

# Perspective

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## Talk to the animals

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# We must sweat nature's small stuff

Wade Graham



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**M**ost of us are too busy pursuing our business to notice much about the natural world around us – its infinite complexities, subtleties, balances and dynamism. Worse, large subsets of us are functionally blind, either unable or unwilling to see what's going on around us, even as climate chaos threatens our ways of life, and increasingly our very lives.

Fortunately, some people have long known that wisdom comes from careful observation of nature. To them we owe our understandings of how the living, physical world works, how its parts fit together, and how it changes. Notable among them is Gilbert White, curate of the rural parish of Selborne, Hampshire, who spent his years there, from 1720 to 1793, noting in minute detail the rhythms and ways of the parish's

plants and animals, from the lowliest bugs to the largest mammals. He especially delighted in birds, the creatures most visible to him, whose mysterious seasonal comings and goings most perplexed and intrigued him. Though his observations were limited to his walks around the confines of one small parish, it was a teeming microcosm, from which he grasped the intricate order and marvellous balance of nature. "All nature is so full, that that district produces the greatest variety which is the most examined," he wrote to a correspondent. His published letters constituted a deep data set of nature in his time and place; it became one of the most popular books in the English language, going through 100 editions by the twentieth century, and one of the origin points of the modern science of ecology.

Such troves of observed detail, laid down over centuries by citizen-scientists like White

all over the world, form important baselines from which scientists can now chart change in natural systems over time – invaluable in this era of accelerating climate change. One of the best documented and strongest indicators of change comes from studies of animal and plant migrations. Living things are more sensitive to their environment than our most advanced instruments, and much better at seeing local effects and anomalies than our most sophisticated computer models. Animals and plants are in effect early warning systems.

The larger trends are clear, overwhelming, and startling: in response to global warming, animal and plant ranges are moving north in the northern hemisphere, south in the southern. These include whales, caribou, porcupines, wolves, polar bears, butterflies, mosquitos, trees, grasses and lichens. Birds give us the most comprehensive picture, because their migrations are huge, varied and, since at least the eighteenth century in rural Hampshire, well-studied. All manner of birds are moving their ranges in response to rising temperatures, as well as arriving in their summer grounds earlier in spring and departing earlier in autumn. Some British birds have shifted their timings two to three weeks earlier over the past century.

Range expansion has an ominous side. Pests, such as leaf-eating umber moths that defoliate sub-arctic birch trees in Norway, are penetrating farther north. So are parasites and pathogens – scientists warn that the next pandemic will be another spillover from animals, made more probable as their ranges change, while people put more pressure on them and their shrinking habitats.

And adapting to climate change isn't as simple as flying farther north or leaving earlier. Not everything can fly. Tiny organisms make up most living mass on earth. Even those that walk or otherwise locomote face limitations: snakes, other reptiles, and amphibians are slow, and must adjust their bodies to temperature swings. Barriers to movement are everywhere: cities, military bases, industrial landscapes, motorways, vast swaths of agriculture. Many species face literal dead ends: they may live on isolated mountaintops, or beaches and wetlands that will be turned to open water by rising seas. Extirpation and extinction are the likely results for many species, in many places.

The speed of current warming is an enormous problem. The natural world evolved in changing climates, but the changes were orders of magnitude slower: the sustained average rate of change over the 120,000 years during the Ice Ages and interglacials that shaped our flora and fauna was one degree celsius per millennium. We

have already seen 0.8 degrees over the last century, and the rate is increasing.

Humans may be able to help: by creating interconnecting habitats so plants and animals can move through corridors; by building wildlife infrastructure to mesh with our own, such as overpasses and underpasses; or by physically moving species across otherwise unbridgeable gaps. But a far greater challenge is the complexity of ecosystems. Nature's weave is made up of innumerable strands which are now being pulled apart. Geographic splits between species that rely on each other are already being seen. One species may move, but its food source may not, or may move in a different direction, or at the wrong time. Ecosystems are three-way linkages between plants, animals, and climate – temperature, precipitation, and drought. When they fall out of synch, the disruption of communities can have spiraling effects.

And there is so much we don't know. We are only beginning to understand how temperature affects development – for example, in many birds, reptiles, and amphibians, temperature during egg gestation determines sex, and even small changes can skew sex ratios. Life is governed by myriad other interactions even less visible or understood: CO2 and dissolved oxygen levels affect photosynthesis, while humidity and pheromones affect life cycles, all in ways we have little inkling of.

The details matter to us all, because we depend on them. Intricate, easily disturbed food webs underpin everything: insects pollinate our food, plankton support entire oceanic assemblages. Economists calculate that what are called “ecosystem services” – goods and balancing mechanisms that nature provides for us without charge, such as the small matter of making oxygen – contribute ten times more value to our lives than the sum of our own economic activities. But such figuring is a fool's game. Without intact ecosystems, there is no food, no clean water, nowhere to live. We had better pay attention.

The world is already seeing high rates of extinction – a crisis that may become catastrophic, emptying ecosystems and entire landscapes, leaving them hollowed out, even dead. We human perpetrators will be left to contemplate a lonely, destitute world.

The Reverend White reminded us: “The most insignificant insects and reptiles are of much more consequence, and have much more influence in the economy of nature, than the incurious are aware of... Earthworms, though in appearance a small and despicable link in the chain of nature, yet, if lost, would make a lamentable chasm.” ■

## Nature's intricate details matter to us all, because we depend on them