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EDITORIAL



Kumar Krishna, in appreciation

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It is with admiration and fondness that we dedicate this special issue of *ZooKeys* to Professor Kumar Krishna, dean of Isoptera research. This collection of papers is a humble testament of appreciation by the various biologists who are dedicated to studying termites, insects that are popularly maligned but actually of profound behavioral and ecological importance. Kumar's influence extends beyond the scope of isopterological studies and so several of the papers included herein are from contributors on other lineages of insects who have been similarly inspired by his indomitable spirit.

Kumar grew up in Dehra Dun in northern India, in the foothills of the Himalayas. His father was a physician, and was also one of the first Indians to be commissioned in the British army, in fact serving as a major in World War I. Kumar went to Agra University, earning a Bachelor of Science in 1950, and shortly thereafter a Master of Science degree from Lucknow University in 1952. He then served as a Research Assistant (1952–1954) to Mittan Lal Roonwal (1908–1990) at the Forest Research Institute in Dehra Dun, where he developed his interest in Isoptera. Roonwal is well known among Isoptera workers for his comprehensive papers on the systematics and general biology of termites from India and surrounding areas. Immediately thereafter, he moved to the U.S. where he was a graduate student and employed as a research assistant at the University of Minnesota from 1954–55. It was during this time that he wrote to Prof. Alfred E. Emerson (1896–1976) about graduate studies, and was soon thereafter accepted into Emerson's lab. Emerson was a professor at the University of Chicago from 1929–1962 and well known as the leading authority on the systematics and general



Figure 1. Prof. Dr. Kumar Krishna.

evolution of termites. He was also a coauthor of the classic *Principles of Animal Ecology* (Allee et al. 1949), and a colleague of William Morton Wheeler (1865–1937), the authority on ants at Harvard University and predecessor of E.O. Wilson. It was Emerson and Wheeler who promoted the concept of an insect colony as a superorganism, and both men built massive, global collections of their research groups. Emerson was

also a colleague of the architects of the New Synthesis in evolutionary biology – Ernst Mayr (1904–2005), George Gaylord Simpson (1902–1984), Theodosius Dobzhansky (1900–1975), and G. [George] Ledyard Stebbins (1906–2000) – as well as president of several important scientific societies, and a member of the prestigious National Academy of Science. He was hugely influential, and he had a lasting impact on Kumar.

At the University of Chicago, Kumar began a comprehensive revision of the world genera of drywood termites, still the major reference on the family Kalotermitidae (Krishna 1961). It was there that Kumar met his lifelong partner, Valerie. Valerie was studying English Literature and worked at the University of Chicago Press as an editor and proofreader, a skill that would be thoroughly utilized later on. Kumar and Valerie married in 1960. Kumar completed his doctorate in Evolutionary Biology from the University of Chicago in 1961, and was employed as a National Science Foundation postdoctoral fellow there until 1962 when he and Valerie departed for New York, and where Emerson donated his massive collection of termites to the American Museum of Natural History (AMNH). Kumar became an instructor at City College of the City University of New York (CUNY) in 1962, and a Research Associate in residence in the AMNH's Department of Entomology (now the Division of Invertebrate Zoology). He became Assistant Professor in 1964, Associate Professor in 1969, and full Professor in 1973, principally teaching Biology, Entomology, and Evolutionary Biology. Valerie herself was a Professor of English at CCNY, whose particular interest was Chaucer and The Canterbury Tales, and Malory's Le Morte D'Arthur. Though it took time away from research, Kumar held many important administrative posts at CCNY, which had significant impact on City College, CUNY, and the biological sciences. He served as Chair of the Department of Biology (1963–1968), deputy chair for the Department of Biology (1972–1975, 1978–1981), as Chair of the Graduate Program in Biology (1972–1974, 1978–1981), a member of the Faculty Research Award Program (1978–1981, 1985–1993), and as a member of the University Committee on Research (1981–1983, 1994–1996). There were some very challenging times during this period. In the 1950's, City College was a crucible of intellectualism, but was overcome by student radicalism in the 1960's. In the 1970's, New York suffered a severe financial crisis that cut deeply into the budgets of CUNY and other city organizations. But, biology prospered at CCNY, and the department even embarked on a symbiotic program with the AMNH in graduate student training in systematics.

