

## C. V. Subramanian

*D. Jayarama Bhat, J. Muthumary, C. Rajendran, S. Raghu Kumar and B. P. R. Vittal*

### Making of a scientist

Chirayathumadom Venkatachaliyer Subramanian, fondly referred to as CVS, is an internationally renowned and most distinguished mycologist of our country. He was born on 11 August 1924 in Ernakulam, Cochin State (now Kerala). His father, C. M. Venkatachaliyer, a leading lawyer, passed away when CVS was only 11. The young CVS was brought up and educated by his mother T. D. Parvathi Ammal, to whom he later dedicated the massive tome *Hyphomycetes*<sup>1</sup>. CVS had his early education at Sree Rama Varma High School (1931–1939) and Maharajah's College (1939–1941) both at Ernakulam. In his childhood days, CVS used to collect plants from the wild and raise them in the garden of his home, an exercise which was fondly encouraged by his mother. He loved algae and when he was in the final year of his B Sc (Hon.), he used to visit the University Botany Laboratory (UBL) in Madras on Sundays to examine algae with guidance from his contemporary K. Ramakrishnan. A trip to Krusadai Islands near Rameswaram in southern India further stimulated his interest on algae. CVS wanted to work with M. O. P. Iyengar, a distinguished algologist and botanist. He benefited from Iyengar's guidance and advice as a botanist. Iyengar used to call him home to show the algae on which he was working even after retirement. On one such occasion, Iyengar said: 'Subramanian,

whatever the name you may give for your fungus, your description must be accurate'. CVS passed B Sc (Hons.) with a first class and first rank from the Presidency College, Madras. He did a small piece of dissertation work on the physiological anatomy of *Acanthus ilicifolius*, a common halophyte of the salt marshes of the west coast of India. He obtained his M A from the Presidency College, Madras (1941–1944). After graduation, on the advice of his teachers, Subramanian opted for mycology. T. S. Sadasivan, Director of UBL took CVS as his first research student in 1944. On the suggestion of K. M. Thomas, the then Government Mycologist at the Agricultural College and Research Institute, Coimbatore, he was assigned a topic for research which focused on soil conditions and wilt diseases in plants with special reference to cotton. In a sense, working on soil-borne plant diseases, CVS began as a plant pathologist and subsequently developed into a mycologist. With him, plant pathology and mycology remained inseparable. He obtained Ph D in 1948 for his thesis on 'Soil conditions and wilt diseases in plants with special reference to *Fusarium vasinfectum* Atk. on cotton' and D Sc in 1957 for his published work on 'Floristic and taxonomic studies on Fungi Imperfecti', from the University of Madras. In a general sense, CVS grew to be a

passionate botanist. He often used to tell his students that the Stockholm International Botanical Congress and subsequent Botanical Congresses which he attended brought together botanists, mycologists and plant pathologists. He opined that the founding of the International Society of Plant Pathology (ISPP) and the International Mycological Association (IMA) are merely devices of convenience aimed at better communication and discussions among the communities. For him science, a quest for truth, is a big umbrella under which numerous branches evolved and grew. CVS always told .... there is only one science and that says it all 'from smaller than the smallest to larger than the largest'.

### Professional career

Starting his career as a Senior Lecturer in Madras University in 1951 and promoted to a Readership in 1953, CVS successively held the post of Professor of Plant Pathology at the Indian Agricultural Research Institute (IARI), New Delhi (1958–1960) and Professor and Head of the Department of Botany in the University of Rajasthan (1960–1964). Subsequently, he moved to the University of Madras as Professor of Botany and later became the Director of Centre for Advanced Study in Botany (1964–



C. V. Subramanian.



C. V. Subramanian (extreme right) with his students. Also seen are John Couch (next to CVS) and B. D. Tyagi (extreme left). Students from left to right: B. C. Lodha; P. D. Tyagi; B. L. Jain; C. G. Prakasha Rao; N.G. Nair.

