EO Wilson's Love of Ants – and All Things Living*

Raghavendra Gadagkar

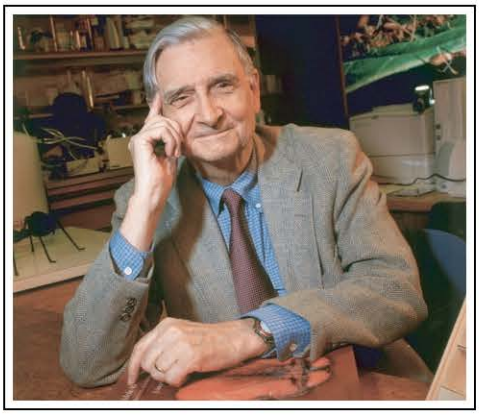

Figure 1. Edward Osborne Wilson (1929–2021). Photo: Jim Harrison, CC BY 2.5.

The American myrmecologist, naturalist and writer Edward Osborne Wilson passed away on December 26, 2021. Wilson's philosophy was "Love the organisms for themselves first, then strain for general explanations, and, with good fortune, discoveries will follow." Wilson was primarily a social insect specialist who, with characteristic energy, reached out to other organisms and disciplines. Wilson gathered wisdom about the distribution of ants and other animals and plants that allowed him to build theories and test their predictions for years to come.

Having just read *Scientist – E. O. Wilson: A Life in Nature* by Richard Rhodes [1] and begun to re-read Wilson's Pulitzer prize-

Raghavendra Gadagkar is DST Year of Science Chair Professor at the Centre for Ecological Sciences, Indian Institute of Science, Bangalore, Honorary Professor at JNCASR, and Non-Resident Permanent Fellow of the Wissenschaftskolleg (Institute for Advanced Study), Berlin. During the past 40 years he has established an active school of research in the area of animal behaviour, ecology and evolution. The origin and evolution of cooperation in animals, especially in social insects, such as ants, bees and wasps, is a major goal of his research.
http://ces.iisc.ac.in/hpg/ragh.
https://www.researchgate.net/profile/Raghavendra_Gadagkar

*Vol.27, No.8, DOI:https://doi.org/10.1007/s12045-022-1427-x

Reprinted with permission from *The Wire Science*, 26th January 2022. https://science.thewire.in/society/history/remembering-edward-osborne-wilson-naturalist-raghavendra-gadagkar/

Keywords
Ants, insect societies, sociobiology, biogeography.

winning *On Human Nature* [2], I was knocked out of my senses when my wife called out, "have you heard, Wilson has just died?". During the next two weeks, I painfully retrieved my fondest memories of Ed Wilson, both personal and professional and grieved as one would at the passing of a parent. But the show must go on. So, I have now pulled myself up to celebrate Wilson's life and work, with the enthusiasm befitting his life and work.

Ants of Alabama

Born in Birmingham, Alabama, on June 10, 1929, Edward Osborne Wilson, Jr., enjoyed a childhood rich in natural history and adventure, if limited in social interactions with family and his peers.

Born in Birmingham, Alabama, on June 10, 1929, Edward Osborne Wilson, Jr., enjoyed a childhood rich in natural history and adventure, if limited in social interactions with family and his peers. Catching snakes and butterflies and, above all, collecting ants, kept him busy and well-equipped to assume leadership roles at a young age in boy scout camps.

"A nomadic existence made Nature my companion of choice because the outdoors was the one part of my world I perceived to hold rock steady. Animals and plants I could count on; human relationships were more difficult.", Wilson recalls in his inspiring [3] autobiography *Naturalist* [4] written in 2006, (of which there is also a charming graphic adaptation [5] by Jim Ottaviani, famous for his graphic novels about scientists such as Stephen Hawking and Dian Fossey).

Perhaps an even better window to Wilson's life and thoughts at that early age is *Anthill*, a novel that Wilson wrote in 2010 chronicling the adventures of Raphael Semmes Cody or Raff, an unmistakable alter-ego of Wilson. In the words of Jeffrey D. Sachs, director of the Earth Institute, *Anthill* [6] is "a triumphant epic of life by the world's greatest naturalist...War and Peace—among the ants, the land developers, and the environmentalists and preachers."

