region they are about a thousandth part of a millimetre in diameter. Their size increases as we proceed outwards from the centre towards the periphery of the fovea. The distance between adjoining cones widens as we proceed outwards from the fovea and becomes as much as three, four or even five thousandths of a millimetre towards the periphery of the retina.

These features of the retinal structure enable us to understand in general terms why the visual acuity diminishes rapidly as the optical image of external objects is shifted outwards from the very centre of the fovea to the peripheral regions. A significant feature in the organisation of the retina indicated by anatomical studies is that each cone in the retina apparently possesses a private channel of nerve fibres along which it can send its messages to the brain. Unless some such arrangement exists, it is difficult to understand how the confusion in our perceptions which would arise from a superposition of the messages arising from adjoining cones could be avoided.

The foregoing remarks leave the observed dependence of visual acuity on the strength of the illumination unexplained. Such dependence is of a quantitative nature and can be demonstrated with the same technique as that used by ophthalmologists for the examination of defective vision. A chart

containing rows of letters of progressively diminishing size is viewed by the observer from such a distance that the smallest letters can be read when the illumination is adequate. On progressively diminishing the illumination, one line after another becomes blurred and the letters in it cease to be observable. Precise measurements can be made using special forms of test object, as for example two black bars with a white bar between them, the three bars being of equal lengths and equal widths. If with such an arrangement, a grey bar instead of a white bar is set between two black bars, the visibility falls off even more rapidly with diminishing illumination.

The facts set forth above indicate that the dependence of acuity on illumination has a physical origin. Light consists of quanta or indivisible units of energy which can only be perceived when they are absorbed by the retinal receptors and the energy passed on to the visual cortex. The fact that our eyes can adapt themselves to very high levels of illumination indicates that in daylight vision, the retina is not capable of absorbing more than a very small percentage of the number of light quanta falling on it. If, in addition, the retinal illumination is itself of very low intensity, the number of quanta incident on the retina and actually absorbed by it may be insufficient to enable all the cones present in the illuminated area to function effectively and continuously all the time. When such a situation arises, a fall of the visual acuity is inevitable.

INDIAN ACADEMY OF SCIENCES: 29TH ANNUAL MEETING

THE Twenty-Ninth Annual Meeting of the Indian Academy of Sciences was held at Nagpur on the 20th, 21st and 22nd December 1963 under the auspices of the Nagpur University. Shrimati Vijayalakshmi Pandit, Governor of Maharashtra and Chancellor of the Nagpur University, inaugurated the session. Mr. Justice S. P. Kotval, Vice-Chancellor of Nagpur University, welcomed the Delegates. Sir C. V. Raman, Nobel Laureate and President of the Academy, delivered the Presidential

Address. The inaugural function was held in a specially erected and decorated spacious shamiana before a distinguished gathering of more than three thousand people which included Fellows of the Academy, Delegates, University and College professors, research workers and students. The three-day session included invited addresses, symposia and public lectures.

In her inaugural address Shrimati Vijayalakshmi Pandit called for utilising the achievements of science to the maximum benefits of

the common people. Mr. Justice Kotval in his welcome address pleaded for a judicious combination of research with teaching in our educational system. Sir C. V. Raman chose as the subject of his Presidential Address "The Physiology of Vision" in which he expounded his new findings on the quantum theory of vision. A summary of his address is given on page 1.

At the scientific meeting in Section A, in the forenoon of the second day, 21st December, over which Professor T. R. Seshadri presided, there were three invited addresses. In the opening address Prof. Seshadri spoke on "The Chemistry of Flower Colours". (A summary of this address will appear in an ensuing issue of *Current Science*.) The second invited address was by Dr. S. Bhagavantam who spoke on "Defects in Crystal Lattices" with special reference to crystals of ThO_2 impregnated with different amounts of CaO . In the third talk which was by Dr. K. G. Ramanathan on the "Basic Properties of the Metallic State", it was pointed out how the elucidation of the correct model of a metal is facilitated by the study of certain basic properties like the emission and absorption of radiation by metals, thermal conductivities of metals and superconductivity. Attempts to understand the superconductivity state in the language of classical physics enables us to postulate an ideal reflecting boundary with the help of which it will be possible to explain the basic properties in a simple qualitative way.

In the afternoon session of the second day there was a symposium on "X-rays and Crystal Structure". Dr. S. Ramaseshan opened the symposium with his address on "Some Procedures in the X-ray Crystal Structure Analysis". Using a working model Dr. Ramaseshan demonstrated the various properties of the Patterson function. He next dealt with the methods of recovering a structure if a molecule and its substituent do not form isomorphous crystals. The actual procedure consists of rotating the Pattersons of the two substances (crystallising in different space groups) about the origin and finding out the actual coincidences. The second talk was by Dr. R. Srinivasan on "Statistical Properties of X-ray Intensities". Mr. Anil Kumar Singh spoke on some instrumentation and structural investigations at low temperatures. Mr. S. Srinivasan spoke on electrical conductivity and the rotation of groups in crystals. The last talk of the symposium was by Dr. S. Swaminathan who presented his results on the X-ray crystal structure studies of potassium oxalate monohydrate and the crystal co-ordination of water.

There were two invited talks on "The Atmosphere of Planets". The first was by Dr. K. R. Ramanathan, Director, Physical Research Laboratory, Ahmedabad, who spoke on the optical properties of the planetary atmospheres, and the second was by Dr. M. K. Vainu Bappu, Director, Astrophysical Observatory, Kodaikanal, who spoke on the radio properties of the atmospheres of the planets.

On the third day of the session, 22nd December, the forenoon meeting in Section A started with an invited address by Dr. K. S. Viswanathan of the National Aeronautical Laboratory, Bangalore, on "Artificial Satellites". This was followed by a symposium on Spectroscopy over which Prof. R. K. Asundi presided. Opening the symposium Prof. Asundi spoke on the effect of neutron irradiation on the spectral characteristics of uranyl ion with special reference to caesium uranyl nitrate. This was followed by a talk on "A Possible Iodine-Argon Ultra-violet Maser" by Dr. P. Venkateswarlu. Dr. M. R. Padhye spoke on "Spectra of Aromatic Molecules in the Condensed State", and Dr. N. A. Narasimham gave the results of his latest investigations on the spectra of diatomic molecules.

The afternoon session was the scientific meeting under Section B over which Prof. T. S. Sadasivan presided. The first invited talk at this meeting was by Dr. E. S. Narayanan who presented his latest results on "Breeding Experiments for the Evolution of Superior Races of Silkworms".

The symposium on "Problems of Pathogenesis in Plant" opened with the address by Prof. Sadasivan on "Microbial Balance and Pathogenesis". This was followed by a talk by Dr. C. B. Sulochana on "Pathogenesis and Rhizosphere Microflora". Dr. R. Kalyanasundaram spoke on "Toxins and Pathogenesis" and Dr. R. S. Badami on "Inclusions under Virus Pathogenesis". At the University Botany Laboratory, Madras, many facets of the problems of soil-borne diseases and virus diseases of plants have been underway for the past more than a decade. The symposium covered some of the new ground emanating from these investigations. (A detailed account of the symposium will appear in *Current Science* shortly.)

There were two public lectures on the evenings of the second and the third days. The first lecture was by Dr. S. Ramaseshan on "March towards Absolute Zero". The second lecture on the concluding day of the session was by Sir C. V. Raman on "The Colours of Flowers".