

# REMEMBRANCE: Terry L. Erwin (1940–2020): Un científico muy *Agra*-dable

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It is with a profound sadness that we acknowledge the passing of the ineffable Terry L. Erwin on 11 May 2020. Along with being a true giant in the fields of entomology and biodiversity science, Terry was a steadfast colleague, an unsurpassed curator of specimens and information, an indefatigable mentor, and most of all a dear friend. Terry was a powerhouse in the field of biodiversity science, but he was also a very “nice” (= “agradable” in Spanish) scientist who emitted a playfulness that belied his extensive knowledge and deep understanding of the world’s organismic diversity. Terry’s sense of humor often made itself apparent in the names he gave to new species in his favorite genus of carabid beetles—the genus *Agra*, also known as the elegant canopy beetles, including *Agra cadabra*, *Agra memnon*, *Agra vation*, and (of course) *Agra dable*—a very nice carabid that reminds us of our mentor and friend.

After completing his Ph.D. at the University of Alberta under the supervision of George Ball, and postdoctoral research at Harvard University with Philip J. Darlington, Jr., Terry joined the Department of Entomology at the Smithsonian’s National Museum of Natural History (NMNH), where he served as curator for almost 50 years. In 1974, Terry traveled to Barro Colorado Island, Panama to estimate the biomass of canopy arthropods as part of a project studying the diet of silky anteaters. During that trip, he devised a revolutionary technique now known as “canopy fogging,” where he used thermal foggers and biodegradable insecticide to easily collect mass quantities of previously little-known canopy dwelling arthropods. Over the following decades, Terry worked extensively in the Peruvian Amazon, and on a long boat ride along the Rio Madre de Dios met Peruvian ornithologist Grace Servat, who became his wife and life-long companion. From this locality, he described a beetle, *Agra grace*. In Terry’s words: “The epithet *grace* is an eponym, based on the given name of the Peruvian Ornithologist, Grace Servat, who has shared the bird-infested Amazon and Andes with me for many years.” For

the past 10 years, Terry has performed most of his fieldwork in Yasuní National Park, Ecuador, where he worked every summer until last year.

If you asked Terry to classify himself, he would tell you that he was a carabidologist: an entomologist who studies the taxonomy of a particularly charismatic and beautiful group of predatory beetles (specializing even further on the genus *Agra*). However, if you asked Terry what he thought of as his most significant contribution to science, his response would be a one-page paper published in the *Coleopterists Bulletin* in 1982, emerging from his self-described naïveté to come up with an estimate of 30 million species of insects in the world: “my naïve hypothesis built on some naïve assumptions, and naïve arithmetic” (Rice, 2015). As discussed in our own paper published in this volume (García-Robledo et al., 2020), Terry’s publication became a major wakeup call for humanity to discover, understand, and preserve biodiversity on Earth. When asking him about this original estimate, Terry used to laugh and say that his estimate might actually be very conservative. When asking him to give a number of arthropod species, he would laugh again and say “gazillions!”

Terry was a great field biologist, but he was so much more. As Curator of Entomology at the NMNH for his entire professional career, he oversaw the vast museum beetle collections. He also served as NMNH Deputy Director for Research, Director of the NMNH BIOLAT program, and the Smithsonian’s SI/MAB Biological Diversity Program. Through his experiences in these roles as well as in the field, he came to understand all of the hurdles and pitfalls that face taxonomists in their race to discover and describe taxa new to science.

In a brave and bold attempt to speed up the process of publishing new species of animals Terry, with the help of Lyubomir Penev, set out to create a new on-line, open-access taxonomic journal. In 2008 with Terry as Editor-in-Chief, ZooKeys was successfully



**FIGURE 1** Remembering the “beetle man” Terry L. Erwin. (a) Terry searching for carabid beetles under the bark of a tree on Barro Colorado Island, Panama, 1980. (b) In Bulgaria, during a visit to his friend Lyubomir Penev, founder of the journal *ZooKeys*, 2007. (c) Terry used to arrive to his office in the National Museum of Natural History at 05:00 AM to work on his collections, here with some specimens from the genus *Agra* (Carabidae). (d) Terry L. Erwin and Grace Servat (front row) on their way to Pakitza Station, Manú National Park, in the Peruvian Amazon, 1987. All photographs from the archives of Grace Servat

