

(H₂) = 36118.0 cm⁻¹. He determined also the ionization potentials of H₂ and also of HD and D₂.

At NRC, there was an intense activity in the study of spectra of free radicals using different excitation methods including flash photolysis. Herzberg and Ramsay started the studies with NH₂ radical produced by photolysis of ammonia. The second free radical was HCO. Herzberg using flash photolysis of diazomethane, obtained the first (true) spectrum of CH₂ at 1415 Å. One may recall how the 4050 Å band observed in Comet Halley was later produced in the laboratory by Herzberg. He attributed it to CH₂; the emitter of the 4050 Å band was found to be C₃ by Douglas much later in 1954. In this connection, it is worthwhile to refer to another case of cometary spectrum (Kohoutek comet). Italian astronomers Benvenuti and Wurm photographed the spectrum of Kohoutek comet and while examining the spectrum, they could not identify certain features. On reference to Herzberg, they learnt that they belong to H₂O⁺, the spectrum of which was studied earlier by Herzberg and Hin Lew at NRC. Among the spectra of free radicals, Herzberg found it easier to obtain that of methyl radical rather than meth-

ylene. He did photograph the spectrum of CH₃ which has two diffuse peaks around 2160 Å. In the case of CD₃ he found a simple fine structure near 2144 Å. Herzberg gave an excellent account of his work on CH₃ and CH₂ in the Bakerian Lecture to the Royal Society of London.

Herzberg realized the importance of H₃⁺ in interstellar chemistry. So he decided to look for it in emission while his colleague T. Oka in absorption. Oka did obtain its absorption spectrum while Herzberg obtained a spectrum due to H₃ in Rydberg states.

Herzberg wrote excellent books on atomic and molecular spectroscopy. He published the German edition of *Atomic Spectra and Atomic Structure* and with the help of John Spinks he could submit the English translation of this book to Prentice-Hall by the end of 1936. His three volumes on molecular spectra are all time classics: Vol. I, *Spectra of Diatomic Molecules* (1939), Vol. II, *Infrared and Raman Spectra of Polyatomic Molecules* (1945) and Vol. III, *Electronic Spectra of Polyatomic Molecules* (1966).

Herzberg was the first Canadian to win a Nobel prize in science. During his lifetime, Herzberg received countless

honours, some of these are: Companion of the Order of Canada, an Academician of the Pontifical Academy of Sciences at the Vatican, a Fellow of the Royal Societies of London and Canada and a Member of the Canadian Science and Engineering Hall of Fame. He also gave his name to NRC's Herzberg Institute of Astrophysics (HIA), created in his honour in 1975. In 1987, asteroid 3316 was officially named after him, as was a street in Kanata, Ontario. Herzberg was appointed as a member of the Queen's Privy Council for Canada on 1 July 1992.

Herzberg visited India several times and each time he made it a point to visit the Himalayan mountains and also old historical monuments. He was elected an Honorary Foreign Fellow of Indian Academy of Sciences in 1955 and also of Indian National Science Academy in 1974. He was conferred honorary doctorate by Delhi, Osmania and Andhra universities. He delivered the first R. K. Asundi Memorial Lecture of Indian National Science Academy in 1984.

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M. J. Thirumalachar (1914–1999) – An obituary

In the passing away of M. J. Thirumalachar on 21 April 1999 at Walnut Creek, CA, USA, the world of biological sciences has lost a veteran researcher of over 60 years whose original contributions embraced a wide spectrum of scientific disciplines like botany, mycology, microbiology, antibiotic fermentations and chemotherapy of human, animal and plant infections. Best known as an outstanding mycologist of international standing, his contributions to the study of Indian fungi have been phenomenal. Through his publications on several new genera and species of fungi belonging to all the major groups of the mycological kingdom, Thirumalachar has indeed placed his footprints firmly on the sands of time. His earlier contributions monographing the rusts published jointly with B. B.