Wilson was nothing if not precocious. His biographer Richard Rhodes [1] recounts an inspiring story. Securing admission to the undergraduate programme at the University of Alabama, Wilson had decided that the topic of his undergraduate thesis would be

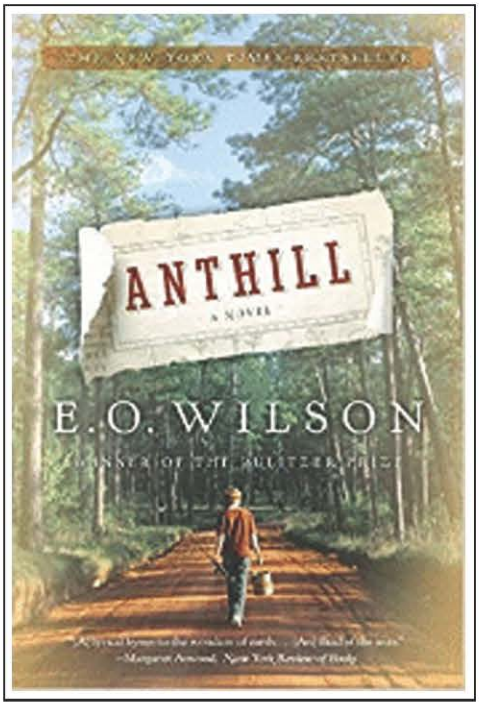

Figure 2

the ants of the state of Alabama. Naively assuming that all undergraduates had to declare and justify the topics of their thesis immediately, he went directly to the Chair of the biology department and said, "I'm up from Mobile. I'm here to show you my project".

The Chair took him to one Professor Williams, who in turn discussed Wilson's proposed project with him, and immediately allotted him one of the cubicles meant for graduate students. As Rhodes says: "The department chair and the professor of botany had both recognized the newly arrived seventeen-year-old's commitment and potential and welcomed him to the community of scientists."

Ants of Australia, Sri Lanka, New Guinea and New Caledonia

After his under graduation from the University of Alabama and a brief stint at the University of Tennessee, Wilson was not only accepted at Harvard but also won one of their prestigious Junior Fellowships, awarded to a small number of exceptionally bright young scholars across all disciplines. Wilson used his fellowship to fulfil his dream of travelling to the world's unexplored frontiers to collect ants and other creatures.

Wilson conveys the passion and satisfaction he experienced during this expedition at the age of 25—finding ants new to science every day—in his autobiography *Naturalist*.

Figure 3. A photograph of E. O. Wilson in Panama, taken by Mark Moffett in 1990. Copyright Minden Pictures.

Wilson conveys the passion and satisfaction he experienced during this expedition at the age of 25—finding ants new to science every day—in his autobiography *Naturalist* [4], but he is a little shy about his personal life and passion. For a glimpse of that side

of Wilson, we must turn to his biography by Rhodes:

"Then, in his second year as a Junior Fellow, at about the time he and Irene were planning to marry, he was invited to collect ants in the South Pacific for the Harvard Museum. Going away for a year might have soured their romance. "I'd dreamed of doing this," Wilson told me, recalling his childhood expectations. "I realized it could be a tremendous personal experience for me—to be a pioneer, the first to go into areas where ants had never been collected before. I explained all this to Irene. We were engaged, but I told her, 'I really need to go.' It was something like a soldier leaving for war. I explained what an extraordinary advantage I was being offered, doing original work in a completely unstudied part of the world. And she said: 'Go.' And go I did, with each of us pledged to write each other every day."

The two said goodbye at Boston's Logan Airport on 26 November 1954, the day after Thanksgiving, both of them heart-stricken at the long separation that opened before them. "I am proud that you didn't cry," Wilson wrote her later that day from Louisville, where he had stopped over to visit his mother, "but I want you to know that it was the most painful thing I had ever experienced." He didn't cry, either, not when they separated, but as soon as he boarded he started "crying like a baby."

