T. N. Ananthakrishnan

Anantanarayanan Raman

Taracad Narayanan Ananthakrishnan, a renowned Indian entomologist and insect ecologist, will complete 90 years in December 2015 (Figure 1). He has enriched our knowledge of Indian insects in general and thrips (Thysanoptera) in particular and of the ecology of insect–plant interactions for over 50 years. As one who spent the maximum time with him – first, as his Ph D student working in the field of insect–plant interactions and secondly, as his colleague at the Entomology Research Institute at the Loyala College, Chennai (Madras), for 25 years – I am privileged to present this tribute celebrating his life of perseverance, focused commitment, hard work and professional attainments.

Early life

Ananthakrishnan was born as the eldest child to T. K. Narayanan and T. A. Annapurani on 15 December 1925. Because his father worked with the Railways at Mangalore, Ananthakrishnan's early days were spent there. He studied at St Aloysius High School, Mangalore and gained reasonable conversational skill in Kannada. He had difficult time as a youth. His father died early and he had to shoulder the responsibility of looking after and bringing up his two younger brothers and one sister. He educated himself and ensured that his brothers and sister too received good education and were comfortably settled in their lives.

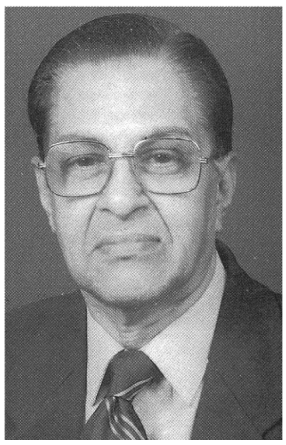

Figure 1. T. N. Ananthakrishnan (1996).

After studying the Intermediate class from the Government Victoria College, Palghat (now Palakkad), he joined B Sc (Honours) in zoology at the Madras Christian College (MCC), Madras (now Chennai) (1943–1946). Soon after graduation, he worked at MCC during 1946–1948, first as a demonstrator and later as a lecturer in zoology. The Department of Zoology at MCC, by then, had established a rich legacy[1]. Another distinguished entomologist from Taracad was T. V. Ramakrishna, who had also completed his postgraduate training at MCC in 1889, when H. Reynolds was the relieving professor of zoology[2]. Ananthakrishnan's meritorious performance at MCC won him the Buckie Prize. Probably impressed by his youthful enthusiasm to teach, Alexander J. Boyd, the Principal of MCC recommended Ananthakrishnan to Jerome D'Souza, Principal of Loyola College, Madras, for a lectureship in zoology. Ananthakrishnan joined the Department of Natural Sciences, Loyola College in 1948, which was headed by Alfred Rapinat, whose work on cryptogamic plants, especially the mosses, liverworts and lichens of the Madras Presidency is well known. Being the lone academic in zoology at Loyola, the onus fell on Ananthakrishnan to build the department from scratch. I always wondered whether he may have ever dreamed – at that point of time – that his link with Loyola College was going to be a lifelong relationship! Dry-insect specimens, taxidermied birds and reptiles, and skeletons of large mammals stand in the zoology laboratory of Loyola testifying his tireless labour. Charles Leigh, an English Jesuit had made extensive collections of South-Indian snakes in the 1930s due to his amateur interest in snakes and in the Indian rock python (*Python molurus*, Squamata: Pythonidae)[3]. Ananthakrishnan made every effort to secure those magnificent Leigh collections to the department, from the Jesuit Museum, Shenbaganur, Kodai Hills, although he was only partly successful. Until he formally quit his position as the Head, Department of Zoology to move to the Entomology Research Unit within the Loyola College campus in 1968, I have seen these museum specimens maintained well. As a lecturer in the earlier days and as a full professor of zoology when the Department of Natural Sciences was cleaved into Departments of Botany and Zoology, he was popular among his students. Many of his former students speak of Ananthakrishnan with admiration and gratitude. The zoological content taught to the students of the intermediate class included a considerable chunk of human anatomy and physiology in the 1950s. His lectures on human anatomy and physiology, especially to those students aspiring to get into medical colleges after their intermediate class were a windfall. He used to tell me, in the later years, that the exclusion of human physiology and anatomy from the undergraduate zoology curriculum was a major mistake committed by the administrators of higher education; I could not agree more.

