Mycology and Plant Pathology, University of Madras, gave an address on "Immunoserology in Plant Pathology". The following papers were presented and discussed : (1) Electron Microscopy and Ultrastructure" by Prof. C. V. Subramanian, University of Madras ; (2) "Tea : Clonal Selection and Propagation" by Dr. K. S. Venkataramani, Director, United Planters' Association of South India ; (3) "Distribution of Oxygen in the Arabian Sea" and (4) "On the Occurrence of Oxygen Maxima and Minima in the Upper 500 Metres of the North-Western Indian Ocean" by Dr. R. Jayaraman, National Institute of Oceanography ; (5) "The Acetylcholine-Atropine Antagonism as Determined by a Series of pA Values" by Dr. M. B. Gharpure, Medical College, Aurangabad.

Two public lectures were delivered, the first on the 21st evening by Dr. S. Bhagavantam on "*Electronics and Its Applications*" and the second on the 22nd evening by Dr. M. S. Swaminathan, Director, Indian Agricultural Research Institute, New Delhi, on "Genetic Harvest of Our Biological Resources".

ABSTRACTS OF PAPERS PRESENTED AT THE XXXV ANNUAL MEETING OF THE INDIAN ACADEMY OF SCIENCES AT AURANGABAD, MARATHWADA UNIVERSITY, DECEMBER 20-22, 1969

Immunoserology in Plant Pathology

T. S. SADASIVAN
University Botany Laboratory, Madras

Although serology has played a notable part in bacteriology and virology, it has hardly been applied to the same extent in determining specificity in fungal pathogenic forms. Common antigens between host and parasite as a factor in resistance or susceptibility seems to be the objective to be achieved. In other words, disparity between the antigens constituting a resistance factor has to be explored in much detail as it constitutes an area in which much can be understood in host-parasite interactions.

The concept that response of the host towards immunity could be selective and have a bearing on fitness to survive of many parasitic species has had support in both animal and plant diseases. It has been shown, for instance, that the parasitic worm *Hæmonchus contortus* displayed less antigenic disparity towards sheep which is its natural host than with rabbit. None of the larval antisera derived from sheep reacted pith adult worm antigenic fractions and also none of the antisera from adult worms derived from sheep showed reaction with antigens from larvæ. Therefore, the lack of response of sheep to antigens common to adult and larval forms seemed to indicate that these antigens were also common to sheep and perhaps constitute "fitness characters". Turning to *Salmonella typhimurium* which had greater susceptibility in mice to infection as compared to rats, susceptibility was ascribed to inability of the susceptible host to produce 'anti-factors' against antigens of the parasite. The common antigen concept has been extended to animal viruses : turkeys resistant to Rous 1 virus could be made susceptible by treating in the embryonic stage with red blood cells of the chicken which is its natural host and, indeed, antigenic similarity between Rous 1 virus and the red blood cells of chicken has been established.

There is no certain evidence, of the type of immune responses mentioned above in plants infected by bacteria, fungi or viruses. However, the formation of abnormal substances in plants under pathogenesis has been shown in many diseases. Dealing with rusts, specific antigens in each of four races of *Melampsora lini* was shown to be shared by only those lines of flax that were susceptible to a particular race. Conversely, a race of rust was avirulent to flax lines that lacked the specific antigen. In these tests four lines of flax that differed from each other in a gene-controlling reaction to the rust were used. Study of antigens of cotton (*Gossypium hirsutum*) and *Xanthomonas malvacearum* showed that host specificity could be immunological in reaction. Similarly, host specificity has been noticed in sweet potato (*Ipomœa batatas*) against *Ceratocystis fimbriata* isolates which produces the black rot disease. These experiments with *C. fimbriata* indicated that an immune response may operate in plants and that a bridge between common antigens in a host and a parasite may provide a less hostile environment to the pathogen.