Despite Kumar's administrative and teaching loads, perhaps the most impressive achievements are that he continued to produce influential research, funded by National Science Foundation research grants. It was during this time, for example, that Kumar Krishna and Frances M. Weesner organized and contributed to the seminal, two-volume work, *Biology of the Termites* (1969–70), synthesizing all major topics on termite biology and systematics. Interestingly, publication of *Biology of the Termites* coincided with the first major book by E.O. Wilson, *The Insect Societies* (1971). It was the heyday of social insects. Although two recent volumes on termite biology have been produced (Abe et al. 2000; Bignell et al. 2010), Krishna and Weesner remains an invaluable reference. On far more adventurous fronts, Kumar and Valerie made numerous (some-



Figure 2. Valerie Krishna, Kumar Krishna, Renato Araujo (1912–1978), and Alexander Sokoloff (1920–2011) at the XII International Congress of Entomology, London, 1964.

times dangerous) expeditions to collect termite specimens. Of particularly note are four weeks collecting in Myanmar (1961); a ten-month expedition across Sri Lanka, India, Thailand, and Taiwan (1968–1969); eight weeks collecting in Borneo, Malaya, and Singapore (1977–1978); four weeks in Borneo (1984–1985); four weeks in Sumatra (1988); three weeks in Malaya (1990); and seven weeks in Sulawesi and Java (1992). When Kumar retired in 1996 he was appointed Emeritus Professor at CCNY and took up residence full time on the fifth floor at the AMNH, devoting his efforts to the world's largest and most comprehensive termite collection, and to research.

It is safe to say that no one today has such comprehensive knowledge of termites globally, particularly their systematics, taxonomy, morphology, biogeography, and the fossil record. When Emerson was working, for example, there was only one Cretaceous termite known, *Cretatermes carpenteri* Emerson. Now, there are 36 species and 32 genera, nearly a quarter of which we have had the pleasure of working with Kumar to describe, but more importantly he has united a critical study of fossil termites with that of their modern counterparts. Emerson would have been immensely pleased to see how much more we now know about termite diversity, relationships, and evolution, largely as a result of Kumar's efforts. Kumar's encyclopedic knowledge makes him the ideal person to have been the principal author of the upcoming and highly anticipated magnum opus, *Treatise on the Isoptera of the World* (2012). At 2400 single-spaced manuscript pages, the work is immense, 85% of which is a taxonomic compendium of the 3138 living and fossil termite species of the world (as of 26 March 2011) – incorporating a plethora of nomenclatural corrections made along the way, all based on direct study of over 4000 original taxonomic references and the more significant biological ones. Whereas many catalogues simply add to previous ones, propagating errors, this work was created de novo. Valerie applied her editorial acumen, spending months fastidiously proofing the manuscript for style and punctuation, a testament to the regard she and Kumar hold for each other.

Putting his considerable academic accomplishments aside, Kumar is one of the most positive, jovial, and generous individuals we know. Now in his eighties, his enthusiasm and energy for termite research seem tireless. When he worked on the Termitidae in Miocene Dominican amber, for example, Kumar spent hours each day hunched over his microscope, examining, sorting, comparing, and measuring hundreds of specimens and describing dozens of species. He worked like a graduate student. Indeed, there is perhaps no more enjoyable way for us to spend an afternoon than taking turns peering into a microscope alongside Kumar, discussing the details of some challenging fossil or exotic living specimen. We look forward to his residence on the fifth floor of the museum for many years to come, where we can peer through the microscope together in excited discussion.

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Taxa proposed by Kumar Krishna

Available names as of 5 September 2011

Unranked names (2):

Euisoptera Engel, Grimaldi, & Krishna Neoisoptera Engel, Grimaldi, & Krishna

Family-group names (6):

†Archeorhinotermitinae Krishna & Grimaldi Archotermopsidae Engel, Grimaldi, & Krishna †Carinatermitinae Krishna & Grimaldi †Cratomastotermitidae Engel, Grimaldi, & Krishna Sphaerotermitinae Engel & Krishna Syntermitinae Engel & Krishna

Genus-group names (19):

†Archeorhinotermes Krishna & Grimaldi *†Baissatermes* Engel, Grimaldi, & Krishna Bicornitermes Krishna Bifiditermes Krishna Ceratokalotermes Krishna Comatermes Krishna †Dharmatermes Engel, Grimaldi, & Krishna Dicuspiditermes Krishna †Garmitermes Engel, Grimaldi, & Krishna Incisitermes Krishna *†Kachinitermes* Engel, Grimaldi, & Krishna *†Khanitermes* Engel, Grimaldi, & Krishna Labiocapritermes Krishna Marginitermes Krishna †Melgartitermes Engel, Grimaldi, & Krishna †Mylacrotermes Engel, Grimaldi, & Krishna Postelectrotermes Krishna *† Tanytermes* Engel, Grimaldi, & Krishna Tauritermes Krishna

Species-group names (106):