Wilson wrote frequent, loving letters to Irene during this trip, describing his exultation at what he saw and collected. In the *Naturalist*, Wilson tells us:

"My archetypal dream came clear: Take me, Lord, to an unexplored planet teeming with new life forms. Put me at the edge of virgin swampland dotted with hummocks of high ground, let me saunter at my own pace across it and up the nearest mountain ridge, in due course to cross over to the far slope in search of more distant swamps, grasslands, and ranges. Let me be the Carolus Linnaeus of this world, bearing no more than specimen boxes, botanical canister, hand lens, notebooks, but allowed not years but centuries of time.

And should I somehow tire of the land, let me embark on the sea

"Take me, Lord, to an unexplored planet teeming with new life forms. Put me at the edge of virgin swampland dotted with hummocks of high ground, let me saunter at my own pace across it and up the nearest mountain ridge, in due course to cross over to the far slope in search of more distant swamps, grasslands, and ranges."

– EO Wilson

in search of new islands and archipelagos. Let me go alone, at least for a while, and I will report to You and loved ones at intervals and I will publish reports on my discoveries for colleagues. For if it was You who gave me this spirit, then devise the appropriate reward for its virtuous use."

Wilson's philosophy was "Love the organisms for themselves first, then strain for general explanations, and, with good fortune, discoveries will follow. If they don't, the love and the pleasure will have been enough."

Wilson's philosophy was "Love the organisms for themselves first, then strain for general explanations, and, with good fortune, discoveries will follow. If they don't, the love and the pleasure will have been enough." But of course, like Darwin on his voyages, Wilson gathered wisdom about the distribution of ants and other animals and plants that allowed him to build theories and test their predictions for years to come. Perhaps Wilson's most important theoretical contribution was in the field of island biogeography.

The Theory of Island Biogeography

In the 1960s, Wilson collaborated with Robert MacArthur, one of the most gifted theoretical ecologists, to construct mathematical models and develop the equilibrium theory of island biogeography [7]. They showed that the number of species on an island would be a compromise between two opposing forces. The more species already present on the island, the fewer new species would arrive by immigration from the nearest mainland. Conversely, the more the number of species present on the island, the more the number of species would go extinct. The balance between immigration and extinction would predict the equilibrium number of species seen on the island.

Wilson collaborated with Robert MacArthur. They showed that the number of species on an island would be a compromise between two opposing forces. The more species already present on the island, the fewer new species would arrive by immigration from the nearest mainland.

Simple extensions of the basic idea predict that the greater the island's distance from the mainland, the slower the rate of immigration would be. But the rates of extinction would be unaffected by distance from the mainland. Thus, islands closer to the mainland would have more species than islands farther away. By similar logic, the smaller the island, the greater would be the rates of extinction. But the rates of immigration would not be affected by the size of the island. Consequently, larger islands would have more species than smaller islands.

The theory of island biogeography has endured and continues to inspire research [8] for almost half a century. Ecologists to this day are writing papers such as "*A roadmap for island biology: 50 fundamental questions after 50 years of The Theory of Island Biogeography*" [9]. Even more pleasingly, the theory of island biogeography has been at the forefront of conservation biology, providing a rational basis for the design of nature reserves.

The theory of island biogeography has endured and continues to inspire research [8] for almost half a century.

The Social Insects

I like to think that Wilson was primarily a social insect specialist who, with characteristic energy, reached out to other organisms and disciplines. I like to think of ants as his core interest, from which he reached out successively, and very successfully, to all social insects and then to all social animals, all of biodiversity, with an inevitable foray into activism for conservation, to human nature and finally to the unity of all knowledge.

Perhaps Wilson might have agreed with this characterisation of the structure of his intellectual canvas. Wilson has given us four major books on social insects, two written by himself and two co-authored with his long-time friend and colleague, Bert Hölldobler.