In plant viruses serology has mostly indicated group specificity and has aided in indicating common antigenic determinants pointing to grouping serotypes and strains. One such recent example is that the Indian legume virus isolate Dolichos enation mosaic virus (DEMV)

and the NDEMV strain which infects French beans (*Phaseolus vulgaris*) are serotypes of tobacco mosaic virus (TMV) as it is only remotely related serologically. However, DEMV and NDEMV produce a large proportion of virus particles shorter than 3000 Å which is the accepted length of TMV.

Our own work with strains of the cotton wilt pathogen *Fusarium vasinfectum* and the rice blast fungus *Pyricularia oryzæ* has brought interesting results. An American strain of *Fusarium vasinfectum* pathogenic to *Gossypium hirsutum* and an Indian strain pathogenic to *G. arboreum* were serologically identical. An Indian strain which had lost its pathogenicity lacked an antigen common to the two virulent strains but had an additional antigen. The host specificity of the two virulent strains could not, however, be explained on the basis of antigenic comparison. In *Pyricularia oryzæ* three of the four cultures (P1, A1, M1 and M2) were mutants. The virulent cultures P1 and A1 differed in their growth factor requirements, but were serologically identical. The avirulent cultures M1 and M2, although similar in their growth factor requirements to P1, showed differences in some of the antigenic constituents. However, both avirulent strains shared an additional antigen not present in the virulent ones. The avirulent M2 showed an extra specific antigen. Thus genetic differences between virulent and avirulent strains of *P. oryzæ* seem to be expressed in the protein synthesized by the fungi. Our results seem to point out to the fact that in both *F. vasinfectum* and *P. oryzæ* virulence and avirulence are reflected in antigenicity. However, differences in host specificity in the case of *F. vasinfectum* and nutritional requirements in *P. oryzæ* were not correlatable serologically.

Aspects of Computer Science and Technology

R. Narasimhan
T.I.F.R., Bombay-5

In this paper the problem of processing visually given data with the help of computers is considered in some depth. This is an application area of considerable practical importance. It is also of fundamental significance to behavioural studies. Thus, there could be two motivations for studying picture processing with the aid of computers. The first relates to our desire to use computers in much the same way as we use human technicians to process pictures in a variety of situations that arise in science and technology. The second motivation relates to our desire to use computers as simulation tools to imitate human perceptual and cognitive behaviour in relevant ways so as to enable us to construct testable theories. A specific computational approach to picture processing, called the descriptive approach, is developed in some detail. Recent work in this area is discussed. Several computer generated outputs using this approach are presented and their relevance to visual behaviour theory-construction is considered.

Electron Microscopy and Ultrastructure

C. V. Subramanian
Centre of Advanced Studies, Madras University

The development of the electron microscope and the remarkable improvement in techniques that have made possible the application of electron microscopy an extremely useful tool in studies on cell biology have been primarily responsible for some of the major breakthroughs in the biological sciences in recent years. It is hardly possible to cover in a single talk the many significant observations on ultrastructure that have been made by the technique of electron microscopy. Consideration is, therefore, limited to some problems of development and morphogenesis in certain fungi, *viz.*, the fungi imperfecti in which I have been interested for several years and in the elucidation of which electron microscopy has been and will continue to be indispensable.

Understanding of conidial ontogeny in the fungi imperfecti is basic to a proper analysis of conidial types, and current emphasis on conidial types and conidiophore behaviour as taxonomic criteria, therefore, imparts a special significance to critical studies on conidial ontogeny. A variety of conidial types are recognized by various authors, but the basic types seem to be only a few. Five conidial types (blastospore, gangliospore, porospore, phialospore, and arthrospore) were recognized by me (1965), based on studies with the ordinary light microscope. Observations with the ordinary light microscope alone are, however, inadequate for the purpose, and the more significant points emerging from recent studies at the ultrastructural level using both the transmission and scanning electron microscopes are summarized. Some analogies between sporogenesis and spore germination, especially in regard to relationship of walls or wall layers, are mentioned. A correct appraisal of the fine structure of cell walls/wall layers of conidiogenous cells and conidia, and of the structural continuity or

