

Wild beneath the s

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Housemate. This electron micrograph shows a house dust mite *Dermatophagoides pteronyssinus* on woven household material. The mite's mouthparts are adapted to feeding on the dead scales of human skin found in household dust.

the sheets



We've all seen photos of those microscopic monsters that prowl around in beds (but surely not in *ours*?). As **Robert Dunn** explains, no one can avoid them, and they are one of nature's biggest little success stories.

Dust rises in the summer air, swirls in the wind and settles back down. Dust covers the plants on the side of the road and grows thick on top of our shelves and under our beds. Dust rises on one continent and settles upon another. Dust is neither mineral, nor animal, but instead a miasma, a sort of falling apart of things. Dust is dust, or so it seemed, until the 1920s, when scientists began searching houses for mites. Scientists found thousands of mites where they had expected several. House dust is not dust after all. It is mostly mites and human skin. House dust is alive.

The first time I saw a picture of a dust mite was in a doctor's office. The mite faced me. Its eight, hairy legs crabbed along through a forest of carpet fibres. On the front of its gnathosoma (mites don't really have heads) were pinchers, chelicerae that seemed disproportionately large, pointed as though up to no good. Long hairs trailed behind it into the background of the picture. The genus of the mite in the picture was, I later learned, *Dermatophagoides*, the skin eater. Species of this genus, like those of several other genera of dust mites, thrive on abandoned bits of skin. Biologists often like to ask the philosophical question whether we are currently inside or outside 'nature'. If the mites have any say, we are in. No need to wait to be reborn in your next life. You are being reborn as you read, reincarnated only to crawl away on thousands of tiny legs.

Mites evolved 400 million years ago, give or take 10 million years. In those millions of years, mites have radiated into every conceivable niche. There are mites that ride in hummingbird nostrils, mites that ride on the feet of army ants and even mites that live in human hair follicles. They are everywhere. Unlike many mites, dust mites are generalists and do not depend on a particular host. They are equally happy in beaver dens, pack rat middens, squirrel nests and our homes. To dust mites, we are another grubby mammal.

Throughout history, humans have seldom been without dust mites. They were probably in the Pueblo cliff dwellings and even in Caesar's throne. Dust mites came ►

with us across land bridges, rode on our ships to distant shores and moved into each of our new beds. There are as many dust mites per bed in New York City as there are in a village in Botswana. In a world where the rich continue to get richer and the poor, poorer, dust mites are pleasingly equal opportunity arachnids. George Bush's presidential bed is an ecosystem. Dust mites feast on Madonna, Queen Elizabeth and Bill Gates as well as your grubbiest nephew.

The average dust mite cannot be seen with the naked eye, which for the entomophobic public is probably good, because dust mites are everywhere. They are in your carpet, in your sheets and mattresses, in your clothes and under your fridge. And in each of those places, dust mites have sex, eat and live out their short lives. Dust mites feast on dead skin, hair and whatever else sloughs off us. As appetising as these scraps may be by themselves, mites get most of their nutrition from bacteria and fungi that grow on our sloughed skin and hair. At 250-300 microns (smaller than the period at the end of this sentence), dust mites are so small that bacteria and fungal hyphae can be a mouthful. We shed skin and hair, bacteria eat skin and hair, and mites devour bacteria. In the bedroom, we are at the base

Much of the weight of your favourite down pillow may be mites and the remains of mites.

In most beds, dust mites are probably the top consumer under our sheets. Most dust mites die of natural causes and are then sucked up by other dust mites. In some houses, however, there are larger, predatory mites that feed on dust mites. Battles are waged on our pillows. At least some of the mite species in house dust defend themselves by secreting defensive chemicals. Sometimes mite defences probably work. Other times, the small mites may become *hors d'oeuvres* for large mites, which in turn are appetisers

for even larger mites. As mites move up the food web, they carry hunks of us with them. As a result, we haunt our own houses like blood in a Marquez novel, until the mites carry us off under some window or door.

It is hard to imagine that there is anything terribly complicated about a dust mite. They are too small to have a circulatory system, have no heart or head and have given up on eyes. But alas, the dust mite is an arthropod, and arthropods cannot help but be complicated. Take, for example, the dust mite's life-cycle. A pregnant female dust mite lays one smooth,

egg at a time, careful to glue it to something sturdy, such as a carpet fibre. The soft animal inside the egg then begins a transformation, from embryo to six-legged larva. After a few days, the larva parts the egg along its soft creases and enters the world. The larva later moults into a protonymph (eight legs, but still not genitals), a tritonymph and then eventually an adult, with genitals and a chemical bell ringing out, *eat and mate, eat and mate*.