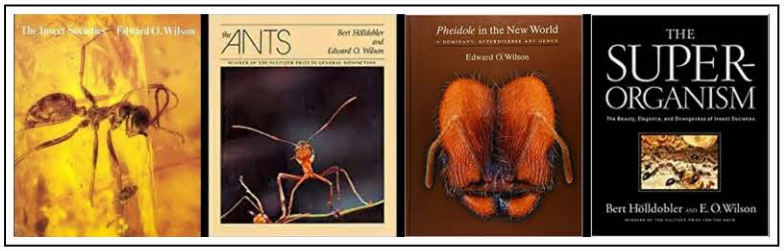

Figure 4

On the topic of social insects, *The Insect Societies* (1971) [10] is, without doubt, Wilson's most famous book, and in my reckoning, the most famous book by any author. "In comprehensiveness of scope and modernity of outlook, *The Insect Societies* can truly be said to be unique. For many years to come, it will surely con-

stitute a benchmark... The book is likely to become a collector's item.", wrote Caryl Parker Haskins, President, Carnegie Institution of Washington and fellow entomologist and myrmecologist, in the *New York Times*.

To this day, *The Insect Societies* has remained the go-to book for basic information and for citing as a general reference at the beginning of most research papers on the subject. It is currently out of print, and a used copy on Amazon.in is going for Rs. 40,923! My copy is priceless as it is signed for me by the author!

These words were prescient. To this day, *The Insect Societies* has remained the go-to book for basic information and for citing as a general reference at the beginning of most research papers on the subject. It is currently out of print, and a used copy on Amazon.in is going for Rs. 40,923! My copy is priceless as it is signed for me by the author!

A compulsive synthesiser, Wilson placed the study of insect societies in the unifying framework of population biology and genetics. Fifty years on, it is easy to see how far-sighted he was. Despite significant progress, much of his agenda for the study of social insects remains to be accomplished.

Wilson's next major book on social insects was *The Ants* (1990) [11], also written in collaboration with Bert Hölldobler. Wilson is not shy about telling us how this project came about [4]:

"One day, as Hölldobler grew more serious about leaving [Harvard], we decided to write a book recounting everything we knew about ants. And while we were at it, we asked ourselves, why not try for a book that has everything everybody ever knew about ants, throughout history? Such a project would take a great deal of effort and time, and it might fall short of the goal we set. But what a worthy conceit! Try for the impossible, as Floyd Patterson, the undersized heavyweight boxing champion of the world once said, in order to accomplish the unusual. The result was *The Ants*, published by Harvard University Press in 1990. It contained 732 double-columned pages, hundreds of textbook figures and color plates, and a bibliography of 3,000 entries. It weighed 7.5 pounds, fulfilling my criterion of a magnum opus—a book which when dropped from a three-story building is big enough to kill a man."

It should come as no surprise that when asked about the source of his motivation to do science, Wilson cites 'love of the field' and

'ambition'.

In 2003 Wilson single-handedly produced an even more massive tome, *Pheidole in the New World – A Dominant, Hyperdiverse Ant* [12], focussing on just one genus of ants and that too only those species found in the New World (those in India await their Wilson!). Here, Wilson draws, describes, and classifies 625 species—of which 341 are new to science—and brings together all that is known about them, often drawing on his personal observations. In *The Times Literary Supplement*, the British entomologist Gadd F. Robinson said:

In 2003 Wilson single-handedly produced an even more massive tome, *Pheidole in the New World – A Dominant, Hyperdiverse Ant* [12], focussing on just one genus of ants and that too only those species found in the New World (those in India await their Wilson!). Here, Wilson draws, describes, and classifies 625 species—of which 341 are new to science—and brings together all that is known about them, often drawing on his personal observations.

"Faced with an illustration and explanation such as Edward O. Wilson's *Pheidole in the New World*, we can only be stunned... Wilson's monograph is the product of a master craftsman. It reeks of authority. Opening sections explain anatomy, terminology and abbreviations. There are 100 pages of keys. Each one-page species treatment includes line drawings of the major and minor workers in lateral view, frontal views of the heads, and details of the thorax and petiole; the location of the type-specimens; the derivation of the name; diagnosis, measurements, colour, geographical range and biology. Here are 624 treatments—a gigantic undertaking."

