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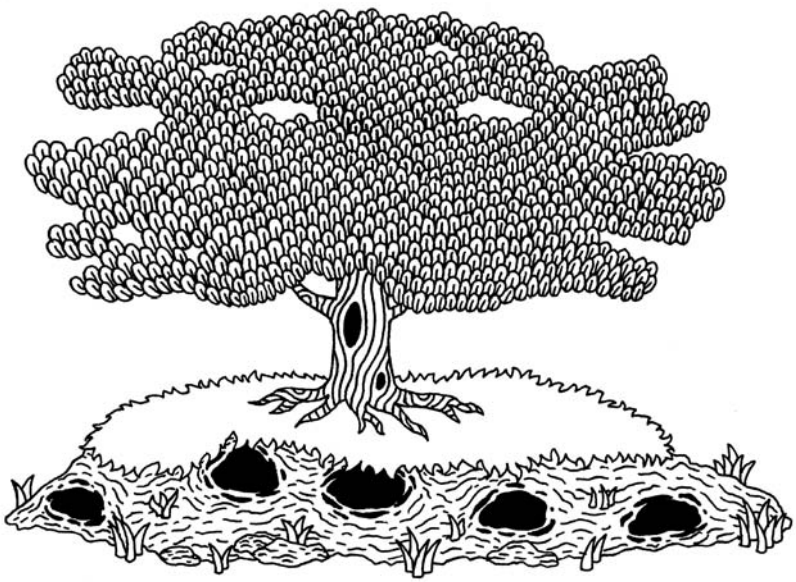
# *Meles meles*



A dome of dark-leaved trees smothering a broad hill, Wytham Woods appears to hover, like a fecund flying saucer, over the floodplain of the Thames. These 1,000 acres of ash, maple and hazel are the epicentre of Badgerland. Here, four miles west of Oxford, lives a higher density of badgers than anywhere in the world. But although the wood on the hill may be perfect for badgers, when I arrived there one early summer evening it seemed that humans were not so welcome. Wytham's owners were determined to keep hoi polloi at bay. Unsignposted, the wood was reached via a road marked 'private – no thoroughfare'. At the gate there were further instructions – members of the public could visit but must first apply for a permit. Once granted, by the 'conservator' of the property, the visitor must stick to the footpaths, depart before dusk and obey a long list of bylaws, which prohibited fun: nothing must be collected or removed from the wood and there must be no dogs or horses, no bikes, no fires, no metal detectors and, heaven forbid, 'no playing of radios, tape recorders and musical instruments'.

Most importantly of all, the scientific equipment must not be touched.

This sobriety was because Wytham was dedicated to science. Since it was bequeathed to Oxford University during the Second World War, the wood had become the most renowned natural laboratory in the country. It was one of the birthplaces of the science of ecology and the site of many significant scientific undertakings, most notably a famous study of great tits which began in 1947 and, still going strong, is thought to be the world's longest-running population study in which wild animals are ringed or marked. These four square miles were also home to at least 220 of the best-studied badgers in the world. For the past five decades, the badgers of Wytham have been trapped humanely and weighed, measured and scrutinised by curious scientists, beginning with the pioneering work of Hans Kruuk in the 1970s and continuing today with a twenty-five-year study overseen by Professor David Macdonald and his project managers Dr Chris Newman and Dr Christina Buesching.

Barred from exploring this badger metropolis alone, I waited by the White Hart in the village of Wytham (pronounced 'Whiteham') for Drs Chris and Christina, who had agreed to take me beyond the barricades to catch a glimpse of how we acquired our scientific understanding of the badger – its habits, its homes, and how it socialises, communicates, lives and dies. As smoke from a summer barbecue wafted over the pub wall, Chris and Christina came clattering around the corner in an exhausted university-issue Land Rover. A couple who met in Wytham while examining badgers as students,

Chris and Christina were wry global intellectuals who commuted to Oxfordshire from Nova Scotia and collectively possessed the biggest brain ever to be trained upon these animals.