“launched to accelerate biodiversity research.” In the latest count, this journal has published 14,450 pages including 525 separate papers describing 5,565 new species and subspecies, 382 new genera, and 26 new families (Erwin, Stoev, Georgiev, & Penev, 2015). Among the innovations of *ZooKeys* were new accelerated workflows for uploading and visualizing specimen data electronically as well as the automated registration of new taxa immediately upon publication. *ZooKeys* is now recognized as the most reliable venue for publication, integration, and dissemination of taxonomic data on animals. The press releases that accompanied many of the articles published in *ZooKeys* were also a great innovation by informing and exciting the media about biodiversity and popularizing taxonomic discovery. Not long after the appearance of *ZooKeys*, a similar on-line taxonomic journal for plants, *PhytoKeys* (whose Editor-in-Chief happened to be right down the hall from Terry in the Museum), was similarly launched following the leadership of Terry Erwin (see Kress, Knapp, Stoev, & Penev, 2018). Along with facilitating the description of so many taxa in his role as the Editor-in-Chief of *ZooKeys*, Terry himself is responsible for describing over 415 species, 22 genera, and four tribes of beetles (Pensoft Editorial Office, 2015)!

Terry made substantial contributions to the field of tropical biology and global change. His long-term datasets on tree diversity and canopy biomass in Yasuní were central for publications in journals such as (e.g.,) *Science*, *Nature*, and *PNAS* on how tropical forests are responding to the climate crisis. Together with Terry, we pioneered DNA barcode techniques to identify insect herbivore host plants using DNA from beetle gut contents and to discern species identities of cryptic tropical insect larvae (García-Robledo, Kuprewicz, Staines, Kress, & Erwin, 2013). We also started an ongoing project evaluating

the effects of global warming on arthropod communities at La Selva Biological Station, Costa Rica, and along elevational gradients in the region.

One of Terry's most lasting contributions to tropical science lies in the strong impact he has had on students' lives, especially in field and museum settings. Terry participated as an invited faculty member on numerous graduate-level field courses in the Peruvian Amazon and Costa Rica, run by the Organization for Tropical Studies (OTS). In the field, Terry was always on call, eager to share his insight with students. He was able to seamlessly blend muddy boots field experiments with meticulous taxonomic identification work in the laboratory: a hallmark of his career. Terry was especially passionate about teaching the importance of accurately naming species—“only by knowing something's name can you understand it, care about it, and work to protect it. Knowing these names (e.g., of species), gives each of us our own ecological context.”

Terry was the epitome of tropical biology. His departure will leave a gaping hole in our field, but Terry would be happy to know that his legacy continues through the many scientists he has trained and inspired over his career. Terry leaves a lasting imprint on tropical science and how we view the world's biodiversity and especially the human place within it. We will continue to follow Terry's advice to his students: “If you want to understand biodiversity, go to the tropics—once there, you will be hooked for life.”

As Terry used to say, bug hugs amigo. Y besitos from Grace. We will miss you so much.

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## REFERENCES

- Erwin, T., Stoev, P., Georgiev, T., & Penev, L. (2015). ZooKeys 500: Traditions and innovations hand-in-hand servicing our taxonomic community. *ZooKeys*, 500, 1–8. <https://doi.org/10.3897/zookeys.500.9844>
- García-Robledo, C., Kuprewicz, E. K., Baer, C. S., Clifton, E., Hernández, G. G., & Wagner, D. L. (2020). The Erwin equation of biodiversity: From little steps to quantum leaps in the discovery of tropical insect diversity. *Biotropica*, THIS ISSUE.
- García-Robledo, C., Kuprewicz, E. K., Staines, C. L., Kress, W. J., & Erwin, T. L. (2013). Using a comprehensive DNA barcode library to detect novel egg and larval host plant associations in a Cephaloleia rolled-leaf beetle (Coleoptera: Chrysomelidae). *Biological Journal of the Linnean Society*, 110, 189–198.
- Kress, W. J., Knapp, S., Stoev, P., & Penev, L. (2018). PhytoKeys at 100: Progress in sustainability, innovation, and speed to enhance publication in plant systematics. *PhytoKeys*, 100, 1–8. <https://doi.org/10.3897/phytokeys.100.27591>
- Pensoft Editorial Office (2015). Celebrating with the 'beetle' man: Terry Erwin's 75(th) birthday. *ZooKeys*, 541, 1–40. <https://doi.org/10.3897/zookeys.541.7316>
- Rice, M. E. (2015). Terry L. Erwin: She had a black eye and in her arm she held a skunk. *American Entomologist*, 61(1), 9–15. doi: 10.1093/ae/tmv002. <https://doi.org/10.1093/ae/tmv002>