I think most people would have been quite satisfied if this volume had been the sum total of their lifetime's labours. But Wilson was ambitious indeed.

In 2008, Wilson collaborated once again with Bert Hölldobler, in spite of the latter having left Harvard and moved to the University of Wüerzburg in Germany, to write the highly readable (for the specialist and layperson alike) *Superorganism: The Beauty, Elegance and Strangeness of Insect Societies* [13].

Sociobiology

Wilson closed *The Insect Societies* with his vision for the future:

"In spite of the phylogenetic remoteness of vertebrates and insects and the basic distinction between their respective personal

and impersonal systems of communication, these two groups of animals have evolved social behaviors that are similar in degree of complexity and convergent in many important details. This fact conveys a special promise that sociobiology can eventually be derived from the first principles of population and behavioral biology and developed into a single mature science."

The publication of *Sociobiology: The New Synthesis* (1975) [14] was a watershed event in many ways. It was the most ambitious and comprehensive synthesis of social behaviour from microbes to humans ever attempted and it established the new discipline of sociobiology.

It did not take long for Wilson's prediction to come true as he himself made it happen a mere four years later. The publication of *Sociobiology: The New Synthesis* (1975) [14] was a watershed event in many ways. It was the most ambitious and comprehensive synthesis of social behaviour from microbes to humans ever attempted and it established the new discipline of sociobiology which has since grown to have its own books and journals and thousands of practitioners.

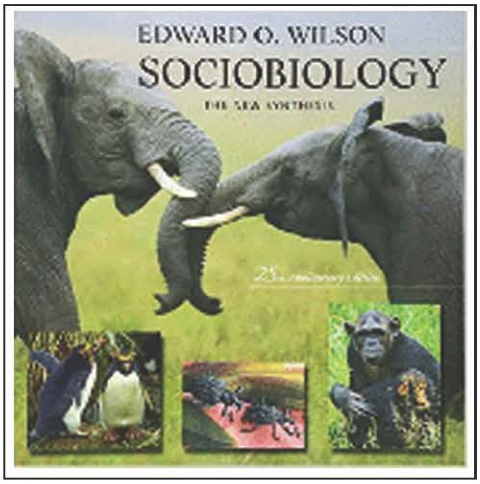

Figure 5

In the last chapter entitled "*Man: From Sociobiology to Sociology*", Wilson wrote:

"Let us now consider man in the free spirit of natural history, as though we were zoologists from another planet completing a catalog of social species on Earth. In this macroscopic view the

humanities and social sciences shrink to specialized branches of biology; history, biography, and fiction are the research protocols of human ethology; and anthropology and sociology together constitute the sociobiology of a single primate species."

This chapter led to a storm of protests accusing Wilson of promoting racism at best and being a racist at worst. The real tragedy was that the public attack on Wilson was led from the front by his own colleagues at Harvard, colleagues who knew only too well that the allegations being made against Wilson were blatantly false. I have read and re-read the last chapter of *Sociobiology*, looking in vain for a single sentence that remotely justified the allegations. Finally, I have come to accept the scathing indictment of the historian of science Ullica Segerstråle in *Defenders of the Truth* (2000) [15]:

"But how can we explain the critics' astounding disregard for the original context of their citations, particularly in cases where they cut and pasted so as to make Wilson say the opposite of what his original text said?...Perhaps the critics felt justified in processing a text in any way they wanted—including cutting and pasting—as long as they were dealing with passages that could indeed be found somewhere in the text. Just like other scientists, the critics knew they were not free to invent 'data', but, just like other scientists, they may have felt free to 'massage' existing data to make the result come out more clearly. (Substitute 'data' here for sociobiological text)."

A Spokesman For All of Life

When asked to identify the most important problems facing the world, EO Wilson said:

"The worst thing that can happen, will happen, is not energy depletion, economic collapse, limited nuclear war, or conquest by a totalitarian government. As terrible as these catastrophes would be for us, they can be repaired within a few generations. The one process ongoing in the 1980s that will take millions of years to correct is the loss of genetic and species diversity by the destruc-

"The worst thing that can happen, will happen, is not energy depletion, economic collapse, limited nuclear war, or conquest by a totalitarian government. As terrible as these catastrophes would be for us, they can be repaired within a few generations. The one process ongoing in the 1980s that will take millions of years to correct is the loss of genetic and species diversity by the destruction of natural habitats. This is the folly our descendants are least likely to forgive us."