The badger's common names reflect our first impressions: its black-and-white colouring and its appetite for digging. The name 'badger' could simply come from 'badge', a description of its black-and-white striped face, and may also be derived from *bêcheur*, a French name for the animal meaning 'digger' introduced to Britain by the Normans, who also brought new breeds of dog across the Channel to hunt badgers. The modern French word for badger, *blaireau*, is from the Old French *bler*, denoting 'striped with white'; *blaireau* also means 'corn hoarder'. Almost as frequently used in Britain is 'brock', a Gaelic-Danish word for badger, while 'pate' was once the favoured name in the north. The badger has also been called a 'grey' and 'bawson', a term that originated in Scandinavia and means striped with white.

The badger's scientific classification as a mustelid points to its less obvious distinguishing features. A family of carnivorous mammals, the Mustelidae are a varied bunch: creatures of water, trees and earth. They tend to be long-bodied, sinuous and predatory – weasels, stoats, pine martens and otters – and so, on first impressions, the badger looks like the black sheep of the family. As Tim Roper, emeritus professor at the University of Sussex and author of *Badger*, a thorough and very readable tour of what we currently know about *Meles meles*, puts it, an animal can survive by being quick and agile or robust and strong; it can be a sniper or a tank. And the badger is a tank. When faced by

an adversary, it adopts a 'head down' stance, displaying its stripes as a warning. 'If it is meant to be intimidating, it works,' he writes. But the badger also has a deceptive sinuosity more in keeping with other mustelids, alongside their sharp teeth and long front claws.

All carnivores have anal glands but the badger has a special, large scent gland, the subcaudal gland, beneath its tail. The badger's habit of scenting, or musking, baffled early badger watchers. 'There is no doubt the badger sucks and licks this substance, whether by way of taking a tonic, a cooling draught, a stimulant, or other physic, I cannot say,' wrote Sir Alfred Pease in 1898. But rather than the slurping of an energy drink, scientists discovered, the badger's rather philosophical squatting on its nightly rounds is actually an eloquent expression of identity and territory. Badgers use their distinctive musk to recognise each other, signify their reproductive state, whether they are a baby or an adult and, crucially – where badgers live in clan-like social groups – whether an individual animal is an insider or an outsider.

Twenty million years ago, the ancestors of *Meles meles*, the European badger, began evolving from their marten-like origins as agile climbers with long tails and a predatory demeanour. To survive in the evolving grasslands and savannahs, prey animals could either run, as ungulates did, or burrow into the ground like rodents. Predators had to be either good at chasing, such as dogs, or good at snaring subterranean prey, in which case they evolved to slink down holes like a weasel or became rotavators, such as bears and badgers, with formidable claws to dig for their dinner. In the badger's case, they could also burrow away from

larger predators. Around three million years ago, the ancestors of the badger moved north into Europe. The earliest fossil remains, of Thoral's badger, *Meles thorali*, a clear precursor of today's badger, are about two million years old and were found at Saint-Vallier, near Lyons. At Boxgrove, West Sussex, badger bones dating from the Pleistocene era, between 750,000 and 500,000 years ago, have been found alongside the bones of human ancestors, which suggests the British relationship with badgers is an ancient one. The last glacial period, between 110,000 and 12,000 years ago, forced the badger to retreat from much of northern Europe until the thawing of the ice enabled it to colonise Britain in the company of bears, wolves, Arctic foxes, reindeer – and humans.

Wytham is a perfect illustration of how badgers across Britain have successfully adapted to a landscape increasingly shaped by man. When the ice retreated and badgers advanced again, they would have found Oxfordshire to be inhospitable Arctic tundra. As the climate warmed, forests of birch and pine quickly established themselves, followed by dense deciduous woodlands of oak, elm, lime and hazel. The Thames Valley may have been a swampy floodplain, home to beavers and too wet for badgers, but the woods of Wytham were high and dry. An outlying piece of Cotswold escarpment, the hill possessed a limestone top, below which was a generous layer of sandy soil that met the heavy Thames clay at the bottom. While Neolithic people created modest clearings across Oxfordshire, badgers dug their setts in the easily mined sand halfway down the hill at Wytham; the limestone cap above their heads was a perfect roof and stopped their tunnels

caving in. The distribution of badgers in Britain today remains influenced by geology; badgers can't dig setts in heavy clay soils that will collapse or flood and so are largely absent from valley bottoms, floodplains and swathes of flat land such as East Anglia.