J. Samuel Raj (Lecturer, Zoology, MCC) and K. Rangaswamy Iyengar (Demonstrator, Botany, MCC) were key forces in igniting his passion for research. On several occasions Ananthakrishnan has excitedly recalled their skills in teaching biology in natural settings. Samuel Raj pursued entomology, studying the taxonomy, biology and physiology of the bioluminescent Lampyridae (Coleoptera)[4,5], although in later years, after quitting MCC, his interest shifted to studying medically important Diptera, other than mosquitoes. Ananthakrishnan used to tell me that he and his classmates were encouraged by Samuel Raj to exploring the scrub vegetation that flourished then between Tambaram and St Thomas's Mount. Rangaswamy Iyengar would accompany the trekkers, teaching botany to them. Considering the impact Samuel Raj and Rangaswamy Iyengar may have had, I am not surprised at all how Ananthakrishnan became passionate about studying plant-feeding insects and later insect–plant interactions (Figure 2): indeed Samuel Raj and Rangaswamy Iyengar had sowed the right seeds in the right mind at the right time.

As a young academic with a motivation to teach, Ananthakrishnan was well-liked not only in Loyola College, but also in other colleges in the neighbourhood.

Charismatic personality (Figure 3) and a capacity to speak eloquently in public forums on biological themes were his strong points. My elder brother – his student at Loyola College in the mid-1950s – used to tell me that Ananthakrishnan won the hearts of almost all of his students by his impressive personality, impeccable dressing practice, powerful classroom lectures, clear laboratory demonstrations and affable nature during field trips. He came to classes in a full-cotton suit and a silk tie; the tie knot always stood at 45° from his shirt collar. By the time I joined Loyola College, as a student in the early 1970s, fashion had changed; he used to wear full-sleeved, synthetic fabric slacks. His versatility and profundity of knowledge of the Indian fauna – from the infinitesimally minute protozoans to massive mammals – were excellent and that won the esteem of his students. In the early years of the 1960s, each year, Master's students of zoology from MCC would come to the undergraduate laboratories of Loyola College to listen to his week-long discourses and demonstrations in entomology. His active teaching career ended in 1968, because of a row with the then principal of Loyola College, Gnanapragasam, who was a professor of English.

Figure 2. Ananthakrishnan (mid-1940s) in the zoology laboratory at MCC, Chennai.

Figure 3. Ananthakrishnan in the early years of his lectureship in Loyola College. (Note the tie knot standing at 45° from his shirt collar.)

Family and cricket

Ananthakrishnan married Menaka of Taracad in 1950 (Figure 4) and settled in Triplicane, Madras. Their children Ranee and Ramdas are presently living in USA. I know of Ananthakrishnan's excitement about cricket. From the time I knew of him, he had never missed witnessing any test match held either at the SIAA Grounds or at the Chepauk Stadium (later M. A. Chidambaram Stadium), Madras. Ramdas supplied me a photograph that speaks of his role as the captain of the academic staff cricket team of Loyola College (Figure 5). I have no idea how many 'rubbers' and 'ashes' he and his team won in Madras, but what makes me smile is that as a young man, he was certainly influenced by the dictum 'work while you work, play while you play'.

Figure 4. Ananthakrishnan and Menaka (1950).

Academic adventure with thrips

During his vacation trips to Taracad Ananthakrishnan used to meet Ramakrishna, who had settled there after retiring from the Madras Agricultural College, Coimbatore (now the Tamil Nadu Agricultural University). Ramakrishna urged Ananthakrishnan to earn his Ph D studying thrips (Thysanoptera). Although Ramakrishna made great strides studying different groups of agriculturally important insects of southern India, his Ph D work was on the Indian Thysanoptera. Ramakrishna directed Ananthakrishnan to M. S. Mani, who was the rising star of Indian entomology then. I recall a humorous anecdote, narrated by Ananthakrishnan to me, when I was working with him at Loyola College. Ananthakrishnan had collected a thrips in the neighbourhood of Madras, which he found as a new species. He described the insect and prepared sketches as would be appropriate for describing thrips. He sent the draft manuscript to Mani, who was the editor of the *Agra University Journal of Research (Science)*, with a request that it be published in the journal. Mani, reviewing the paper found merit in publishing it, but decided that the biological details were inappropriate. He sought specimens of that thrips from Ananthakrishnan, redescribed details and published the paper in Ananthakrishnan's name in the *Agra University Journal of Research (Science)* in the 1950s. Ananthakrishnan's happiness on seeing 'his' description of a new thrips was ephemeral; the published details were as though a hymenopterist would describe wasps and not as a thysanopterist would describe thrips. Although this event turned