1985), the post which he held until retirement.

Early in his career (1948–1950), CVS was recipient of ICI research fellowship of the National Institute of Sciences of India (now, the Indian National Science Academy) which enabled him to carry out work on soil Fusaria. At that young age, he attended the VII International Botanical Congress in Stockholm in 1950 and visited several centres in Europe and discussed mycology with leading scientists. He did post-doctoral work on soil mycology, with S. D. Garrett, at the Botany School, Cambridge, and on taxonomic mycology with E. W. Mason, at the Commonwealth Mycological Institute, Kew, in the UK, during 1950–1951.

### Significant research contributions

Subramanian's major scientific contributions in mycology are on fungal floristics and taxonomy.

### Fungal ecology

Subramanian's early researches were on soil mycology, i.e. (autecology) of *Fusarium oxysporum* f. sp. *vasinfectum*, a notorious cotton wilt pathogen, which caused devastating effect in cotton-growing areas of Udumalpet in Tamil Nadu and other parts of India. He demonstrated that the fungus was an enduring facultative pathogen and a competitive colonizer of substrates in soil. Controlling such pathogens is not an easy task. His studies on *F. lateritium* f. sp. *udum* and its recognition as a root inhabitant have relevance in the management of this soil-borne pathogen. His studies on soil Fusaria and elucidation of the 'wild type' in the genus *Fusarium* highlight the dual phenomenon in conidial fungi. He published a series of papers<sup>2-4</sup> on the occurrence and status of Fusaria in Indian soils.

Jointly with K. Natarajan (soil inhabiting), B. P. R. Vittal, K. Sudha (leaf-litter), S. Raghukumar (marine) and B. C. Lodha, K. V. Chandrashekara (coprophilous), CVS made significant contributions to our knowledge on fungal succession and floristics. His remarkable observation was that fungi appear on these substrates, depending on the availability and release of nutrients. Following

colonization, substrates are degraded, for example, with solubles, cellulose and finally lignin, in a succession. Jointly with M. Udayan, S. Sankaran and with J. Savitha, CVS studied the fungi growing in industrial effluents discharged from paper industries, oil refineries and cooling towers and the possibility of using them in bioremediation.

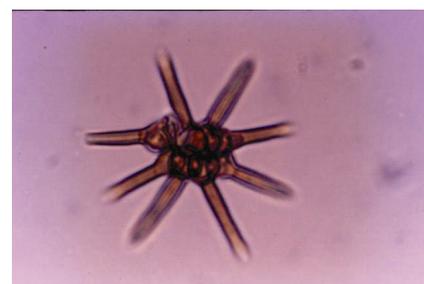
### Fungal floristics and taxonomy: exploration of new/interesting taxa

With knowledge of fungi, especially the conidial fungi, derived from examination of hundreds of types and other materials housed at the herbarium of the Commonwealth Mycological Institute (CMI), Kew, in 1950 and later, CVS pioneered studies on hyphomycetes in India. Realizing the importance of studies on taxonomy, biology and distribution of tropical fungi and application of knowledge gained from such study to human welfare, CVS carried out detailed studies on diversity, distribution, ecology and conservation of fungi of India and South East Asian countries, during the past six decades.

Subramanian collected fungi from varied habitats in the tropics and described numerous fungi. The major collection localities of CVS and his students in India included the following: the Nilgiris, Palnis, Bandipur, Thirumala and Nandi Hills and Chennai and Bangalore in the Eastern Ghats and plains, Agumbe, Sampaje, Kodagu, Waynad, Palakkad, Silent Valley, Kalakkadu and Mundandorai in the Western Ghats in southern India, and Kumaon Hills of Himalayas in northern India. In later years, he travelled extensively in south-east Asia and collected samples of fungi in Singapore, Malaysia, Thailand, Taiwan and Western Australia. Apart from exploration and inventorying for fungi, the discovery and description of over 130 new genera of hyphomycetous and coelomycetous conidial fungi and Ascomycota and many new species in these groups by CVS significantly strengthened our knowledge on the distribution and taxonomy of these fungi. The remarkable myco-diversity of the Western Ghats and Eastern Ghats in India and other areas in south-east Asia, as revealed by these studies, is a reflection of the diversity of fungus flora in the tropics. CVS is

indebted in no small measure to H. Santapau, the distinguished botanist, who helped him with Latin translations of diagnoses of the new genera and species that he discovered from 1952 onwards.