No slice of British countryside endures without a reason, and Wytham Woods escaped destruction because of the same quirk of geology – the limestone cap that made it so ideal for the badger. Half the forests that covered Oxfordshire had disappeared by Roman times; by 1300 just 7 per cent was left. Like everywhere else, Wytham's ancient trees were taken for firewood. The University of Oxford joined in the destruction – in 1632 eight oaks were purchased for just over £11 to make the grand gates of the Bodleian Library's Schools Quadrangle – and the trees on the hill were divided by a toll road known as the Singing Way because medieval monks on pilgrimage from Cirencester to Canterbury broke into song when they caught sight of Oxford for the first time from the high ground. But the woods endured.

In the Middle Ages Wytham was earmarked for tithed agriculture, but when farmers tested the soil they realised that the limestone below would break every plough. After Henry VIII seized control of Wytham from Abingdon Abbey during the dissolution of the monasteries, he sold the woods to acquisitive aristocrats who planted new forests for hunting. Assisted by the Enclosure Acts, the 5th Earl of Abingdon carved a much larger estate from common land and liberally adorned it with beech, oak, lime, sycamore and wych elm. The family's fortunes changed, however, and in 1920 the penniless 7th Earl sold his 3,000 acres to an arriviste miner called Raymond ffennell. The London-

born son of a German father and English mother, Raymond Schumacher, as he was originally known, was educated at Harrow before making his fortune in the gold mines of Johannesburg. In 1915 he returned to England, adopted his mother's maiden name to avoid anti-German sentiment, and bought the estate of Wytham, including the woods. At first, ffennell, his wife and daughter Hazel commuted from London and stayed in 'the Camp', a set of lavishly carpeted, heated and fully staffed tents erected on the hilltop. Then he built a hunting lodge in the style of a Swiss chalet in the middle of the woods and, playing the perfect English gentleman, invited friends over for shooting weekends.

In the year the Second World War began, ffennell's heart was broken when Hazel, his only child, died of mysterious causes. She had been a sickly, rather solitary figure who had savoured the wildlife in Wytham, recording its beauty in her diary. With no heirs, and an inclination towards philanthropy – he had given his Johannesburg home over to sick children when he returned to London – ffennell bequeathed his entire estate to Oxford University. He wanted the woods to be known as the Woods of Hazel, and asked that their beauty be preserved for education and science, a bequest hailed in *The Times* as the most significant for the university since the Middle Ages. With the characteristic ruthlessness of a powerful landowner, the university initially ignored his wishes, signing an agreement with the Forestry Commission that dedicated the Woods of Hazel to the production of timber. Thankfully, the growing number of university fellows studying ecology recognised its value as a nature reserve rather

than a commercial forest. The felling of ancient trees was halted in the 1960s and Wytham – the name Woods of Hazel never stuck – was truly given over to science as its benefactor had intended.

The geology of the woods was one reason for the density of the badger population at Wytham. Another was its bountiful supply of food. The fertile plains of the Thames Valley, which made the woods a virtual island, were hopeless terrain for setts but provided ideal foraging grounds. After dark, badgers would surge out of their elevated woodland home into the fields below to feed.

