



# Diana Wall: A Champion for lives underfoot

John C. Moore<sup>a,b,1</sup>, David C. Coleman<sup>c</sup>, Camille T. Dungy<sup>d</sup>, Tony Frank<sup>e</sup>, Kathleen A. Galvin<sup>f</sup> , Peter C. de Ruiter<sup>g</sup>, Diane M. McKnight<sup>h</sup>, Johan Six<sup>i</sup>, and Wim H. van der Putten<sup>j,k</sup> 

Diana Wall, a distinguished environmental and sustainability scientist, passed away on March 25, 2024, at age 80 from a sudden illness. Diana was a University Distinguished Professor in the Department of Biology, served as the Director of the Natural Resource Ecology Laboratory (NREL), and was founding Director of the School of Global Environmental Sustainability (SoGES) at Colorado State University. Diana served as president of six scientific societies including the American Institute of Biological Sciences, the Ecological Society of America, and the Association of Ecological Research Centers. Her science and engagement with the community led to her being elected a fellow of the Society of Nematology, the Ecological Society of America, the American Association for the Advancement of Science (AAAS), and the National Academy of Sciences. She was a Laureate of the Tyler Prize for Environmental Achievement, selected as a Tansley Lecturer for the British Ecological Society, and had her research site in Antarctica—Wall Valley—named in her honor. Above all, her career impacted so many people and helped shape the fields of soil ecology and sustainability science. It all started with an interest and love for nematodes.

Diana studied biology (BS) and plant pathology (PhD) as an undergraduate and graduate student at the University of Kentucky. Her interest in ecology developed during her time at University of California, Riverside (1972 to 1993), the International Biological Program Desert Biome site, and the NSF Long-Term Ecological Research program. She established herself as a leader in soil ecology for her research on the roles of nematodes and the full breadth of soil biota on soil biogeochemistry, plant growth, and ecosystem processes (1). In the 1970's and 1980's soil ecology was developing as a field in ecology, moving beyond cataloging biota to studying their importance to ecosystem processes. At a time when the central focus of network site-based research was dedicated to plant diversity experiments, Diana was at the forefront of a movement that transformed the compartmentalized field of soil animal and microbe researchers into a soil biodiversity research community. During her tenure at Colorado State University (1993 to 2024), she combined climate change-inspired studies on nematodes in the soil food web of the Dry Valleys of Antarctica with work on soil biodiversity and ecosystem functioning. From lessons gained through the study of humble lives underfoot, engagement through site-based science networks and collaboration, she established research and education programs at the NREL and SoGES to better understand earth systems processes and their importance to humankind.

Diana championed and practiced interdisciplinary and transdisciplinary approaches and her enthusiasm for taking science to the public was unbounded. Diana had a knack for working across disciplinary boundaries to address challenges



**Diana Wall.** Image credit: Colorado State University School of Global Environmental Sustainability.

by encouraging and bringing together researchers in a highly inclusive way (2).

Author affiliations: <sup>a</sup>Natural Resource Ecology Laboratory, Colorado State University, Ft. Collins, CO 80524; <sup>b</sup>Department of Ecosystem Science and Sustainability, Colorado State University, Ft. Collins, CO 80524; <sup>c</sup>Odum School of Ecology, University of Georgia, Athens, GA 30602; <sup>d</sup>Department of English, Colorado State University, Ft. Collins, CO 80524; <sup>e</sup>Office of the Chancellor, Colorado State University, Ft. Collins, CO 80524; <sup>f</sup>Department of Anthropology and Geography, Colorado State University, Ft. Collins, CO 80524; <sup>g</sup>Biometris, Wageningen University, 6708 PB Wageningen, The Netherlands; <sup>h</sup>Institute of Arctic and Alpine Research, University of Colorado, Boulder, CO; <sup>i</sup>Department of Environmental Systems Science, ETH Zurich, 8092 Zurich, Switzerland; <sup>j</sup>Department of Terrestrial Ecology, Netherlands Institute of Ecology, 6708 PN Wageningen, The Netherlands; and <sup>k</sup>Department of Nematology, Wageningen University, 6708 PB Wageningen, the Netherlands

Author contributions: J.C.M., D.C.C., C.T.D., T.F., K.A.G., P.C.d.R., D.M.M., J.S., and W.H.v.d.P. wrote the paper.