discontinuity of wall layers or walls between spores and spore mother cells, is the key for a proper definition of spore or conidial types. Continuity or discontinuity of walls or wall layers may be linked up with identity or differences in chemical composition, ultrastructural features and physical properties. Several techniques other than electron microscopy have necessarily to be used as further adjuncts to it and these are aimed at elucidation of the biochemical bases of morphogenesis in fungi through a better understanding of cell wall properties, cell wall composition, cell wall metabolism, cell wall differentiation, cell wall plasticizing and cell wall splitting enzymes, all of which are equally relevant to problems of morphogenesis of conidia. The impact of studies on ultrastructure on the interpretation and recognition of conidial types is discussed and the need for further intensive work on the problem is stressed.

Tea : Clonal Selection and Propagation

K. S. VENKATARAMANI
United Planters' Association of South India

Tea has been and is still a very important foreign exchange earner. Our tea industry now faces a real competition from other tea-growing countries, particularly Ceylon and East Africa. We have, therefore, to ensure that the quality and quantity of our produce do not fall short of standard and that, in fact, they do improve from good to better. Several factors may come to play in this but the use of the right kind of plant material alone in replanting and future plantings will have far-reaching consequences. Tea breeding has a great role to play, but breeding in the strict scientific sense and evolution of pure line races in the polymorphic species *Camellia sinensis* are time-consuming and beset with practical difficulties. Fortunately, a wealth of variation exists amongst the tea bush population in the existing plantations. Exploitation of such plant variability by careful selection for high yielding capacity, excellence of quality, and fair resistance to drought and some important pests and diseases, and vegetative propagation of the selected bushes would, therefore, appear to offer a ready means of developing improved planting material in this perennial beverage crop.

The work carried out during the past nine years in the Tea Scientific Department of the United Planters' Association of Southern India has shown that clonal selection is, indeed, a most rapid method of improving the planting stock in tea. Over 300 selections were made and after a careful study a dozen tea clones are now being released to the South Indian tea industry. Some of these selections have a high yield potentiality (about 3,000 kg. of made tea per hectare in five years from planting) and produce teas of excellent quality.

The study has also revealed a relationship between certain bush and shoot characters and yield and cup quality of teas made from these selections—orthotropic growth of shoots has a direct bearing on yield, and light colour of flush and pubescence of the leaves contribute to overall quality.

The technique of vegetative propagation employing 'a leaf and internode' cuttings has been standardised. The positive role of juvenility on rooting of tea cuttings has been established and, therefore, the importance of proper source of material for propagation purposes is stressed.

Differences are discerned in the chemical make-up of the various clones under investigation and attempts are being made to develop a chemotaxonomy of tea clones.

Acetylcholine-Atropine Antagonism as Determined by a Series of pA Values

M. B. GHARPURE
From the Medical College, Aurangabad

There is no agreement as regards the nature of the acetylcholine-atropine antagonism, that is whether it is competitive or 'not competitive'. An attempt was made previously by the author (1964) to settle this issue by determining the $pA_{5,001}$ and $pA_{25,001}$ values but the results did not indicate unequivocally that the antagonism is competitive. In the present work, six pA values, namely, pA_2, pA_{11}, pA_{101}, $pA_{1,001}$ $pA_{10,001}$ and $pA_{100,001}$ have been determined. Two more pA values, namely, $pA_{5,001}$ and $pA_{25,001}$ have also been determined. The results provide an overwhelming evidence to say that the acetylcholine-atropine antagonism is competitive. Why a compound like atropine which antagonizes acetylcholine competitively even at the level of its $pA_{10,001}$ - $pA_{100,001}$ values does not do so at the lower level of pA_2-pA_{10} (or pA_2-pA_{11}) values still remains an unsolved problem.

In the study of drug antagonism, such a large series of pA values and such high pA values for a pair of compounds have been determined for the first time by the author.

---

1. Gharpure, M. B., "The acetylcholine-atropine antagonism as determined by very high pA values," *Ind. Jour. Med. Res.*, 1964, 52, 104.