'The Badgerd battles much with sleepe, and is a very fat beast,' wrote George Turbervile, a sixteenth-century hunting enthusiast who was among the first to write of the badger's natural history. Badgers are great gastronomes. They enjoy eating anything we do – and plenty that we cannot stomach. In 1973, a Sunday paper published a photo of a badger that regularly visited a pub in Wales and was served a tipple of beer. As part of a series of 'repellent' experiments to discover what badgers found unpalatable, Chris and Christina once deposited some extremely spicy curry in the woods. They could tell it had been enthusiastically consumed by badgers when they found lurid yellow turmeric-coloured turds all over the place. Like us, badgers eat mushrooms, wheat, maize, oats, truffles, and have a bit of a sweet tooth; they enjoy plums and other fruit from trees, grapes from vineyards, and display a Pooh Bear-like gluttony for honey – the naturalist Denys Watkins-Pitchford, better known as the children's author BB, once watched a badger with 'the honey dropping down from each corner of his champing jaws in long elastic strings like yo-yo's'. Unlike most of

us, they also love snacking on slugs, frogs, beetles, roots, bulbs, mice, voles, moles, birds' eggs, baby rabbits, rats, hedgehogs and the occasional fox cub.

Above all, though, badgers adore *Lumbricus terrestris*, the 'nightcrawler' or lobworm, otherwise known as the common earthworm. An average badger can meet its energy requirements by scoffing 175 of these 10g worms in a night. My grandma once watched a sow badger devour 250 earthworms before midnight. 'She would snuffle about until she found some, lying as they do on the wet grass with only their tails anchored, and then with a tug and a stretch she would jerk out the worms and suck them down like spaghetti,' she wrote. This smart technique ensures the worms are not snapped as they are prised from the soil – because half a worm would be a terrible waste. In autumn, badgers eat to excess, building up stores of fat to survive a long winter.

Alongside its geology and plentiful food, one final element made Wytham a badger's idea of heaven: the protection of the woods and its devotion to science. Persecution has been a perennial part of the badger's life in Britain. But the strand of cruelty found in centuries of interaction between humans and badgers has been absent from Wytham's recent history. In fact, the worst treatment meted out to a badger in Wytham is probably an offensive epithet.

Until they relocated to Nova Scotia where they spent most of the year studying the impact of climate change on mice and voles from a log cabin called Ivory Towers, Chris and Christina lived alongside the badgers in the ffennells' strange Swiss chalet, a multi-tiered creation

that resembled a wedding cake on the brink of collapse. In this slightly creepy dwelling set in one of the most crepuscular corners of the wood, their relationship with badgers became almost intolerably close. One evening, they returned home and wondered who was making such a noise in the downstairs bathroom. They opened the door, and there were three badgers, queuing up to drink from the toilet bowl. One badger they named Little Bastard on account of his predilection for nocturnal vandalism. On another occasion, woken by a terrible clamour in the night, Chris had to free Little Bastard's head which, like a cartoon character's, had become stuck after it plunged through a wooden door. 'There were some new words I learned that night,' said Christina, who was born in Germany.

We parked the Land Rover beside the funny old chalet and Chris and Christina ushered me into a large gloomy room at the rear that smelt one part chemistry lab and one part stable. The badgers of Wytham had been meticulously monitored since 1987 and this was the badger-processing HQ, where the scientists conducted their annual three-week census. Patients from a local drug rehab centre helped them lug traps, and badgers, around the wood; tough but oddly therapeutic work for the volunteers. Tomorrow morning they expected to catch around fifteen badgers; seventy individuals had already passed through here in the last week.

Once caught alive in the eighty-five sturdy wire-mesh traps dotted around the wood, each badger was sedated and inspected. First, its inside hind leg was examined. If there was no black ink tattoo already,

the badger was given one. Unlike badger lovers, who name their objects of study, Wytham's scientists use numbers. The previous night Chris and Christina had reached badger no. 1,436. Tattooing sounds old-fashioned but it was quicker and more reliable than using microchips. As well as getting a tattoo, each badger had a distinctive symbol clipped into its guard hairs. This helped the researchers identify specific animals on infrared video surveillance, crucial for behavioural studies.

