

OF ANTS AND WAR

In the American desert, where resources are scarce, honeypot ants wage war without end. **ROB DUNN** asks if we can draw parallels between ant and human conflict.

HE WAS SEVEN. His dad had just come back from the frontline in World War II, where he worked as a medic. The bombs had not yet fallen on Germany. But father and son did not discuss the war; instead, they talked about insects.

The pair went on long country walks to look for beetles, butterflies and, more than anything, ants. The father, Karl Hölldobler, loved ants. But he was also fascinated by the wasps and other animals that lived in their nests with them, “behind enemy lines” as he put it.

In the years that followed, the world changed. The Allies arrived in Germany. East and West were divided and set upon their separate paths. Meanwhile, the boy, Bert Hölldobler, remained devoted to ants. He began by studying species like those his father had collected during the war. Next, he resolved how the beetles that inhabit some ant nests find their hosts. Eventually, he came to study conflict.

Warfare in ants can be ferocious. Ants pull at legs. They bite at antennae and heads. They spray formic acid and stab with their needle-like stings. It was not so much that Hölldobler sought out the wars of ants: his approach was simply to study any ant that he happened upon, in the hope of making new observations. But it was hard to ignore the fighting. ▶



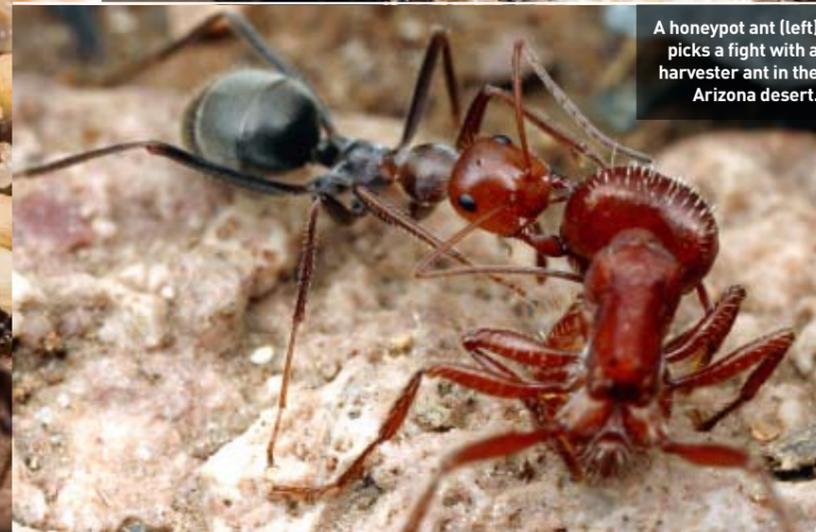
Every army, insect or human, marches on its stomach. A colony of honeypot ants is sustained by sugar stored in the swollen abdomens of immobile workers, which hang from the ceiling of the nest like Chinese lanterns.



This view of the heart of a *Myrmecocystus mimicus* nest shows eggs, larvae, workers tending to repletes and (bottom left) one of the colony's queens.



Myrmecocystus workers attack a beetle larva, before hauling it back to the nest to feed the colony.



A honeypot ant (left) picks a fight with a harvester ant in the Arizona desert.



Honeypot repletes are a specialised caste of workers whose sole purpose is to act as living larders.

John Brown/John Brown Images.co.uk

Some clashes, like those of the pavement ant *Tetramorium caespitum*, seemed to drag on, viciously, without end. Others were harder to relate to his experience of human warfare – or even to explain at all. Such was the case one day in Arizona when he found himself out in the desert on his belly, staring, rapt, at the ground.

HONEY MONSTERS

Hölldobler checked for snakes, cleared a spot and made himself as comfortable as one can be out in the desert sun. Then he proceeded to watch. His subjects were female workers of the species *Myrmecocystus mimicus*, an American honeypot ant.

Honeypot ants, as their name suggests, can store honey. The specialised workers that perform this function, called repletes, hang from the ceiling of the nest. This is their only job. When conditions are good, they are fed by other workers, mouth to mouth, until their abdomens swell with sugary honeydew and



A youthful Bert Hölldobler at work in the field.

nectar. Their heads, legs and antennae are tiny, but their golden bellies bloat to the size of marbles. During lean times, they share their stored goodness with those in need. Their wax and wane mark the seasons.

The honeypots of *Myrmecocystus* have been eaten by desert-dwelling people for generations (see box, opposite). But this is not what Hölldobler noticed that day in the desert. The scene looked more like a ritual than a biological phenomenon. It defied belief.

RITUAL SPARRING

The ants ran towards each other, reared up as high as they could, then looked at one another, heads cocked. It was almost as if they were sizing up their opponents in a diminutive version of *West Side Story*, staged on a set of prickly pear and sand.

Hölldobler noticed certain patterns in the ants' behaviour. Again and again, they faced off.

Most of the time, these 'contests', for want of a better word, resulted in a kind of uneasy peace. But, every so often, full-scale wars broke out.

When hostilities erupted, the resolution was swift and dramatic. The winning army would kill the workers of the rival colony, dispatch the queen, then carry home the honeypots. Back in the nest, these abductees would be tended to as a living larder, in much the same way that sailors once kept live tortoises aboard ships, to be eaten when needed.

Hölldobler discovered that *Myrmecocystus* ants in general, and those of the species *M. mimicus* in particular, feed on termites. Termites are a food worth fighting for. Like cows, they are fat and unprotected. But – unlike cows – they are hard to predict.