Subramanian's pioneering work on exploration of hyphomycete flora of India resulted not only in the discovery and description of numerous new and interesting species of fungi but also eventually culminated in writing of the monograph *Hyphomycetes*<sup>1</sup>. This volume was a prelude to his own and his students' numerous later studies which together brought out a wealth of knowledge on the fungi of India and further enthused several younger students on mycology and cemented a lasting connectivity with the second and third generation mycologists in India. The accuracy and exhaustive synonyms are part of this work, which is widely used by mycologists throughout the world to this day. Many friends have been suggesting a revision of this work. CVS has been fittingly described by D. L. Hawksworth, former Director of International Mycological Institute, Kew, UK, in 2005 as 'the uncontested father of mycology'. In this enduring work, CVS named several new genera and new species of fungi in Sanskrit, which was considered a novel and bold step. Many of his associates and students followed the trend which highlighted our ancient language, Sanskrit, at the global level. Some of the Sanskrit generic names proposed by CVS for fungi are the following: *Angulimaya*, *Ashtaangam*, *Bahusaganda*, *Bahusandhika*, *Bahusakala*, *Bahusutrabeja*, *Drumopama*, *Dwayabeeja*, *Dwayaloma*, *Koorchaloma*, *Kutilakesa*, *Lomachasaka*, *Nalanthamala*, *Paathramaya*, *Prathiigada*, *Prathoda*, *Tharoopama* and *Vakrabeeja*.



The beauty of 8-armed conidium of *Ash-taangam sundaram* Subram.

### Concepts, correlations and classification

The discovery and description of numerous unknown, known, rare and interesting species of fungi are part of Subramanian's significant contributions to taxonomic mycology. The formulation of concepts and of terminology of conidiogenesis and the application of these to development of a hierarchical system of classification of hyphomycetes vis-à-vis their teleomorphs engaged his attention for many years. His contributions to hyphomycetology are well appreciated in the recently published volume *The Genera of Hyphomycetes*<sup>5</sup>.

CVS proposed a hierarchical system of classification in 1962 and refined the earlier concepts of conidiogenesis proposed by Costantin in 1880, Vuillemin in 1911, Mason in 1936 and Hughes in 1953. Realizing that conidium ontogeny and 'spore types' are true biological features, CVS put forward a pragmatic system of classification of Hyphomycetes. He recognized and defined six basic spore types, viz. blastospore, gangliospore, porospore, phialospore, arthrospore and meristem arthrospore and made these spore types as the basis of six corresponding families: Torulaceae, Bactridiaceae, Helminthosporiaceae, Tuberculariaceae, Geotrichaceae and Coniosporiaceae. He observed that, based on conidium ontogeny, the bulk of the genera of Hyphomycetes could be accommodated within these families.



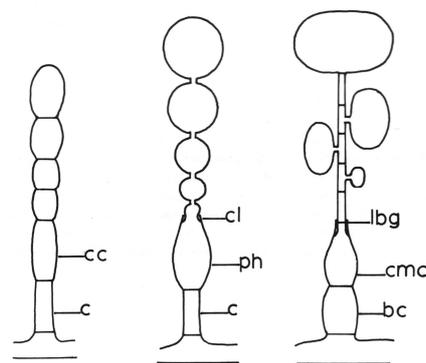
The basauxic conidiophore and conidium of *Spegazzinia xanthorrhoeae* Subram. The basauxic conidiophore elongates from the base upwards, a unique feature in a fungus.