Each individual had its own record sheet, noting its length, weight and general health, and the results of all manner of tests. DNA and blood samples were taken and parasites and ectoparasites living in and on the badgers were logged. A study of badgers in East Sussex found 88 per cent had fleas, but more deadly than these ectoparasites was a gut parasite, coccidia, which, according to Chris, who studied parasitology, often determined whether a cub lived or died. If a cub survived into adulthood, it gained immunity from it. In a good year, Wytham's badger population rose above 300. In an average year, fifty cubs were weaned and made it above ground (those that die in the setts are never counted). Badgers may be robust and Wytham safer than most other places but mortality at birth was still high; in some years, more than 80 per cent of cubs died. In 2011, just fourteen were counted in Wytham: a hot, dry spring reduced the availability of worms and caused most of the cubs to starve to death in the first few sett-bound weeks of their lives.

The badgers had their hormones measured as well as the level of antioxidants in their bodies. Chris and Christina also peered into their

mouths, where they saw some catastrophic dentistry. Although toothless old boars survived because they could still suck up worms, they often carried nasty bite wounds because they were less able to defend themselves in fights, a small sign that *Meles meles* is a more formidable adversary than many of us imagined. One final piece of data was extracted: every trapped badger had the skin pouch of its subcaudal gland gently scooped out with a small silver spatula and each individual's distinctive musk was deposited in vials in the freezer.

Christina is the world's leading expert in badgers' olfactory communication and one of her PhD students was currently conducting a scent playback experiment at Wytham, depositing 'foreign' badger scents in particular spots outside their territory and videoing residents' responses. A resident badger would sniff an alien scent particularly intently and then spend considerable time searching for this phantom stranger. An individual lacking the scent of the local clan might be viciously dispatched.

If this smell was the defining characteristic of a badger, and one of the most important ways in which it expressed itself, I had to experience it. Christina opened the freezer door and defrosted a small glass vial by warming it in her hands. 'It looks very much like mayonnaise,' she said. It smelt, added Chris, arching an eyebrow, rather like another popular household spread. 'If you ever wondered where Marmite came from . . .' Steeling myself, I unscrewed the cap and inhaled one badger's special mayonnaise. It did indeed smell like extremely strong Marmite mixed with billy goat and an upper note of rancid fox. Unforgettable.

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We left the laboratory and strolled through Wytham. Like someone at first turned away from a private club and then later admitted, my offence at the fussy restrictions curtailing access melted away once I was inside the woods. Our solitary walk at dusk was luxuriously exclusive. This elevated sanctuary felt as if it was suspended above Oxford. To the south, two hot-air balloons hung in the sky near Didcot power station. Remote sounds drifted up from the busy Thames Valley, amplified by the vivid acoustics of a domed, wooded hill. When they used to live here permanently, Chris and Christina would watch badgers to the blare of every barge party and summer ball. When an oil storage terminal near Hemel Hempstead, thirty-five miles distant, dramatically exploded in 2005, the noise arrived at Wytham with such clarity and violence that the couple thought their home was being broken into.

It looked as if the scientists, as well as the badgers, were jostling for space in Wytham. Trees had strange identity tags on their trunks, measuring growth rates, or modest square carbuncles – some of the 1,000 great-tit boxes and 500 blue-tit boxes in the wood. A metal disc on a pole gleamed in the gloaming, another mysterious measuring contraption. 'It's easy to bump into other research projects,' admitted Chris. On one occasion, he came across a group firing three 12-bore shotguns into an ash tree. This, apparently, was the best way to measure its seed production – the shot caused the ash keys to scatter onto blankets spread out below.

A barn owl swung low over a meadow and we passed an old gamekeeper's hut, its wooden cladding peeling off like a dead tree

sloughing its bark, as if Hansel and Gretel had grown up and left the fairy-tale building some years before. Ducking away from the path and wading through thick leaf mould, we halted at the top of a steep west-facing slope underneath a heavy canopy of mature trees. Dug into the slope at the point where the limestone cap gave way to sandy soil were fifty holes. This huge sett had been inhabited by badgers for at least 475 years; the scientists knew this because after the dissolution of the monasteries, a deed was produced for Henry VIII to sell the woods which identified land by its proximity to the 'great oak badger sett'.