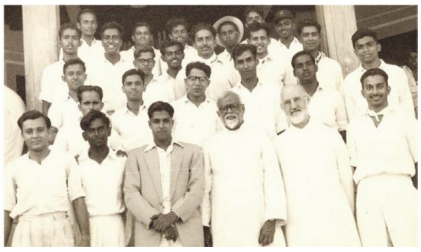

Figure 5. Captain of Loyola College Academic and General Staff Cricket team. First row: L. Simon (chemistry), B. N. Ramamurthi (zoology), Ananthakrishnan (captain; in a cotton jacket), S. Arulsamy (Principal, Loyola College), A. Mona. I could not recognize the others, except the fourth person in the second row, S. Narayanan (commerce; 1953–1954).

somewhat awkward, Ananthakrishnan maintained a reverential regard for Mani. Upon Ramakrishna's introduction, Mani instructed Ananthakrishnan to study the internal morphology of thrips. Ananthakrishnan made efforts using a rickety Spencer AO microtome, which was available to him in Loyola; for unknown reasons, Ananthakrishnan was uncomfortable with that study area and decided to change tracks studying instead the taxonomy of thrips. The regulations of the University of Madras then were more flexible to tertiary-level teachers than today, enabling them to carry out a Ph D on their own, sans a supervisor, provided they had a Master's degree by research. Ananthakrishnan worked for a research M Sc of the University of Madras, supported by his earlier publications. For example, he had published a short paper in the *Journal of the Bombay Natural History Society* referring to the anomalous antennae of *Rhipiphorothrips cruentatus* (Terebrantia: Thripidae) in 1947, written and published while he was at MCC. His research M Sc thesis was examined by S. G. Manavala Ramanujam (Presidency College, Madras) and R. V. Seshaiyya (Annamalai University, Porto Novo), who approved his claim for M Sc in zoology. Obtaining a Ph D, followed by a D Sc from the University of Madras was a cakewalk, given the volume of publications Ananthakrishnan prepared in later years. In the late 1950s and early 1960s, he came under the influence of another entomologist of distinction, Y. Ramachandra Rao, who, similar to Ramakrishna, studied a range of Indian insects, although Rao's contribution to Indian locusts (Orthoptera: Acrididae) is memorable[6]. The role played by Ramakrishna, Mani and Rao in triggering a passion to study insects in general and thrips in particular in Ananthakrishnan, cannot be gainsaid.

Between 1948 and 1968, Ananthakrishnan looked at the species diversity among thrips. Initially he investigated the South-Indian thrips and during 1968–1975, he explored the thrips of northern India up to the foothills of the Himalaya (Figure 6). One major support factor was the PL–480 funding in India. Dwight D. Eisenhower, President, USA, signed the Agricultural Trade Development and Assistance Act (also known as Public Law 480 (PL–480)) in 1954. This legislation facilitated a secondary foreign market by allowing food-deficient countries to pay for American food imports in their currencies instead of in US dollars. This programme triggered PL–480-based rupee funds in India, which were used in the 1960s to promote scientific research, particularly agricultural research. Ananthakrishnan was one of the early recipients of this support. Between mid-1960s and 1968, he published more than 60 journal articles, most of them on the taxonomy of different Indian Thysanoptera in the *Proceedings of the Royal Entomological Society of London*, *Zoologischer Anzeiger*, *Proceedings of the Entomological Society of Washington*, *Pan-Pacific Entomologist*, *Senckenbergiana Biologica*, *Treubia*, *Entomologisk Tidskrift*, *Opuscula Entomologica*, *Annales de la Société entomologique de France*, *Indian Journal of Entomology*, *Journal of Bombay Natural History Society*, *Journal of the Zoological Society of India* and *Current Science*. A majority of these articles were by Ananthakrishnan, although a few were co-authored with his early graduate students: A. Jagadish (former professor of agricultural entomology, University of Agricultural Sciences, Bangalore), M. C. Muralirangan (former professor of zoology, Guru Nanak College, Chennai), N. Muraleedharan (former Director of UPASI Tea Research Station, the Anamalais) and T. R. Viswanathan (Macmillan India, Bangalore).