The authors declare no competing interest.

Copyright © 2024 the Author(s). Published by PNAS. This article is distributed under [Creative Commons Attribution-NonCommercial-NoDerivatives License 4.0 \(CC BY-NC-ND\)](https://creativecommons.org/licenses/by-nc-nd/4.0/).

<sup>1</sup>To whom correspondence may be addressed. Email: John.Moore@colostate.edu.

Published August 12, 2024.

## Nematodes

*For Diana Wall, in memoriam*

Go out to the desert. Far from anyone's anywhere. There are reasons for everything everywhere. If you want answers, look

where you are. The desert: that cold dry valley—that wide opening. There is never nothing to look at. Never say nothing but dirt.

Say you see tan and more tan until you invent a color wheel for tan tones. Dust rock stone tan. Ancient glacial residue tan. Tan

like the hide of some furred animal though no four-legged creature lives in this place. Cold tan. Tan of scree and solitude. A vastness.

Begin to see differences between this patch of tan soil and that. The human heart's a super predator—like the mind—hungry

and omnivorous. Rarely docile. Sift and sift until you find the one solution that solves for nearly everything. See roundworms

writhing through this compaction—like only hope can move. Not at all small when considered in context. Why imagine one massive God

when magnification reveals so many creators inside a handful of soil. Maybe we can save the world. But we must see

first the tiny examples. Tiny habitat builders. Tiny fixers—sequestering carbon, turning that form of harm over and over until harm might not be a word for carbon anymore. A trillion quadrillion microscopic lives. Tiny

change makers. Tiny predators. Tiny prey. The work of the heart—like the work of the mind—is to build a system for survival.

Go out to the dry valley. Then come back and show us what you find

—*Camille T. Dungy, May 6, 2024*

Her approach was pleasantly and unavoidably effective and everybody knew that deadlines needed to be met when she returned from the Antarctic ice. She would lead discussions by introducing an unconventional mix of topics, then turn them to address cross-cutting interactions and offer a call to action. This was on full display at the 2011 Wageningen Soil Conference, where during a discussion on the importance of soil biodiversity when with a bang of her fist on the table and an emphatic “let’s do it” initiated the Global Soil Biodiversity Initiative (GSBI). She became the founding chair of the GSBI and secured funding from Colorado State University, which guaranteed the independence of this grass-roots organization.

Diana tirelessly advocated for the recognition of and maintenance of soil biodiversity to the point that the need to protect it for the well-being of humankind is now high on the international policy agenda. Soil is alive, not a sterile vessel of

nutrients and water for plant growth as many textbooks of the past had depicted. Soil is more than “dirt”—a four-letter word in the soil ecology realm that implied a derogatory tone, something to be washed off—as soil was complex, vital, indeed—priceless. These sentiments were not new of course as Charles Darwin (3, 4) had published a series of papers on the biology and ecology of earthworms and their importance to the earth system process, Hans Jenny (5) recognized the importance of organisms to soil formation, and soil ecologists and agronomists had made the point as well. Yet, these truths were often overlooked by the public and many in the scientific community. Diana reminded us with clarity that as small as they are, soil organisms are inherently significant, are ubiquitous and through their actions collectively form the foundation of much greater phenomena.

In 2013, at her lecture to the AAAS for the Tyler Prize for Environmental Achievement, she shared how Antarctic soils away from streams were thought to be devoid of all but microbes. She asked whether this was indeed true. Upon sampling Antarctic soils—there they were! Diana and her colleagues discovered several invertebrate taxa, though low in diversity, represented different functional groups found in more diverse soils. Diana also was fascinated by the connections across the expansive polar desert landscape and the ephemeral streams that flow only in the summer. The picture of Diana in the McMurdo Dry Valleys shows her collecting a sample of soil interstitial water when one of her long-term experimental sites was suddenly saturated by streamflow during a warm sunny summer. Her smile reflects her love of working in the field and her special joy in the adventure of discovery shared with colleagues.