First proposed in 1962, he revised the hierarchical system of classification of hyphomycetes in 1983, in his book *Hyphomycetes: Taxonomy and Biology*<sup>6</sup>. In this revision, he recognized five Orders: (i) Moniliales (= blastic ontogeny), (ii) Helminthosporiales (= tretic, poric), (iii) Bactridiales (= gangliar, ganglic), (iv) Tuberculariales (= phialidic) and (v) Geotrichales (= arthric). Within these Orders, Moniliales and Bactridiales which are known to have clamps and hence had teleomorphs in the Basidiomycotina, he recognized families separately for taxa without and with clamps. Thus in the Moniliales, five families (Moniliaceae, Cladosporiaceae, Botrytidaceae, Helicosporiaceae and Cercosporaceae) without clamps and three families (Nematoctonaceae, Spinigeraceae, Echinodiaceae) with clamps were recognized. In the Bactridiales nine families were recognized (Bactridiaceae, Sepedoniaceae, Clasterosporiaceae, Sporidesmiaceae, Cephalotrichaceae, Sporendonemataceae, Cladobotryaceae, Coniosporiaceae, Arthrinaceae) for taxa without clamps, and four families (Sporotrichaceae, Pagidosporaceae, Asterophoraceae, Antromycopsidaceae) for taxa with clamps. Helminthosporiales with a single family, Helminthosporiaceae and the Geotrichales with a single family, Geotrichaceae, are the other Orders. In the Tuberculariales, four families (Tuberculariaceae, Phialophoraceae, Chalaraceae, Aspergillaceae) were recognized. Of these, nine new families were proposed: Cladobotryaceae, Phialophoraceae, Nematoctonaceae, Spinigeraceae, Echinodiaceae, Sporotrichaceae, Pagidosporaceae, Asterophoraceae, Antromycopsidaceae.

Further, on the basis of participation of the wall/wall layers of conidiogenous cell in conidiogenesis, CVS recognized five types, support for which came from transmission and scanning electron microscopic studies, viz. totitunicogenous, penititunicogenous, demiseptatunicogenous, novitunicogenous and eutunicogenous. To describe the 'meristem' or growth features in conidiophores with phialidic and other modes of conidium development, CVS introduced the terms, 'porrectic' to describe conidiogenesis<sup>7</sup> involving extension growth of the cell wall, 'exporrectic' to describe conidiogenesis involving no extension growth of cell wall, 'synechidic' to denote ability of a conidiogenous element to produce an indefinite number of conidia in

succession from, usually, a fixed conidiogenous locus, 'asynechidic' to mean 'not synechidic' and 'pseudosynechidic' to denote a mode of conidiogenesis, which is 'asynechidic' but appears being 'synechidic'.

Subramanian<sup>8,9</sup> paid special attention to phialidic conidial taxa and carefully looked at the nature of conidial chains and correlations arrived at between the 'slimy' and 'dry' nature of the conidia and thereby development of false or pseudo-chains and true conidial chains. He felt that the slimy and dry nature of conidial chains are innate biological features in fungi and therefore important in taxonomy. His presentations on 'phialide' at Kananaskis-I in 1971 and 'phialidic anamorphs' and their relationship to teleomorphs' at Kananaskis-II in 1979, together contributed immensely to our understanding of the heterogeneity of the phialide. He recognized four kinds of phialide or phialoconidiogenesis with the conidia being (i) synechidic, etunicogenous, exporrectic, pseudo-catenate or discrete, sometimes glomerate, slimy, as in *Thielaviopsis basicola*; (ii) synechidic, novi-cum penititunicogenous, porrectic, catenate, dry, as in genera such as *Penicillium* and *Aspergillus*; (iii) pseudo-synechidic, tunicogenous (first conidium totitunicogenous or penititunicogenous, later conidia demiseptatunicogenous), porrectic, percurrent, solitary, glomerate, sometimes pseudo-catenate, slimy as in *Trichoderma* and *Verticillium*; (iv) pseudo-synechidic, penititunicogenous, porrectic, sympodial, solitary, glomerate,



