incidence developed by Siegbahn at Upsala for a study of very soft X-rays is then described. The best sources of radiation for work in this region are then examined and it is shown that the Geissler tube possesses many advantages. The hollow cathode method developed by Paschen and Schüler is also very convenient for this purpose as well as for hyperfine structure work.

Coming next to hyperfine structure, its significance for a study of the nucleus and isotopic constitution is mentioned. The work of Hargreaves, Hill, Back and Goudsmit is discussed and in view of the paucity of the present data and the divergences between various workers, the necessity for much further investigation is pointed out. Details are then given of the systematic study of the arc spectra of Thallium and Indium and the spark spectra of Arsenic and Bromine by Dr. Narayan and Rao. The source was a cooled cathode arc of the type described by Venkatesachar and used by him in this line of work. The hyperfine structures were examined by means of quartz and glass Lummer plates and fused silica etalons. The results differed from those of McLennan and Crawford as regards the number of components and the existence of isotope shift in the lines 5351 and 3776 of Thallium. An extra component which has no place in the level scheme was also found in 3776. Results of an investigation of the hyperfine structure of the spark spectrum of Arsenic are also given and show deviations from those of Tolansky.

Touching next on the intensities of spectral lines, the rules governing the intensity relations in multiplets are alluded to and an attempt to compare these relations in emission spectra with those obtaining in the Solar spectrum using the lines of Nickel is then described. The results show that stronger lines appear relatively much stronger, in contradiction to the conclusion of Woolley that weaker lines appear relatively stronger.

Saha's theory of thermal ionization is discussed and its success in clearing up a number of problems in Astrophysics is pointed out. This leads then to the mechanism of the chromosphere and of the prominences on the sun's limb. Photographs of the prominences in K and Hα light were found by Royds to be nearly identical and this is shown to necessitate a revision of the present ideas of the mechanism of these prominences.

The problem presented by the green line in the spectrum of the Aurora and the Night Sky is then referred to and McLennan and Shrum's interpretation of it as due to a transition from the metastable $^1D_2$ to the $^1S_0$ state of oxygen and their production of the entire auroral spectrum by means of a discharge in a mixture of oxygen and the rare gases are described. The fact that whereas Lord Rayleigh and McLennan found that the intensity of the green line in the spectrum of the night sky reached a maximum about an hour after midnight, Ramanathan found it to be the reverse, is mentioned as likely to throw much light on the structure of the upper atmosphere in our latitudes.

Regarding the spectrum of nebulæ the interpretation of the lines 7325, 6584, 6548, 5007, 4959, 4363, 3726, 3729, as $^2D_{23} - ^2P_{12}$ (O II), $^3\bar{P}_2 - ^1D_2$ (N II), $^3\bar{P}_1 - ^1D_2$ (N III), $^3\bar{P}_2 - ^1D_2$ (O III), $^3\bar{P}_1 - ^1D_2$(O III), $^1D - ^1S_0$ (O III) $^4\bar{S}_2 - ^2D_3$(O II), $^4\bar{S}_2 - ^2D_2$ (O II) respectively, finds mention and Hopfield's production of the lines 6300 and 6364 is noted as the only successful attempt to produce nebular lines in the laboratory. The origin of the coronal lines is also yet obscure but a hope is expressed that it may be elucidated in the near future.

Next dealing with molecular spectra, Dr. Narayan notices the advances made during the last few years, the importance of the aid rendered by the study of the Raman Effect to a knowledge of molecular structure and the success of the new quantum mechanics in predicting the half integral numbers involved in band spectra, and the transition rules in molecular spectra.

The proof of the Boltzmann law of distribution of energy states from a study of the intensities of the Stokes and anti-Stokes lines in the Raman Effect is then dealt with. The initial qualitative results of Raman and Krishnan in CCl_4 and the later quantitative work of Ornstein and Rekveld are mentioned as providing a proof of the correctness of Boltzmann's law. The address concludes by referring to the work of K. R. Rao on the changes in the intensity of the Raman lines of electrolytes with increasing dilution, and that of Bhagavantam on the spin of the photon carried out in Raman's laboratory.

T. S. S.

MEDICAL AND VETERINARY RESEARCH:

IN the course of his address Lt.-Col. A. D. Stewart dwells first on the recent recognition of Preventive medicine as a branch of general science. He then proceeds to consider the place of Scientific medicine in human life.

"Medicine was first associated with religion which allowed of its rapid development in the earlier stages but stifled independent speculation and investigation and experiment. Later, medicine broke the bonds of doctrine and dogma; the names of Harvey, Koch, Manson, Ross and Ehrlich are some of the names associated with brilliant experimentation. But the real human touch and sympathy which brought medical science close to the human race was due to the combination of Harvey, the experimentalist, Chadwick, the legislator and Wesley, the humanitarian. Since then the boundaries of medical science have been tremendously widened. 'Man is a personality and an entity—the combination of body, mind and spirit.' The conception of health now is to envisage the full development of these powers, physical, mental and spiritual of which man is possessed. The development of our modern conception of public health is logical; care of the body first, then mind and then spirit."