Earlier in 2006, Diana received an honorary doctorate from the Utrecht University (The Netherlands) during its 370th-anniversary celebration. This exceptional award was given to Diana during a traditional ceremony in the Utrecht Domkerk, the church where the Netherlands was founded as an independent country. Diana was given only 2 minutes to speak. For Diana that was enough as she had two quotes. The first was from U.S. President Franklin Roosevelt: “A nation that destroys its soil, destroys its future.” The second by herself: “A handful of soil contains thousands of species all working for the quality of our lives.” Herewith Diana silenced the audience, poignantly declaring to everyone the importance of soils and soil biodiversity in an impressive and memorable way. Diana carried this message further by speaking at the Convention of Biological Diversity, influencing the Joint Research Centre of the European Union and the Food and Agriculture Organization of the United Nations, ultimately leading to the Global Soil Biodiversity Atlas (6) and the first Global Soil Biodiversity Assessment. Under her leadership, the GSBI hosted conferences in Dijon, Nanjing, and Dublin. During Covid, Diana started the GSBI Speakers webinars, to enable young researchers to stay engaged with the community on soil biodiversity topics.

Diana could always see the significance and beauty of the seemingly insignificant. When coupled with her openness and inviting and welcoming attitude, she provided a clarity of purpose and direction. These were the bedrock values of her leadership at Colorado State University as the Director of the NREL (1993 to 2005) and Founding Director of the SoGES (2008



Diana Wall collecting soils in the Wall Valley of Antarctica. Image credit: Byron Adams (Brigham Young University, Provo, UT).

to 2023). She championed big ideas to be pursued and shared with the scientific community, public, and policymakers. Activities included the Aldo Leopold Leadership program, a Student Leadership program, the Global Challenge Research program, and establishing a minor in Global Environmental Sustainability reaching across academic disciplines, university departments, and colleges engaging the sciences, arts, and humanities. All gained a holistic understanding of environmental science and sustainability and trained to communicate their science.

Diana was a generous mentor to her students and post-docs. She was open-minded, funny, and highly enthusiastic, which put people at ease and made them aware that what they did and had to say was important. She was genuinely engaged with out-of-the-box thinking about her research and encouraged students around her to use their research to impact science. Questions were asked out of genuine interest, respecting what each individual brought to the dialog. She made one feel like they were part of a broader community. Then again, she provided feedback, guidance, and mentorship in a direct and “no-nonsense” way. For some people, this was a bit intimidating, believing that they had drawn her ire. But to those who knew her, it would bring on a knowing smile, as all would quickly learn that Diana did it

with the best intentions. This direct and honest approach had a big impact on early career, women, minoritized, and established scientists.

Diana threw herself into the social side as well. Who could forget Diana leading over 50 scientists in a conga line dancing their way from the scene of the conference dinner back to the dormitory at the International Colloquium on Soil Zoology, in Uppsala, Sweden, her leading a karaoke rendition of “Ghost Nematodes in the Sky” at the Soil Ecology Colloquium in Taipei, Taiwan, her being thrown into a pool by NREL students upon receiving the Distinguished Career award from the Soil Ecology Society in Palm Desert, or her annual greeting cards from the Antarctic “Worm Herders.” What fun!

To simply list Diana’s accomplishments and accolades as an accomplished scholar and educator should not overshadow the truth that she was a wonderful human being. She left behind her sister Ann B. Wall, two stepsisters, nieces and nephews and their families, and a multitude of friends and colleagues. Her legacy lies in the inspiration she showed and the lives she changed. We will miss her wit, sarcasm, wonderful smile, and love of Kentucky and Lakers basketball. We will miss our colleague. We will cherish the legacy and memory of our friend.

1. D. W. Freckman, *Nematodes in Soil Ecosystems* (University of Texas Press, Austin, TX, 1982), p. 220.
2. C. T. Dungy, "Nematodes: For Diana Wall, in memoriam" in *Presented at the Memorial Celebration for Diana Wall*, (School of Global Environmental Sustainability, Colorado State University, Ft. Collins, CO, 2024).
3. C. R. Darwin, *The Formation of Vegetable Mould, Through the Action of Worms, with Observations on Their Habits* (John Murray, London, 1881).
4. W. Gifford *et al.*, Review of the formation of vegetable mould, through the action of worms, with observations on their Habitats. *The Q. Rev.* **153**, 179–202 (1882).
5. H. Jenny, *Factors of Soil Formation – A System of Quantitative Pedology* (McGraw-Hill, 1941).
6. A. Orgiazzi *et al.*, *Global Soil Biodiversity Atlas* (European Commission, Publications Office of the European Union, Luxembourg, 2016).