The Entomology Research Unit, as a wing of the Department of Zoology, was born. It was housed in the top floor of the Chemistry Building, which was previously used as a research laboratory for psychological tests by W. T. V. Adiseshiah. B. Vasantharaj David, who started studying the Aleyrodoidea (Hemiptera) at the Madras Agricultural College, joined Ananthakrishnan as the Project Officer in the new PL–480 project in the mid-1960s. The Ananthakrishnan–David duo made impressive strides in unveiling the little-known aspects of Indian Thysanoptera: one highly useful contribution is their key to second-stage larvae of diverse thrips[7].

Figure 6. Ananthakrishnan during field work in Kalimpong (North Bengal bordering Nepal, *c*. 1250 m amsl; 1972–73). (On his right is C. Kochumman, an efficient technician, who worked with Ananthakrishnan for more than 15 years preparing permanent mounts of thrips on glass slides, a technique which Ananthakrishnan followed from the master of world Thysanoptera, Hermann Priesner, Linz, Austria.)

Ananthakrishnan built the capability to deal with thrips by himself. Thanks to a generous support from the British Council, Madras, he could receive training on the taxonomy of thrips at the British Museum of Natural History (London), when William China was the Keeper of Entomology. On this occasion, he travelled in Europe meeting experts of Thysanoptera. Most importantly, he visited Hermann Priesner, who streamlined the science of Thysanoptera. Priesner lived in Linz, Austria. I have heard from Ananthakrishnan that the Priesner–Ananthakrishnan rendezvous was a turning point in his professional life, when he acquired a better understanding of the species diversity and evolution of Thysanoptera. Early in Ananthakrishnan's career, a contemporary of Ramakrishna, Dudley Moulton was in his late phase of life in California; Ananthakrishnan was in contact with him. Ananthakrishnan used to tell me, in a tone of gratitude, about Moulton's gift to him of a fine set of instruments for dissecting and examining internal and external parts of thrips with ease in the late 1940s. Could there be a greater reward for a young and excited Indian entomologist–thysanopterist from a world authority? For the work Ananthakrishnan turned out in later years unravelling 396 new nominal taxa of Thysanoptera (1950–1980), which include 76 new taxa of the genus group and 320 new species group[8,9], I imagine Moulton's spontaneity lit the fire in Ananthakrishnan.

At the Zoological Survey of India

Right from the day Ananthakrishnan ever saw the majestic and tall Mithan Lal Roonwal, the Director of the Zoological Survey of India (ZSI), Calcutta (now Kolkata), at an Indian Science Congress Association Session, his cherished dream was to one day become the Director of

ZSI. For Ananthakrishnan, this was the greatest recognition an Indian zoologist–entomologist could achieve professionally. Indeed, he became the Director of ZSI in 1977. By this time, his professional interest had shifted from α-taxonomy to population-based species determinations. While presiding over the destinies of ZSI, until the mid-1980s, he reframed its philosophy of work and reformed its mode of functioning. He pushed the scientific staff of ZSI to move to an ecology- and evolution-based study. His belief is that for understanding the dynamics of species and their adaptive radiation, critical assessments of populations and ecosystems are but vital. He demonstrated his belief through publications made on the biosystematics of Thysanoptera while at Calcutta. As the Chief Executive and Scientific Officer of an institution of national significance, he emphasized the importance of biological diversity and its ramifications, at a time when none ever thought of these themes as seriously as they are today. His efforts in refocusing the research priorities and survey methods have made indelible changes in the work culture of ZSI. During the three years he worked at ZSI, Ananthakrishnan started five regional stations in different parts of India, depending upon the nature of biological materials those regions prided as part of their heritage.

