EYE OF SCIENCE/SPL

A bedbug pictured in an image from a scanning electron microscope.

ECOLOGY

There's a jungle in your bed

William Foster enjoys Rob Dunn's hymn to the life in our homes and on our bodies.

Never Home Alone: From Microbes to Millipedes, Camel Crickets, and Honeybees, the Natural History of Where We Live
ROB DUNN
Basic (2018)

Rob Dunn invites us on a safari in pursuit of the wildlife teeming on our bodies and in every corner of our homes. For him, the creatures that sprawl in the human navel and under the bathroom shower head elicit the kind of wonder most of us would feel only on seeing the denizens of Tanzania's Ngorongoro Crater or the Great Barrier Reef off Australia. Dunn is more than an informed and entertaining commentator, a David Attenborough of domestic biodiversity. He is a scientist whose research group at North Carolina State University in Raleigh made many of the discoveries described in his fascinating and illuminating book, *Never Home Alone*.

Dunn and his colleagues have used the concepts and techniques of community ecology to tease apart the functioning of a mostly ignored ecosystem: the human home. Their research enriches our understanding of ecosystem function, and — more grippingly — gives us insight into how our interactions with living things in the domestic habitat affect our health and well-being. The book is structured around sub-habitats in our homes — our bodies, rooms, water supply, pets and food. It considers an awesome range of organisms, from the rich fungal flora on bakers' hands to the diversity of fly larvae in our drains.

We discover that warm, moist shower heads are ideal for the growth of biofilms containing trillions of bacteria, including *Mycobacterium* species that are harmful to human health. Dunn and his colleagues invited thousands of volunteers globally to send in samples from their bathrooms. The researchers are finding, for instance, that the more a water supply is treated with chemicals designed to kill microbes, the greater the abundance of pathogenic strains of mycobacteria. We also learn that the numbers of plant and butterfly species in our gardens are correlated with the robustness of the community of microbes on our skin; that some German cockroaches have evolved to perceive glucose as bitter, thus avoiding poisoned bait; and that dogs can give us both heartworm and a top-up of beneficial bacteria from their microbiomes.

The message of *Never Home Alone* is clear. The health of an ecosystem depends on its biodiversity: this is as true of our homes as of a mangrove swamp. Two factors, notes Dunn, are important. Simply by chance, a home containing more species is more likely to include organisms (especially microbes) that are vital in sparking our immune systems into life. And an ecosystem with niches fully occupied by diverse species is likely to be resilient and resistant to invasion by pests and pathogens.

We rightly fear the handful of domestic species that can harm us, such as lice and *Legionella* bacteria. But all-out chemical warfare is not a viable defence. It scythes down thousands of other species, and the target rapidly evolves resistance and flourishes on the blank slate we have thoughtlessly provided. This story is familiar from the overuse of antibiotics and pesticides, but Dunn's book is the first to apply it across the range of domestic wildlife, from bacteria to bedbugs.

Dunn is a man on a mission. He is determined to recruit others to his research programme, to hunt for camel crickets in basements and to send samples of armpit flora, face mites or sourdough starters. He champions citizen science — as long as ▶

the citizens have curiosity and focus. The book opens and closes with a supreme exemplar of a lay scientist: seventeenth-century Dutch businessman Antonie van Leeuwenhoek, who pioneered microscopy and discovered bacteria and protozoa, opening up the universe of microbiology. His discoveries — based on everyday substances in his Delft home, such as saliva — and the wonder they excited in him epitomize the ideas in *Never Home Alone*.

Just one of Dunn's arguments fails to convince. He asserts that some organisms, such as fruit flies and house mice, are important because they have become iconic model lab species, or because, like the *Penicillium* fungus, they could be sources of drugs. He suggests that by understanding the biology of, for example, domestic camel crickets — which thrive on very poor diets — we might learn new ways of breaking down intractable materials such as plastic. Quite so; but none of it depends on the fact that these organisms can be found in homes. Biologists find useful animals anywhere, from the axolotl to the hagfish and the *Xenopus* frog.

The results of the projects described are important. The indoor biome is huge. Humans are an urbanizing species, and in most cities, the combined floor space of homes and apartments exceeds that of the ground space outside. If we are to chart a harmonious settlement with the species living with us, we need to understand as much as possible about them.

I think this research has even broader significance. Since the Darwinian revolution, we have accepted that, biologically, we are one species among millions, subject to the same laws of evolution by natural selection. It is less clear that we have accepted that we are also subject to the same ecological laws. We know we can control, disrupt and destroy the ecosystems of the world, but we tend to imagine that we do so from inside a hermetically sealed personal bubble. By reframing our homes and selves as ecosystems, we are forced to contemplate how we fit in with the complex community of organisms with whom we share our lives.

The book has one final message. We have "farsighted" ecologists (Dunn's term), whose eyes are fixed on the distant, charismatic ecosystems of rainforest and coral reef. We also need near-sighted ones who will study the half-hidden communities closely quartered with us in our homes. This book is their battle cry. ■

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SPUTNIK/SPL

UK crystallographer Dorothy Hodgkin and Soviet physicist Moisey Markov at a 1983 Pugwash conference.

HISTORY

The covert politics of cold-war science

Ann Finkbeiner reflects on an era when research and education were co-opted to promote a government line.

In the late 1950s, students in a Hong Kong school were dissecting local earthworms and labelling the parts to match diagrams in a British textbook — even though the worms in Britain and Hong Kong were anatomically different. Watching the children, US herpetologist and educator Arnold Grobman noted that they were being directed to follow the textbook over their own observations.

The students' reliance on authority was not what worried Grobman. The real danger, he said, is that this choice "left the students vulnerable to the influence of Communism".

So begins science historian Audra Wolfe's *Freedom's Laboratory*, a study of how the United States won the cold war partly by embracing and promoting ideals embraced by science itself. Today, equating unquestioning trust in authority with vulnerability to Communism sounds overwrought. But at the time, the tense stand-off between the Soviet Union and the United States (which ran roughly from 1947 to 1989) was ramping up. Almost simultaneously with the start of the cold war, the Soviet Communist Party endorsed a pseudoscientific stance: Lysenkoism, the political campaign to reject Mendelian genetics, headed by agronomist Trofim Lysenko. Stocks of *Drosophila* fruit flies for research were destroyed, and Soviet geneticists were fired, imprisoned, exiled or executed.

Freedom's Laboratory: The Cold War Struggle for the Soul of Science
AUDRA J. WOLFE
John Hopkins University Press (2018)

One US countermeasure against Communism, as Wolfe shows, was to present democracy as a bastion of scientific freedom for nations aligned against a totalitarian state. This message fitted the ideals of scientists and scientific institutions, so they went along with it. Scientists are ideally driven by curiosity and logic, not politics. But politics, writes Wolfe, were crucial to how the US government "constructed and maintained" the equation of science with freedom.

This politicization took advantage of scientists' habits of international collaboration. In the early 1950s, the US government, in particular the Department of State and the CIA, tried using independent scientists as attachés — actually, spies. This mirrored Soviet practice. (I recall old US physicists' stories of visiting Soviet scientists announcing that they needed to take photos of, say, local military depots.) As Wolfe shows, however, the US scientist-spies proved ineffective.

Meanwhile, the State Department, CIA and National Academy of Sciences sponsored international conferences and travel to promote scientific freedom. The US government also used the international Pugwash