Mundkur, description of new genera of smuts like *Mundkurella*, *Narasimhania* and *Franzpetrakia* (along with M. S. Pavgi) and *Georgefischeria* (along with



M. J. Narasimhan, M. C. Srinivasan and H. C. Govindu), erecting *Sclerophthora* as a new genus of downy mildew for the destructive crazy top of corn and other graminaceous hosts (along with M. J.

Narasimhan and Charles Gardner Shaw), establishing the morphological basis for differentiating *Entomophthora* from *Conidiobolus* on the basis of cultural studies (along with M. C. Srinivasan and M. J. Narasimhan) and the studies on the life cycle of an edible rust causing malformation on *Acacia eburnea* and identifying it as *Ravenelia esculenta* (along with M. J. Narasimhan) rediscovered sixty years after Barclay had described *Aecidium esculentum* from Maharashtra are just a few examples of his most notable contributions to mycology.

In the field of antibiotics, Thirumalachar is well recognized for his discovery of Hamycin, Dermostatin and Aureofungin which are potent antifungal antibiotics therapeutically useful in the control of human mycoses and com-

bating fungal diseases of plants. An anti-protozoal, anti-helminthic antibiotic from a new species of *Emericella* isolated by him was designated anti-amoebin and shown to successfully control intestinal parasites in milch cattle. He continued active research leading to the discovery of bioactive compounds after he went over to the United States and established the Jeersannidhi-Anderson Institute at Walnut Creek, California along with his son M. J. Narasimhan Jr. Among his major contributions are the development of new derivatives of established antibiotics with better performance and lesser toxicity designated JAIMYCIN Inc. He also focused on chemical control of plant and animal disease and patented Phyton 27 as a non-phytotoxic systemic fungicide which was successfully applied for the control of Dutch elm disease and other tree wilts. Thirumalachar also developed chemotherapeutants for the control of a wide range of fungal, bacterial and mycoplasma diseases of crop plants and fruit trees and several of these have been in various stages of development and evaluation leading to eventual commercialization.

Thirumalachar was an inspiring teacher and his keen interest and ability to spot unusual specimens during field collections was unique. During the early

years when Mundkur visited Bangalore after he had received several new and interesting specimens from Thirumalachar, he was pleasantly surprised that they were all collected in the neighbourhood of Malleswaram or Yeswanthpur in Bangalore through careful field observation and Mundkur exclaimed that it is the eye behind which is more important for discovery than the location. Even in his screening for new antibiotics and metabolites, Thirumalachar isolated some of the most promising and interesting cultures from Pimpri soil where the Hindustan Antibiotics Ltd. is located. The new actinomycete genus *Chainia* about which he published in *Nature* (1955) and the antifungal Hamycin producer which he designated as a new species *Streptomyces pimprina* are just two examples of his outstanding discoveries. He has perhaps contributed more than anyone else to enriching our knowledge of microbial biodiversity in the Indian subcontinent and also showed their biotechnology potential as sources of novel and useful secondary metabolites. Thirumalachar was elected to the Fellowship of the Indian National Science Academy in 1956 and was a Council Member from 1969 to 71. He was a recipient of the Sundar Lal Hora Medal in 1967. He received the S. S.

Bhatnagar Memorial Award in 1967 for his outstanding contributions in developing therapeutically useful antifungal antibiotics. He was president of the Indian Phytopathological Society and also the first president of the Mycological Society of India when it was established in 1973. He was a member of the Editorial Board of the *International Journal of Antibiotics* published from Japan and established *Hindustan Antibiotics Bulletin* as a full-fledged scientific journal with contributions from eminent national and international scientists.

An era has ended but his contributions live on to inspire generations of biologists not only to emulate the scientific success he achieved but also to develop the interest and commitment to basic biological science and in particular mycology and microbiology. Personally speaking, he had been a dear maternal uncle, an inspired teacher and the source of every bit of scientific knowledge that I have acquired over the years and his absence is too difficult to accept.

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