Blossoming of the Entomology Research Institute

Ananthakrishnan returned to Loyola College in mid-1980 and resumed administration of the Entomology Research Unit, which, until he was in Calcutta, was managed by me. He returned with new thoughts and new work philosophy. From the Entomology Research Unit, which concentrated on the taxonomy of Thysanoptera (Ananthakrishnan, Jagadish and Viswanathan), Anthocoridae (Muraleedharan) and Aleyrodidae (Vasantharaj David) and Membracidae (Ananthasubramanian), it blossomed into the Entomology Research Institute, with a new and dynamic objective of exploring the chemical ecology of insect–plant interactions. The academic scope widened from the Thysanoptera to include insects of the hemipteroid stock. We started examining and evaluating the vibrant relationships between plant-feeding hemipteroids and their hosts, and the predators and parasitoids of the hemipteroids using sophisticated instrumentation and intelligent ecological theory. Some of us studied the nutritional physiology of a few Lepidoptera and plant-feeding Coleoptera as well, but these were carried out essentially to draw meaningful comparisons and inferences on the evolution of the hemipteroids. We succeeded in that effort to a large extent. The Entomology Research Unit, rededicated to the nation as the Entomology Research Institute in Loyola College, became a star attraction not only within India, but overseas as well. We received several national and international visitors, who came to share their experiences and discuss the science of entomology and the biology of plant-feeding arthropods. The University Grants Commission, New Delhi, under the then newly launched COSIST programme, offered generous support to embellish the infrastructural facilities at the Institute. Ananthakrishnan led the Institute and thus making us hold our heads far above the scientific rigmarole of India. We celebrated the 25th and 30th anniversaries of the Institute with delight.

With the Government of Kerala keen on damming the river Kuntipuzha and developing a hydroelectric project sinking a part of the ecologically pristine Silent Valley under water, the people of Kerala turned restless in the 1970s. In 1983, the Government of India appointed the M. G. K. Menon Commission to evaluate the merits of the claims of the Government of Kerala and of those who resisted the project. Ananthakrishnan was a member of this Commission. That the Menon Commission recommended scrapping of the project idea, which was a grand win for the people of Kerala, is a well-known story and that Ananthakrishnan played a pivotal role in this recommendation is not an exaggeration.

Human factors and humane elements

M. Ekambaranathan (retired professor of zoology, Presidency College, Madras) was another key force who influenced and moulded Ananthakrishnan. Ekambaranathan revolutionized zoology teaching in India through his two massive volumes of the *Manual of Zoology*. This was a pioneering effort in Indian biology education, because for the first time in the country, these books included accurate India-ink sketches drawn to scale, made from freshly done dissections of different animals and a comprehensive bibliography. Ananthakrishnan assisted Ekambaranathan in developing this *Manual* until 1970. He had acknowledged to me that this experience of working with Ekambaranathan on the *Manual* sharpened his scientific prose-writing skill and enabled him to gain a global mastery on the Indian fauna. The relationship between Ekambaranathan and Ananthakrishnan later turned to be more of a filial nature. They had their own pet quarrels, but at the end of the day, realistically and wonderfully, Ekambaranathan perceived Ananthakrishnan as his adopted son.

During his leadership of the Department of Zoology, Loyola College, between 1960 and 1968, Ananthakrishnan encouraged his colleagues T. K. Raghunatha Rao, V. A. Murthy, K. S. Ananthasubramanian and B. N. Ramamurthi to study different groups of arthropods. Raghunatha Rao worked on the bioecology of aquatic insects of the dry scrubs along the Eastern Ghats. Murthy studied the Indian Pseudoscorpionida (Arachnida) and Ramamurthi studied the Dermaptera; both Murthy and Ramamurthi became world experts in their respective arthropod groups. Ananthasubramanian earned his Ph D with Ananthakrishnan studying the Indian Membracidae (Hemiptera). All the above, except Ramamurthi, had postgraduate degrees in zoology; notable is that only because of Ananthakrishnan's pressure, Ramamurthi took to studying Dermaptera and rose in ranks as a world authority of the Dermaptera, with only a B Sc degree.

Conclusion

Ananthakrishnan and I had an ideological conflict in 1996, and I decided to quit the Institute. To me transacting social and scientific business in such a context was daunting. On being successful in securing a permanent-residency status in Australia, I left bidding goodbye to him, and to several of my best friends and colleagues at the Institute and in Madras, of course with a heavy heart.