Diagrammatic comparison of conidiogenesis in *Oidium*, *Aspergillus* and *Arthrinium* by CVS (ph = phialide, cmc = conidiophore mother cell, c = conidiophore, bc = basal cell, cc = conidiogenous cell, cl = conidiogenous locus, lbg = locus of basauxic growth) (extracted from 'The Whole Fungus' – Kananaskis II, 1979).

slimy, e.g. *Chloridium*. Phialidic anamorphs in the second category with true chains of dry conidia have teleomorphs in the Eurotiales, those in the third category with slimy conidia in pseudo-chains have teleomorphs mostly in the Hypocreales, and dematiaceous anamorphs with phialides of the first category had teleomorphs in the Ophiostomataceae.

Underlining the taxonomic significance of the concept of heterogeneity of the phialide and its value in predicting anamorph–teleomorph connections, is a view strengthening the patterns of secondary metabolism with which phialoconidiogenesis appears to be linked<sup>10</sup>. A synthesis of all these ideas is presented in his 1983 volume on *Hyphomycetes*. This book was released by the former Prime Minister, Indira Gandhi.

### Monographs, revisions

Revision of graminicolous Helminthosporia taken up in 1958 resulted in a joint publication with B. L. Jain on the genus *Drechslera*, a position followed by M. B. Ellis in his treatment of the genus. However, later work led to segregation of the genus. CVS also published a monograph on the coelomycetous genus *Discosia*, jointly with Reddy<sup>11</sup>.

### Developmental morphology and taxonomic revision of the Aspergilli

One of Subramanian's outstanding mycological works is the re-assessment of Aspergilli and their teleomorphs<sup>12</sup>, an important step in the understanding of this ubiquitous group of moulds. Following this revision, jointly with C. Rajendran, CVS studied the developmental morphology of a range of taxa in the Eurotiales.

These studies confirmed Subramanian's earlier taxonomic treatment of Aspergilli and assignment of teleomorphs to distinct genera: *Edyullia* Subram., *Sclerocleista* Subram., *Chaetosartorya* Subram., *Syncleistostroma* Subram. (= *Petromyces* Malloch & Cain) and *Warcupiella* Subram. The study revealed the true nature of these fungi and extraordinary variations in developmental morphology of Eurotialen ascomata: *Edyullia* with naked asci, *Chaetosartorya* with free peridiate ascumata, *Warcupiella* and (*Hamigera* Stolk & Samson



Prime Minister Indira Gandhi releasing *Hyphomycetes: Taxonomy and Biology* in New Delhi 1983 (L to R: D. S. Kothari, Mrs Indira Gandhi and CVS).

with its 'Penicillium' anamorphs) with locules in a stroma, *Fennellia* Wiley & Simmons and *Petromyces* with peridiate ascumata embedded in stromata, the stroma in the former being plectenchymatous and pseudoparenchymatous in the latter. These studies of the Eurotiales are perhaps the most detailed and authoritative works of this group and are based on study of type and authentic cultures of the various taxa (courtesy Dorothy Fennell, mycologist at Peoria, USDA). CVS accommodated the anamorph of *Warcupiella* in a distinct genus, *Raperia*; the close relationship of *Warcupiella* to *Hamigera* is now strengthened by von Arx's recognition of *Raperia* as a repository for the anamorph of *Hamigera*.

### Developmental morphology of Hypocrealean fungi

Jointly with D. J. Bhat, CVS studied the developmental morphology of anamorph and teleomorphs of several taxa of the Hypocreales and these studies supported the cohesiveness of the Hypocreales (now Nectriales) as a distinct taxonomic group. The studies on eurotialen and hypocrealean taxa suggested that systematic investigations on developmental morphology would reveal the correct taxonomic identity and true phylogenetic relationships of fungi in the Ascomycota.