– EO Wilson

tion of natural habitats. This is the folly our descendants are least likely to forgive us."

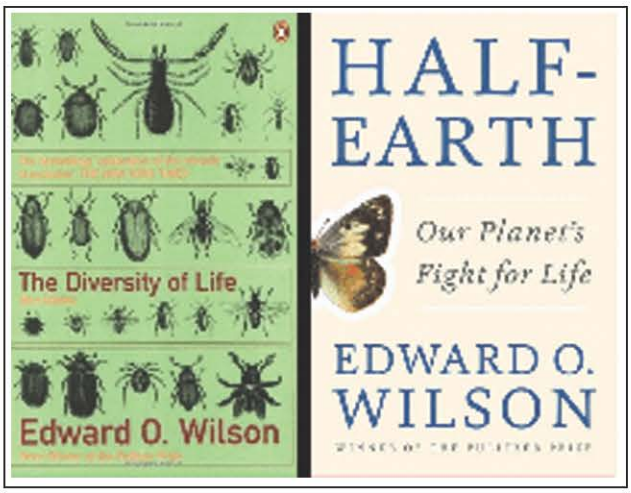

Figure 6

It is in the area of nature conservation that Wilson most effectively combined fundamental research, education, public outreach and activism.

It is in the area of nature conservation that Wilson most effectively combined fundamental research, education, public outreach and activism. In *Diversity of Life* (2001) [16], Wilson defined the biodiversity crisis in a manner that prompted Richard Dawkins to say, "Not since Darwin has an author so lifted the science of ecology with insight and delightful imagery". In *Half-Earth: Our Planet's Fight for Life* (2016) [17], Wilson made the bold proposal that we must set aside half the planet to come anywhere near success in saving the earth's biodiversity. He showed that this is a realistic dream that may fail because of a lack of will but not because of faulty science.

Of Wilson's many efforts toward nature education and conservation, I will mention only two recent successes. One is the online *Encyclopedia of Life* [18], with a webpage for every species meant to provide global access to knowledge about life on earth. The other is the setting up of the *E. O. Wilson Biodiversity Laboratory* [19] in the Gorongosa National Park in Mozambique, to provide research and training in biodiversity, ecology and conser-

vation biology to researchers from around the world.

Figure 7. Left: EO Wilson at the EO Wilson Boardwalk at Fort Blakeley Park near Mobile, Alabama. **Right:** EO Wilson and his long-time assistant Kathleen Horton at the base of a giant redwood in Yosemite National Park in 2011. (Photos: Courtesy Kathleen Horton.)

It is impossible for me to say which book of Wilson's moves me and impresses me the most; they all do and in many different ways. In terms of his ambition, courage and breadth of scholarship, I would place *Consilience: The Unity of Knowledge* (1999) [20] at, or very close to the top of my list. Having spent time at the *Wissenschaftskoleg zu Berlin* [21] for 22 years and having founded and directed the *Centre for Contemporary Studies* [22] at my home institution, I have had a ringside view of the irreconcilable differences [23] in methods and style and the very philosophy of different branches of human knowledge.

I, therefore, find Wilson's vision for the unity of all knowledge utopian in the best sense of the word.

Human Nature

Undaunted by his colleagues' attempts to derail him, Wilson completed the trilogy beginning with *The Insect Societies* and continued with *Sociobiology: The New Synthesis*, by setting forth in bold and clear detail his full vision in the Pulitzer Prize-winning *On Human Nature* (1988) [2].

There is much to admire in this book, but I was especially struck by Wilson's views on religion, a topic that has never ceased to trouble me. It is a measure of Wilson's wisdom that he concludes that:

"...religion itself will endure for a long time as a vital force in society. Like the mythical giant Antaeus who drew energy from his mother, the earth, religion cannot be defeated by those who merely cast it down...So the time has come to ask: Does a way exist to divert the power of religion into the services of the great new enterprise that lays bare the sources of that power?"