"We are realizing now the importance of studying the mind. The Alderian doctrine of reaction to environment—occupational, social and sexual, has made us realize some of the problems of affection of the mind."

"Hygiene and other euthenic measures have prolonged the average length of life in many countries and it must be emphasized that the expectation of life does not merely mean that of body but also of mental powers. Medicine and science are beginning to make a profound appeal—aesthetic and religious—to thinking

people ; the care and the development of the spirit is for future of these sciences. Man is mortal, and he feels disappointed with the shortness of his existence. Goethe wrote very truly, 'The spectacle of nature is always new, for she is always renewing the spectators. Life is her most exquisite invention and death her expert contrivance to get plenty of Life.' The only real objection is to premature death, so distressingly common."

"To the question that the thinking man puts himself regarding the purpose of life, my own answer is that in the quest and appreciation of truth and beauty, in their largest sense and meaning, is the best answer to life's purpose,—the one that gives the greatest satisfaction. Einstein says, 'To ponder interminably over the reason for one's own existence or the meaning of life in general seems from an objective point of view to be mere folly : and yet everyone has ideals by which he guides his aspirations and judgment. The ideals which have always shown before me and fitted me with the joy of living are Goodness, Beauty and Truth.'

"Formal religion has not satisfied the thinking man, and for the pursuit of truth, we look to science ; but it is the poet who helps us most in our appreciation and search of the beautiful. Two medical men who later became poets, *i.e.*, John Keats and Robert Bridges have given the most notable contributions to the English language exemplifying the eternal principle of truth and beauty in life. Keats wrote, 'A thing of beauty is a joy for ever'; and 'Beauty is truth, truth beauty.' Bridges at the age of 86 wrote the 'Testament of Beauty'; he was a qualified doctor."

"Symbiosis and parasitism are two natural processes which have immense significance for the public health worker. True symbiosis is progressive, as it leads to the mutual aid. Parasitism is a degrading influence, injurious to the host, later possibly leading to death of the host. Parasitism is the chief obstacle in man's onward progress ; obliteration of human parasites in India will be for some time the main task of the public health worker. It may be possible for man at some future date by evolving his mind and personality so as to obtain control of the genes in his chromosomes to produce human beings with finer minds and better-built bodies, but this is for the future. The immediate task is abolition of parasitism."

"The instinct for desire for truth and beauty is inherent in everyone. the medical man has got great advantages as his profession leads him to study nature and man. Planck, the celebrated Physicist, considers that the study of nature fosters the two noblest of impulses of human mind—enthusiasm and reverence. Our strongest response to nature when we listen to the 'still sad music of humanity' is to awaken the sense of pity with human aspirations, human suffering and human needs."

"Pity is one of the strongest forces behind public health work and preventive medicine. It has, however, the defect of its qualities. Pity is of its nature combative, it may outrun discretion and reason, and have an un-reasoning contempt for consequences and counting of costs. It may engender a spirit of recklessness, impatience of opposition and even fanaticism and ruthlessness. The essence of pity is unselfishness and sacrifice and in the hygienist these are necessary qualities."

"The life of a medical man is one of curiosity and in some this may be extremely highly developed and the search for truth becomes a passion and a purpose. Research needs a natural urge and aptitude, a long apprenticeship in technique, untiring industry, the highest self-criticism and above all the passion for beauty."

"Another quality the public health worker needs is courage—courage born of belief and faith in one's work."

"Education, guidance and more co-operation between the public and the medical profession are some of the modern trends of public health. There is a growing feeling that in public health policy, too much compulsion is undesirable and should be kept rather for times of emergencies and extraordinary danger. Indifference, ignorance and conservatism and the idea that health is the affair of the sanitarian, are definite handicaps to the health workers."

"A free and honest discussion on the population problem on the following lines would help greatly : —

1. Are numbers alone the cause of general economical stress ?
2. How far the methods of population restriction alone be the cause of population adjustment ?
3. Should the State give facilities for instructing the public in methods of birth-control for :—
   (*a*) medical reasons ;
   (*b*) general economic reasons.
4. What would be the effects of (*b*) alone on the rural masses of India?

"The idea of population restriction seems to be based on the apprehension of the increase of the so-called lower classes or races and the desire for security is from the self-preserving instinct. We should remember our stability is but balance and conduct and lies in masterful administration of the unforeseen."

"I have indicated what I consider should be the attitude of the medical man and the public health worker towards the science and his work. A constant desire for truth, an appreciation of the beautiful and of the essential of the realities and unity of these two ; a spirit of sympathy and pity for the human race ; continuous assiduity in the alleviation and prevention of disease ; a belief in the possibility of upward progress of mankind through evolution controlled by intelligence, and in the application of the ideals of preventive and constructive medicine in the development of man's higher attributes, a spirit of conviction and courage in the face of difficulties."

C. V. N.

PSYCHOLOGY.

DR. GIRINDRASEKHAR BOSE, the pioneer of the psycho-analytical movement in India, has made a distinctive contribution to our understanding of the human mind, in the course of his Presidential Address to the Psychology Section of the Indian Science Congress, of 1933. Dr. Bose has given us a new theory of Mind which may be briefly referred to as the theory of the *Opposite Wish*.