### Coronophorales of India

Jointly with Sekar, CVS<sup>13</sup> wrote a monograph on the Coronophorales of India

which constitutes an important contribution to our knowledge of this little known group of the Ascomycota. These are primarily wood- and bark-inhabiting saprobic fungi whose taxonomy has been under debate. From studies on freshly collected samples from India and elsewhere CVS recognized 14 genera, of which 12 (*Cryptosphaerella*, *Bicliospora*, *Biciliosporina*, *Janannfeldtia*, *Fracchiaea*, *Scortechinia*, *Euacanthie*, *Neotrotteria*, *Acanthonitschkea*, *Nitschkia*, *Schizocapnodium* and *Gaillardella*) in the family Coronophoraceae (= Nitschkiaceae) and 2 (*Bertia* and *Spinulosphaeria*) in the family Bertiaceae. The Coronophoraceae have cupulate ascostromata, whereas those with non-cupulate ascostromata are placed in the Bertiaceae. Later molecular studies<sup>14,15</sup> have confirmed the observations made by CVS on the taxonomy of the Coronophorales.

### Taxonomic reassessment of the genus *Sporidesmium* Link

The anamorph genus *Sporidesmium* Link is represented in the tropics by numerous species. Description of several species of the genus from the tropics by Ellis<sup>16,17</sup> and the continuing discovery and description of many more species, especially in the tropics, called for a re-assessment of this interesting genus complex of dematiaceous hyphomycetes. The study of type and other material of a number of species placed in this group by Ellis and other students, led CVS to a critical appraisal of the taxonomy of this

genus<sup>18</sup>. Morphological and developmental criteria such as euseptation/pseudo-septation of conidia, the nature, regularity and other features of percurrent proliferation of conidiophores, and the presence or absence of conidiophores, were considered important diagnostic features. CVS used these criteria in his re-assessment in which he retained in *Sporidesmium* only those 26 species found strictly congeneric with *S. atrum* Link (= *S. ehrenbergii* M. B. Ellis), the remaining in *Sporidesmium* sensu lato were re-disposed in: 3 in *Polydesmus* Mont., 1 in *Sporidesmiella* Kirk, 12 in *Ellisembia* Subram. gen. nov., 5 in *Stanjehughesia* Subram. gen. nov., 9 in *Repetophragma* Subram. gen. nov. and in 13 in *Penzigomyces* Subram. gen. nov. *Sporidesmium arengae* Matsushima was placed in a new genus *Acarocybellina* Subram., *Sporidesmium casuarinae* Matsushima in a new genus, *Gangliophora* Subram., and *Sporidesmium guadacanalense* Matsushima in a new genus, *Hemicorynesporella* Subram. Ribosomal and RPB2 DNA sequence analyses of representatives of the *Sporidesmium* complex carried out by Shenoy *et al.*<sup>19</sup> ascertained the possible familial position of these genera and suggested that *Sporidesmium* is not monophyletic.

### Evolution of fungi

In discourses on fungal systematics, CVS highlighted the relevance of gene-centred approaches in taxonomy<sup>20</sup>, by stressing the importance and relevance of epigenetic inheritance. Epigenetic systems offer additional heritable variations subject to selection. As noted by Lindegren: 'The general data on which the modern conception of the gene is based are intensively selected data ... The search for precisely segregating genes compels the selection of genetical material. In our work on *Neurospora* we were unable to classify the progeny of over two-thirds of our matings.' There is now much rethinking on the subject and even a growing enthusiasm to delve deeper into epigenetic inheritance. Jablonka and Lamb<sup>21</sup> in their thought-provoking book, argue for an epigenetic perspective, and 'a return to a wider view of heredity, which encompasses multiple inheritance systems'. CVS always highlighted the leads available from fungal chemistry, molecular biology and evolution, in addition to

morphology. Evolution is closely linked to natural selection, self-organization and emergence, besides epigenetics.