Much of the basic biology of the dust mite remains obscure. For example, it is not clear how male mites and female mites find each other in the universe of your bedroom. You could hypothesise that, from deep in the forests of carpet and bedspreads, male mites broadcast to females with pheromones. It is known that many mites use pheromones, and for a tiny creature without any obvious drums or voice, it seems the most practical cry of love. Amorous male mites gather, perhaps to combine their pheromones into a sort of dust mite yelp, to attract distant females. But no one really knows.

Regardless of how they do it, male and female mites meet paramours frequently enough to produce abundant populations that can reach densities of hundreds per gram of dust. A typical, comfortably broken-in

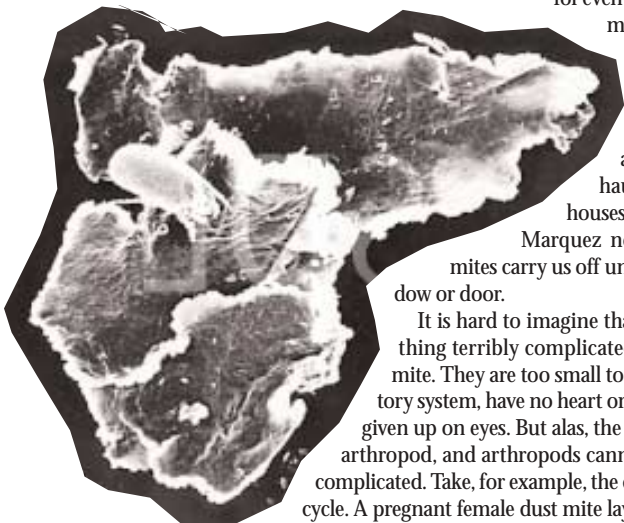
mattress can provide haven to tens of thousands of mites. Much of the weight of your favourite down pillow may be mites and the remains of mites.

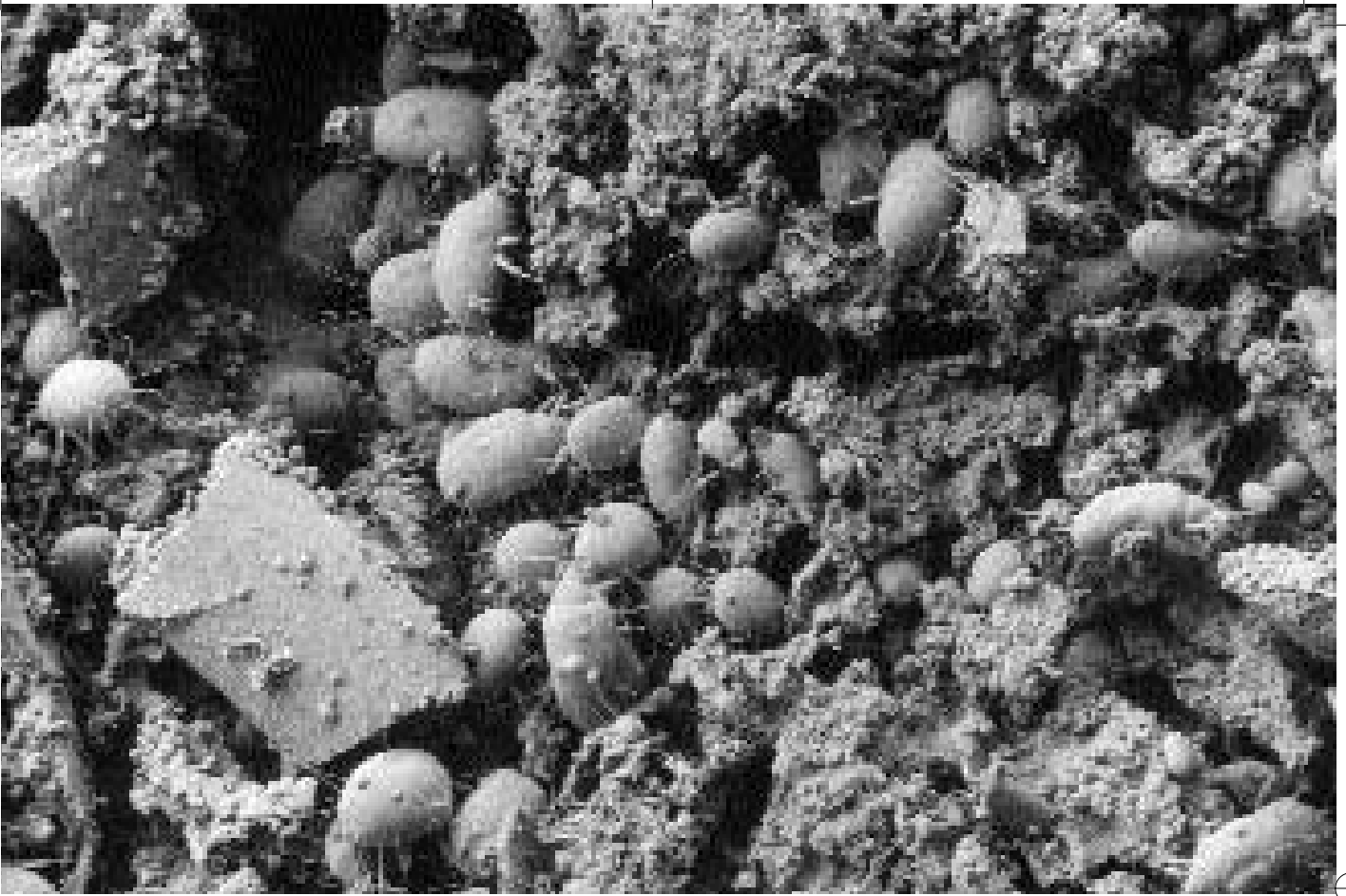
At this point, in the interest of full disclosure, I should say that dust mites do have some less-than-redeeming character traits. They are the source of allergens that affect millions of people every year. People allergic to dust mites are allergic to a mite digestive enzyme, which passes out of the mite gut in the faeces and becomes airborne in our houses. As I write this, I am sniffing, and maybe I should blame the mites. If I went to the doctor and asked her what to do about dust mites in my house, she would probably say, "keep your house dry, cover your mattress with plastic, vacuum your carpets and wash your sheets frequently." None of these things would rid me of dust mites, though they would probably reduce the mite populations in my house. But for my part, my mites need not worry. My allergies are not bad, and besides, mites do me a service. I would rather feed their leggy masses than have dead skin accumulate in my bed. Let them carry away my bits to the far-flung places of the universe or at least to the hall, and that's one less chore for me. The billions of people who are not allergic to mites should count their blessings and enjoy the cleaning services of a crew that comes free of charge. If you are feeling generous during the holidays, give them a treat and don't wash your sheets.