Ananthakrishnan is my teacher. I have learnt the basics of insect–plant interactions from him and with him. I respect him for his indefatigable tenacity to build

himself with a singular goal of achieving an enviable status in Indian entomology, zoology and science. Besides the science, I have learnt – from him – how to be responsive to people – be scientists of repute or less-than-ordinary persons. I admire his quality of responding to people immediately. He always told me that people write because they respect us; we need to, warmly, reciprocate that respect. This was a key learning for me.

Ananthakrishnan won several laurels: far too many for me to list here. I shall name a few key ones: a little more than 500 journal papers, 33 reference volumes and monographs[8,9], Rafi Ahmad Kidwai Award, Jawaharlal Nehru Fellowship, INSA Senior Scientist Award, Pitambar Pant Environmental Fellowship, and the Asiatic Society Gold Medal. He is a Fellow of the both National Science Academies at Bangalore and New Delhi, and the National Academy of Agricultural Sciences. Fellow thysanopterists from India and overseas have honoured him by naming different thrips after him[8]. *Ananthakrishnana* Bhatti 1967, *Ananthakrishnaniella* Stannard 1970, *Ananthakrishnanothrips* Bournier 1985; *Allelothrips ananthakrishnani* Stannard 1961, *Hydatothrips ananthakrishnani* Bhatti 1973, *Exothrips ananthakrishnani* Bhatti 1975, *Helionothrips ananthakrishnani* Wilson 1975, *Liothrips ananthakrishnani* Sen 1976, *Terthrothrips ananthakrishnani* Kudô 1978, *Plectrothrips ananthakrishnani* Okajima 1981 and *Hennigithrips ananthakrishnani* Johansen 1986. I imagine that no biologist could aspire for a greater honour than the accolades from fellow thysanopterists.

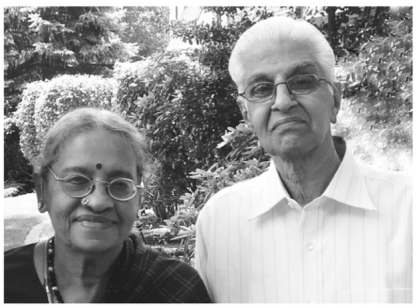

Figure 7. Ananthakrishnan and Menaka in America (2010).

This article would be incomplete if I do not refer to the enormous role Menaka played in his life. She has been, and continues to be, a tower of strength to Ananthakrishnan. She has stood by him in his joys and triumphs and in his tears and failures: a remarkable woman of sheer grit. Not many would know that Menaka is a talented artist, who can deftly use lead pencils and oil paints to create enchanting artworks. I have seen her lead-pencil art works of Jawaharlal Nehru and Indira Gandhi (signed by her) in the Ananthakrishnan–Menaka household.

More than 50 of us received our doctoral degrees working with him. He was a taskmaster. The scars caused by his whip are still on our backs. These scars are 'pleasant' memories of our association with him, and the science and the scientific discipline he endeavoured to inculcate into us. On behalf of my fellow student-colleagues and on my personal behalf, I wish this legend of Indian science, and Menaka Ananthakrishnan (Figure 7) many years of a peaceful and healthy life. A *vãkyã* of *Vyãsã* from *Guru Tattva*, quoted below, radiates my sentiments:

Agñana-timirandasyã
gñananjanã-salakayã |
Çakšurunmilitam yéna tasmai,
Shri Guravé nama: ||

> Salutations to the Guru, who with the instruments of brilliant knowledge and supreme wisdom has opened our eyes to sparkling light, which were swathed in the darkness of ignorance.
>
> – *Guru Gita* [the *Guru Tattva*]

This is the story of a determined man, who rose from being a modest college lecturer to the lofty position of the Directorship of ZSI. He had to jump several hurdles. He did; he swam against the current. Undiluted determination to develop his scientific personality was his singular goal. Similar to the focus of the young Arjunã during archery training with Drônaçaryã, to shoot his arrow, Ananthakrishnan saw only the bull's-eye in this vast world of diverse distractions. I see *vairãgyã* as the spirit of his life; I am sure that he would readily endorse and agree with me that this is what has been the spirit and purpose of his life.

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