"...religion itself will endure for a long time as a vital force in society. Like the mythical giant Antaeus who drew energy from his mother, the earth, religion cannot be defeated by those who merely cast it down...So the time has come to ask: Does a way exist to divert the power of religion into the services of the great new enterprise that lays bare the sources of that power?"

– EO Wilson

As we have come to expect of Wilson, he followed rhetoric with action. In *Creation: An Appeal to Save Life on Earth* (2006) [24], Wilson wrote a book-length letter to a Southern Baptist Pastor, which began with the words (slightly abridged here):

"Salutation Dear Pastor: We have not met, yet I feel I know you well enough to call you friend. First of all, we grew up in the same faith. I write to you now for your counsel and help. Of course, in doing so, I see no way to avoid the fundamental differences in our respective worldviews. You are a literalist interpreter of Christian Holy Scripture. You reject the conclusion of science that mankind evolved from lower forms. I am a secular humanist. I think existence is what we make of it as individuals. There is no guarantee of life after death, and heaven and hell are what we create for ourselves, on this planet. Does this difference in worldview separate us in all things? It does not.

Let us see, then, if we can, and you are willing, to meet on the near side of metaphysics in order to deal with the real world we share. Pastor, we need your help. The Creation—living Nature—

is in deep trouble. Scientists estimate that if habitat conversion and other destructive human activities continue at their present rates, half the species of plants and animals on Earth could be either gone or at least fated for early extinction by the end of the century."

Immortality

I recently listened to a radio programme about my favourite Urdu poet Sahir Ludhiyanvi [25]. The radio host recalled that Sahir fell ill on 25th October 1980 and was taken to the hospital, and even as he spoke to the doctor, he fell silent forever. The host added hastily, "*magar aise log marthe kab hain; apne chahnewalon ke dilo me hamesha zinda rehten hain*" (Hindi for 'but such people never die; they live forever in the hearts of their fans').

EO Wilson is immortal in many ways. He will be remembered for his 45 honorary degrees and 150 medals and awards. He will be remembered through his fine autobiography *Naturalist*, and the recent biography by Richard Rhodes, *Scientist*, of which the India-born, German-British writer and historian Andrea Wulf [26] says, "this short biography [27] only scratches the surface of a remarkable life."

Wilson will be remembered by the fine portraits that hang on the walls of the Smithsonian Institute and the National Portrait Gallery in Washington DC. Above all, Wilson will be remembered for his numerous books, articles and talks (freely available on the internet).

I hope that some venerable institution will preserve Wilson's personal papers for posterity; I would especially like to see his book manuscripts written in long-hand on yellow legal pads. His long-time assistant, secretary, and travelling companion in recent times, Kathleen Horton, will, I am sure, be busy helping set up Wilson's archives and thus find a way to cope with his absence[1]. For the rest of us, Wilson has left a way open to cope with his departure. If his *Letters to a Young Scientist* (2013) [28] is widely read and emulated, we might see many more Wilsons among us.

[1] Kathleen Horton told me in a recent email that "Ed (EO Wilson) wished that his papers go to the Library of Congress. I've sent 74 boxes there and they are nicely curated."

Figure 8. Mark Moffett and E O Wilson at the opening of Moffett's Smithsonian exhibit where Wilson's portrait was unveiled (Copyright James Di Loreto, NMNH). Right: Bert Hölldobler (left) and the author (right) posing in front of a portrait of Edward O Wilson at the National Portrait Gallery in Washington, D.C., in May 2016. Photo: Geetha Gadagkar.

Suggested Reading

[1] R Rhodes, *Scientist: E. O. Wilson: A Life in Nature*, Doubleday Books, 2021.

[2] E O Wilson, *On Human Nature*, Harvard University Press, 1988.