If you do decide to battle the mites, be warned, they are not defenceless. When your house dries out, the mites' first response is to aggregate. Grouped together, the mites may

Snack attack. Many species of mites live out their lives among human skin, sweat and hair (this individual is on a flake of dandruff). The average double bed contains millions of dust mites of various species.

K.H. Kjellson/Science Photo Library





Ronald Ochoa

form a big-enough spot on your pillow that you can see them. By doing so, the mites reduce the water they lose. It is as though they become one larger mite instead of a dozen smaller ones. Emmett Glass and collaborators at Ohio State University recently did an experiment where they isolated some dust mites and left others to form groups. Those mites that formed groups lost less water. In a drawing of the mites in Glass's article, the mites look like tiny football players huddling before the next big match.

If your house gets even drier, snugly mites have other options. Nymphal mites can slow their metabolism and glue themselves to your carpet or bed. The dormant nymphs, called 'quiescent protonymphs', reduce their metabolisms to one twenty-fifth of their normal rate until the going gets better – a sort of hibernation. Like tiny bears, mites typically lie dormant in the winter months when a house is driest. In fact, one of the reasons that people have seasonal allergies to dust mites is that dust mite populations wane in the drier winter months, as nymphs hibernate and adult mites die. When your house gets moist again in spring, the nymphal mites re-emerge, hungry, but alive.

As interesting as dust mites are, I suspect they do not give many people a warm and fuzzy feeling. Few children will ever beg for mite farms for their birthdays. Dust mites don't control pests, they do not, I suspect, inspire awe in the average person and they do not offer any immediate cure for the flu. As far as I know, there are not

dust-mite fan clubs, and if there are dust-mite collectors, they are quiet about it. Take a good look at the dust mite though. As J Follian writes, "It is not always easy to face the animal even if it looks at you without fear or hate . . .", but be brave, we can face the dust mite. Their intricate mouthparts and legs have been honed, shaped over years of natural selection. They are experts at the art of getting by on nothing. They are not like the cockroach that will be here after nuclear winter. Dust mites need us and other messy creatures like us. We are in this together for long haul. And after all, it is nice to know that our bedrooms are gardens. we plant nothing, yet grow mites.

Read on

Mites, by David E Walter and Heather C Proctor (CABI, £55, ISBN 0851993753, code 042/105).
Order this book by filling in the coupon on page 75.

Visit the Mite Image Gallery on www.uq.edu.au/entomology/david.evans.walter.html to check out some colourful characters.

More cheese, please? Species of cheese mites (here *Tyrophagus putrescentiae*) are introduced into cheeses such as *Altenburger* to impart its 'piquant' taste. The greyish powder on some traditional cheeses consists of enormous numbers of living mites, cast skin and faeces.

Robert Dunn works as a Postdoctoral Fellow at Curtin University of Technology in Perth, Western Australia. Rob explores the relationship between ants and the seeds they disperse, focusing on whether ants have affected the biogeography and evolution of the plant species they disperse.