Termites emerge in one place one day, only to appear in another the next. It is difficult for ants to defend such an ephemeral food source by establishing territories in the traditional manner. And so Hölldobler began to wonder if perhaps it might not pay for *M. mimicus* colonies to defend a single patch of ground for long. Maybe they defend more

DID YOU KNOW?

Myrmecocystus mimicus colonies may have several queens – up to six is not unheard of. Each may live for 20 years or more, nearly all of which is spent in total darkness.

momentary territories – a piece of space and time. The question was how.

To understand what was going on, the scientist recorded thousands of hours of video of the ants and their contests. He filmed for two years, letting the tape roll as the drama unfolded. What emerged from these observations, and later modelling efforts, was that the ants he had seen, acting out their strange rituals, were, indeed, assessing each other.

KNOW YOUR ENEMY

The contests were bloodless, with warring ants standing tall and even climbing on pebbles in order to assess their adversaries based on some mix of individual size, the numbers involved and other difficult to discern calculations. Most days, that is the end of it: two colonies, having asserted their respective size and status, manage to keep

the peace. However, if one colony judges the other to be small (that is, roughly a roth of its own size), it attacks.

The desert floor is a hard place to be an up-and-comer. It is a geopolitical realm where only the old powers can share a truce. This is not the full extent of the complex world of ant politics, but a measure of it anyway, and these complex manoeuvres are

ANTS ON THE MENU

Sweet-toothed humans have snacked on honeypot ants since prehistoric times.

Ants have independently evolved honey storage in deserts around the world: *Myrmecocystus* in North America, *Camponotus* and *Melophorus* in Australia, other kinds in other places. Repletes hang. Honey is stored. Tough times are overcome through pluck and reserve.

But ant societies are not the only ones for which history repeats itself. In what is now the south-west USA, Native Americans have long plundered the repletes of honeypot ants, lying prone on the hot earth to dig them out with sticks. Amazingly, the same also happens in Australia, where a totally

going on right now, out in the desert, as you read this article, as they no doubt have done for millions of years.

OF ANTS AND MEN

Hölldobler went on to study many other kinds of ant, and in 1990 published the book on the subject (called simply *The Ants*). In doing so, he and co-author EO Wilson



An Australian aborigine tucks into a sweet *Camponotus* replete.

unrelated honeypot ant is harvested by a culturally unrelated race of people.

If there is a lesson here, it is this: in a desert, ants will work out how to store sugar, and, if they store sugar, desert people will work out how to find it.

Clockwise from top right: J. Carnalosi/NPL (caption), M. Harman/FILPA, alexanderwild.com, NZ



Myrmecosystus mimicus workers tend to a winged female 'alate'. She will stay underground for weeks, waiting for the right conditions to launch her nuptial flight.

won a Pulitzer prize for their writing, which included, dare I say it, his wartime journalism among the ants.

By the time of Hölldobler's work on *M. mimicus*, there was already a long history of studying ant wars in order to better understand the travails of man. It was even felt that generals could learn from their battles (he received two reprint requests for his first *Myrmecocystus* paper from the KGB and CIA). But, for him, they remained just ants: lovely and complex, yet uncomplicated.

Though Hölldobler himself can ignore the parallels between ant and human conflict, as a reader it is more difficult. One cannot help noticing, for example, that his studies of honeypot ants coincided with the Cold War, a quarrel in which two powers rattled sabres at each other while consuming the world's resources – not termites and nectar, yet the narrative was similar.

We stand like the ants on our biggest pebbles and try, again and again, to look tall. This is not to say the ants are a model

We have long studied ant wars to better understand the travails of man.

for what we should do. Hölldobler recently confided this to me: "Wherever you find highly co-operative societies, whether slime moulds, insects or primates (including humans), you will invariably encounter discrimination and aggression against members of neighbouring societies."

A BRIEF HISTORY OF FOOD STORAGE

From ants to wasps, many creatures have evolved the ability to store food.

Grasshoppers store food by getting fat. That is enough for them and so they have diversified and persisted. It's the same for bears and crickets. They have no other way, no place to put anything else they

might gather, nor any way to keep it from rotting. In this they are like our ancestors or, for that matter, the ancestors of ants.

But then the ability to store food evolved, many times. Moles store half-eaten (but still living) earthworms. Squirrels store fungi. Carnivores store meat, bowerbirds fruit. Shrews store snails. Wasps store paralysed spiders and nearly everything stores seeds.

And then there are the ants, some of which cache seeds, while others hang up honey. Ants are the only group in which a special caste of individuals has evolved to store food. We can be thankful for that. I have plenty of relatives, but there are none from whom, even in times of great need, I'd be pleased to receive a dose of regurgitated honey.

Parasitic wasps use venom to cache spider prey for their offspring.



RESOURCES AND REASON

In the end, there is no pithy lesson to be learned from the ants, other than that there is a tendency towards competition and wars, which is exacerbated when resources are scarce. In ants, this may be balanced on some occasions by rituals – a dance here and there of figures struggling to look tall.

In women and men, this must be balanced by reason, that most tenuous of creatures, rather than rituals. Reason holds back the demons. It is also what continues to send Hölldobler, now almost 80 years old, out into the desert.



THE EXPERT

A science writer and biologist, ROB DUNN is now assistant professor at North Carolina State University. He's also mad about ants.



EMPIRE OF THE DESERT ANTS will be broadcast on BBC2 as part of the winter season of *Natural World*.