[3] R Gadagkar, The making of a scientist a life worthy of admiration and imitation, *Resonance: Journal of Science Education*, Vol.1, No.4, pp.87–89, 1996, https://www.ias.ac.in/article/fulltext/reso/001/04/0087-0089.

[4] E O Wilson, *Naturalist*, Island Press, 2006.

[5] J Ottaviani, E O Wilson, C M Butzer, *Naturalist: A Graphic Adaptation*, Island Press, 2020.

[6] E O Wilson, *Anthill*, W.W. Norton & Company, 2010.

[7] R H MacArthur and E O Wilson, *The Theory of Island Biogeography*, Princeton University, 1967.

[8] R Gadagkar, More fun than fun: Evolution on islands in water, in the sky and elsewhere, *The Wire Science*, 4th August 2021, https://science.thewire.in/the-sciences/island-biogeography-shola-sky-islands-evolution-raghavendra-gadagkar/.

[9] J Patino, R J Whittaker, P A V Borges, et al., A roadmap for island biology: 50 fundamental questions after 50 years of The Theory of Island Biogeography, *Journal of Biogeography*, Vol.44, pp.963–983, 2017, https://doi.org/10.1111/jbi.12986.

[10] E O Wilson, *The Insect Societies*, The Belknap Press of Harvard University Press, Cambridge, Massachusetts, USA, 1971.

[11] B Hölldobler and E O Wilson, *The Ants*, Harvard University Press, Cambridge,

Massachusetts, USA, 1990.

[12] E O Wilson, *Pheidole in the New World: A Dominant, Hyperdiverse Ant Genus*, Harvard University Press, Cambridge, Massachusetts, USA, 2003.

[13] B Hölldobler and E O Wilson, *The Superorganism: The Beauty, Elegance, and Strangeness of Insect Societies*, W W. Norton Company, 2008.

[14] E O Wilson, *Sociobiology: The New Synthesis*, The Belknap Press, 1995.

[15] U Segerstrale, *Defenders of the Truth: The Sociobiology Debate*, Oxford University Press, USA, 2000.

[16] E O Wilson, *The Diversity of Life*, Penguin Group, 2001.

[17] E O Wilson, *Half-Earth: Our Planet's Fight for Life*, Liveright Publishing Corporation, A Division of W W Norton & Company, New York, 2016.

[18] Encyclopedia of Life, https://eol.org/.

[19] E O Wilson Biodiversity Laboratory at Gorongosa National Park, 2014, https://www.youtube.com/watch?v=arjDDmn2yUs.

[20] E O Wilson, *Consilience: The Unity of Knowledge*, Vintage, 1999.

[21] Wissenschaftskolleg zu Berlin (Institute for Advanced Study), https://www.wiko-berlin.de/en/institute.

[22] K Ramaswamy, Centre for Contemporary Studies: A case for humanities, *Connect*, Vol.2, pp.15–20, Jan. 2015. See pages 15–19 in https://connect.iisc.ac.in/2015/01/january-2015/.

[23] R Gadagkar, Two cultures at the Wissenschaftskolleg, *Wissenschaftskolleg, Jahrbuch*, pp.68–75, 2000/2001, https://www.wiko-berlin.de/fileadmin/Jahrbuchberichte/2000/2000\break_01_Gadagkar_Raghavendra_Jahrbuchbericht.pdf.

[24] E O Wilson, *The Creation: An Appeal to Save Life on Earth*, W W Norton & Company, 2006.

[25] A Manwani, *Sahir Ludhianvi – The Peoples Poet*, HarperCollins India, New Delhi, 2013.

[26] A Wulf, (born 1972) is a German-British historian and writer, *Wikipedia*, https://en.wikipedia.org/w/index.php?title=Andrea_Wulf&oldid=1018254552.

[27] A Wulf, A Biography of E O Wilson, the Scientist Who Foresaw Our Troubles, *The New York Times*, 2021.

[28] E O Wilson, *Letters to a Young Scientist*, Liveright, 2013.

Address for Correspondence
Raghavendra Gadagkar
Centre for Ecological Sciences
Indian Institute of Science
Bangalore 560 012, India.
Email: ragh@iisc.ac.in