Aciculitermes maymyoensis Krishna Allotermes denticulatus Krishna Allotermes papillifer Krishna †Amitermes lucidus Krishna & Grimaldi Angulitermes paanensis Krishna Angulitermes resimus Krishna †Anoplotermes conio Krishna & Grimaldi †Anoplotermes cacique Krishna & Grimaldi †Anoplotermes carib Krishna & Grimaldi †Anoplotermes naboya Krishna & Grimaldi †Anoplotermes naboya Krishna & Grimaldi †Anoplotermes naboria Krishna & Grimaldi †Anoplotermes nitaino Krishna & Grimaldi †Anoplotermes nitaino Krishna & Grimaldi *†Archeorhinotermes rossi* Krishna & Grimaldi *†Atlantitermes antillea* Krishna & Grimaldi †Atlantitermes caribea Krishna & Grimaldi †Atlantitermes magnoculus Krishna & Grimaldi *†Baissatermes lapideus* Engel, Grimaldi, & Krishna Bicornitermes bicornis Krishna Bicornitermes emersoni Krishna Bulbitermes prabhae Krishna Calcaritermes colei Krishna Calcaritermes rioensis Krishna Calcaritermes snyderi Krishna *†Caribitermes hispaniola* Krishna & Grimaldi Cavitermes rozeni Krishna *†Constrictotermes electroconstrictus* Krishna Coptotermes bentongensis Krishna *†Coptotermes hirsutus* Krishna & Grimaldi *†Coptotermes paleodominicanus* Krishna & Grimaldi Coptotermes sepangensis Krishna †Cryptotermes yamini Krishna & Bacchus *†Cryptotermes glaesarius* Engel & Krishna †Dharmatermes avernalis Engel, Grimaldi, & Krishna Dicuspiditermes cacuminatus Krishna Dicuspiditermes fissifex Krishna Dicuspiditermes kistneri Krishna Dicuspiditermes spinitibialis Krishna *†Dolichorhinotermes apopnus* Engel & Krishna Dolichorhinotermes lanciarius Engel & Krishna Epicalotermes planifrons Krishna Foraminitermes coatoni Krishna Foraminitermes harrisi Krishna *†Garmitermes succineus* Engel, Grimaldi, & Krishna Glyptotermes adamsoni Krishna & Emerson Glyptotermes concavifrons Krishna & Emerson *†Glyptotermes grimaldii* Engel & Krishna Glyptotermes guamensis Krishna & Emerson Glyptotermes hendrickxi Krishna & Emerson Glyptotermes jurioni Krishna & Emerson Glyptotermes kirbyi Krishna & Emerson Glyptotermes lighti Krishna & Emerson *Glyptotermes longipennis* Krishna & Emerson Glyptotermes longuisculus Krishna & Emerson

Glyptotermes nissanensis Krishna & Emerson Glvptotermes palauensis Krishna & Emerson *†Glyptotermes paleoliberatus* Engel & Krishna Glyptotermes parki Krishna & Emerson Glyptotermes parvoculatus Krishna & Emerson Glyptotermes rotundifrons Krishna & Emerson Glyptotermes schmidti Krishna & Emerson Glyptotermes seeversi Krishna & Emerson Glyptotermes sicki Krishna & Emerson Glyptotermes sinomalatus Krishna & Emerson Glyptotermes truncatus Krishna & Emerson Glyptotermes tuberifer Krishna & Emerson Homallotermes eleanorae Krishna Homallotermes exiguus Krishna *†Incisitermes peritus* Engel & Krishna Labritermes emersoni Krishna & Adams Labritermes kistneri Krishna & Adams †Mastotermes electrodominicus Krishna & Grimaldi *†Mastotermes electromexicus* Krishna & Emerson *†Meiatermes araripena* Krishna †Melgartitermes myrrheus Engel, Grimaldi, & Krishna *†Microcerotermes insulanus* Krishna & Grimaldi *†Microcerotermes setosus* Krishna & Grimaldi Microcerotermes uncatus Krishna Mirocapritermes valeriae Krishna †Mylacrotermes cordatus Engel, Grimaldi, & Krishna *†Nasutitermes amplioculatus* Krishna & Grimaldi *†Nasutitermes electrinus* Krishna *†Nasutitermes electronasutus* Krishna Nasutitermes fabricii Krishna *†Nasutitermes incisus* Krishna & Grimaldi *†Nasutitermes magnocellus* Krishna & Grimaldi *†Nasutitermes medioculatus* Krishna & Grimaldi *†Nasutitermes pilosus* Krishna & Grimaldi *†Nasutitermes rotundicephalus* Krishna & Grimaldi *†Nasutitermes seminudus* Krishna & Grimaldi Neocapritermes araguaia Krishna & Araujo Neocapritermes guyana Krishna & Araujo Neocapritermes talpoides Krishna & Araujo Neocapritermes taracua Krishna & Araujo Neocapritermes utiariti Krishna & Araujo †Parvitermes longinasus Krishna & Grimaldi Procapritermes parvulus Krishna

Procryptotermes falcifer Krishna

†Proelectrotermes holmgreni Engel, Grimaldi, & Krishna

†Subulitermes hispaniola Krishna & Grimaldi

†Subulitermes insularis Krishna & Grimaldi

† Tanytermes anawrahtai Engel, Grimaldi, & Krishna

†Termes primitivus Krishna & Grimaldi

†Termopsis ukapirmasi Engel, Grimaldi, & Krishna

†Velocitermes bulbus Krishna & Grimaldi