### Strengthening the base of taxonomy and mycology in India and Asia

In spite of impacting a pivotal role in the well-being of humans and health of earth's ecosystems, fungi are regarded as orphans, within the biological sciences. The former Director of IMI, Hawksworth<sup>22</sup> lamented that fungi lack close relatives, often are misunderstood, ignored or overlooked and only few shed tears. Subramanian<sup>23-25</sup> took keen interest in redressing the identity crisis in mycology and vigorously pursued its cause in national and international fora and actively campaigned for conservation and utilization of fungal resources and myco-genome potentials. Much before the Rio Summit 1991, CVS advocated *in situ* and *ex situ* conservation of fungal biological resources, establishment of culture repositories and trained manpower in fungal taxonomy, in the tropics<sup>23,24</sup>. Establishment of the International Mycological Association Committee for Asia (presently, Asian Mycological Congress) with country-representatives from all Asian and south-east Asian countries, where CVS played a major role, has been one bold redresser step. Under his leadership, India has conducted two meetings of the IMACA, so far. Hawksworth<sup>22</sup> acknowledged the

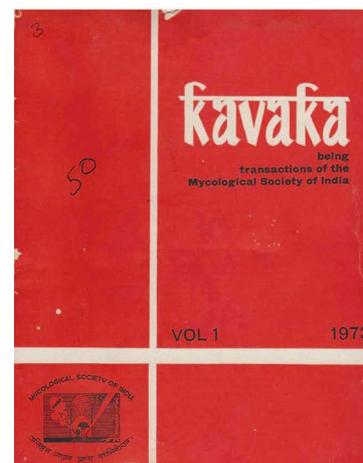
significant role played by CVS in developing mycology in Asia in particular and at global level in general. On an earlier occasion, Hawksworth<sup>26</sup> wrote: '...the current and upcoming generation of mycologists in India, and in all tropical countries, will embrace Prof. Subramanian's vision, and work towards its fulfillment through BioNet-INTERNATIONAL and other initiatives now being set in train'. The personal appeal from CVS to the former Prime Minister of India, Mrs Indira Gandhi, eventually led to the abandonment of a hydroelectric project in the Silent Valley in the Western Ghats and conservation of the whole area as a bio-reserve. As President of the IMA during 1977-1983, he secured a special status for Mycology in the International Union of Biological Sciences, at the General Assembly of the IUBS in Helsinki in 1979. As President of IMA, CVS was closely involved in the organization of IMC3 in Tokyo in 1983.

### Mycological Society of India

CVS established the Mycological Society of India (MSI) in 1973, in the august presence of a galaxy of mycologists from India and abroad, during the International Symposium on 'Taxonomy of Fungi' held at CAS in University of Madras. CVS founded the journal *KAVAKA* (= Fungus, in Sanskrit), the transactions of MSI, and also edited the journal from its inception till 1998. Fascinated by the beauty of *Amanita muscaria*, the 'fly agaric', CVS incorporated



Delivering lecture at IMC3, Tokyo in 1983.



Front-cover page of journal *Kavaka*, volume 1, 1973.



Receiving the Bhatnagar Award from C. Subramaniam in 1972.



Mrs and CVS with students on his 60th birthday function, Udaipur, 1985 (L to R: sitting J. Savitha; K. Sudha; J. Muthumary; standing B. P. R. Vittal, K. Natarajan, CVS, Ramesh V. Bhat, Subbalakshmi, C. Rajendran, H. C. Sharma, B. C. Lodha, D. Anantha Padmanabhan).

the magenta colour of the mushroom as the colour for the cover page of *Kavaka*.

### Academic distinctions

Subramanian's academic contributions have been recognized both in India and abroad. He is a recipient of many honours and awards, which include the Pulney Andi Gold Medal of the University of Madras in 1944, Shanti Swarup Bhatnagar Award for Biological Sciences in

1965, Birbal Sahni Medal of the Indian Botanical Society in 1972, Rafi Ahmad Kidwai Prize of the ICAR for 1972–1973, Jawaharlal Nehru Fellowship in 1976 and E. K. Janaki Ammal National Award for Taxonomy [of Fungi] by Government of India in 2000. He served as the Vice President (1971–1977) and President (1977–1983) of the International Mycological Association, a rare distinction conferred on an Indian Mycologist. He was a member of the Executive Committee of the International

Union of Biological Sciences (1979–1982). He is a Corresponding Member of the Belgian Royal Academy of Foreign Sciences (1978) and an Honorary Member of the Mycological Society of America and the British Mycological Society. He is an elected Fellow of the Indian Academy of Sciences (Bangalore), the Indian National Science Academy (Delhi) and the National Academy of Agricultural Sciences (New Delhi). He was Chairman of the Editorial Board *Proceedings of the Indian Academy of Sciences (Plant Sciences)* for over a decade (1976–1988).

### CVS and his students

Subramanian mentored 24 doctoral and several post-doctoral researchers who worked on fungi. They are now spread all over the world. An active school of mycology grew around him at the CAS in Botany, University of Madras, which made significant contributions on fungal systematics, floristics and ecology. Working in different parts of the country and abroad, his students excelled in their spheres and brought laurels to themselves and to the country.

Those days when academic overseas visits were sparse, CVS arranged a British Council and UGC sponsored scholar–student exchange programme which facilitated exchange visits abroad for his colleagues and pre- and post-doctoral students. He also facilitated visits of his post-doctoral students outside the exchange programme. Several scientists, viz. F. C. Steward, S. D. Garrett, P. H. Gregory and mycologists to the First International Symposium on Taxonomy of Fungi held in 1973, came to Madras. Several students from CAS in Botany, University of Madras, went to CMI, Kew, for training.

Subramanian is 'a complete mycologist'. His knowledge of fungi extended much beyond the Hyphomycetes. He read extensively. He was one of the first to grasp the importance of 'diversity' studies in different ecological habitats. As mentioned earlier, he guided students on fungi growing on leaf litter, herbivore dung, marine and mangroves and industrial effluents. His vast collection of reprints and monographs on fungi, neatly arranged in numerous almirahs in the Botany Department of University of Madras was easily accessible to anyone.

From world over, students of mycology sought reprints from CVS. Those days when blackboards were used in class-lectures, he would insist on neat, black and white transparencies. His students consider themselves fortunate to have been groomed by him.

### Epilogue

Reminiscing his younger days, Subramanian told us once that his alma mater, Presidency College, Madras, accommodated people of all backgrounds, without prejudice of caste, creed and wealth, that is 'unification of language, culture and the arts', in a true sense. CVS not only had a great liking for classical Carnatic music, but could play an instrument also (mridangam – a percussion instrument). He would not miss performances of great musicians especially in the annual music festival in Chennai.

Along with his wife, Srimathi Subbalakshmi (= Lakshmi, to his mycologist and scientist friends), CVS now lives in Nungambakkam, Chennai. Subbalakshmi has played host to students and colleagues and other friends. Kind and compassionate, resourceful and pragmatic, she has remained an affectionate life companion in all his doings. She has travelled widely and CVS has dedicated *Hyphomycetes. Taxonomy and Biology* to her! Their two sons, C. S. Venkatachalam and C. S. Seshadri, are engineers.

Influenced largely by Swami Vivekananda and many great men of science, the life and thought of Subramanian are influenced both by Vedanta, the ancient Indian philosophy, and modern science. His current interests focus on the role of internal factors in evolution. Astutely philosophical, an avid reader and keen observer that he is, CVS spends his time in the enjoyment of literature, philosophy, science and music. He concludes: 'Mine is a life of learning ... learning in enjoyment, from students, with students, the never ending pursuit.'

1. Subramanian, C. V., *Hyphomycetes*, ICAR, New Delhi, 1971, pp. 930.
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