The badger is fêted for its fortresses. The collective noun for a group of badgers is a 'cete', which probably comes from the Latin *coetus*, meaning 'assembly' or 'coming together'. It is now more commonly used to describe a badger's home. Lacking both speed and camouflage, the badger's primary means of defence from bears and wolves, and later from man, has been its labyrinthine subterranean residences. Rabbit warrens and fox earths are mean dwellings in comparison with the grandeur of a badger's sett. 'As an engineering feat the badger warren all but rivals the beaver city,' wrote Mortimer Batten, the author of an early natural history of the badger published in 1923. 'I have known a badger to achieve in a single night a feat of excavation which would have taxed the strength of a strong man armed with a pick and shovel.' Make that a JCB. When the government dispatched seven men to measure a badger sett in the 1970s they took eight days to get to the bottom of it, unearthing a 'typical' sett featuring sixteen entrances, fifty-seven chambers and a maze of tunnels

nearly a third of a kilometre in length. The badgers had excavated twenty-five tonnes of soil to create it. Like a beaver's chain of lakes, a sett can reshape the landscape, shifting hedge lines and transforming the neighbourhood ecology, which becomes governed by nettle and elder, two plants able to tolerate the nitrogen-rich conditions created by latrine pits brimming with badger dung.

Despite its size, the great oak sett was currently inhabited by only ten badgers, an indication that an immense earthwork does not guarantee a large population. Badgers usually move between different bedrooms, rarely sleeping in one chamber for long. A Polish study found badgers used twenty-five different rooms on average over a year, spending only 2.8 consecutive days in each one. Scientists have posited competing theories to explain this, including the need to be close to food sources and to maintain group harmony; the most plausible is that regularly changing chambers helps control parasites in these potentially fetid lairs.

The badger's mania for spring-cleaning is another way to minimise parasites. 'The badger is far and away the cleanliest wild animal that we have – indeed, it is the only one of our burrowing beasts which seems to possess any idea of healthful sanitation,' declared Mortimer Batten. One of the most distinctive behaviours noted by badger watchers is the collecting or removing of cartloads of dry grass, leaves, bracken and even bluebells for their beds. A further piece of sensible housekeeping is their refusal to foul the setts; instead they use specially dug latrines, which are usually beside their regular footpaths around their homes – and another way to demarcate territory. Badgers have

been observed carrying large carcasses into their tunnels for meals but few remains have been found inside, suggesting they clear their setts of old foodstuffs, unlike foxes, who litter their earths with stinking scraps.

Most ingeniously of all, badgers may even create their own damp courses and heating systems. The biologist Tim Roper observed three setts in East Sussex where chambers were lined with plastic bags and old fertiliser sacks, on top of which the residents had created more traditional nests of dry grass, moss and dead leaves. In another study, two captive badgers kept in an artificial concrete sett chopped up hay and straw into a pile, which began to ferment, reaching an internal temperature of 38°C. The badgers built a normal nest near by, and moved it closer or further away from their radiator as required, repeating this technique over two successive winters.

Before I arrived at Wytham, I assumed that there could not be much more to discover about such a well-studied mammal, just as there could hardly be any great scientific debate over the lives of badgers. I was wrong. Almost every known aspect of a badger's being, it seemed, stimulated more questions, and further research. With the increasing use of DNA to define species, taxonomists even dispute the number of species of badger, which are found in all continents except Antarctica and Australasia.

There are relatives of the European badger that indisputably belong in its subfamily, Melinae: the Asian hog badger is *Meles meles*' closest relative; the American badger, *Taxidea taxus*, a more distant cousin; and there are also four species of ferret badger, much smaller animals,

which live in Asia and look like stoats. Distant relatives include the formidable African honey badger, *Mellivora capensis*, which isn't really a badger at all, and two species of stink badger, which, as their name suggests, are actually more like skunks.

Until recently, the Eurasian badger was regarded as a single species with three subspecies: the European, Asian and Japanese badgers. After recent work by geneticists, it is now regarded as three distinct animals: the European, Asian (*Meles leucurus*) and Japanese badger (*Meles anakuma*). In Japan, badgers have been found to live alone, more like other mustelids such as weasels, which are solitary hunters. In chilly northern Europe and the dry Mediterranean, badgers tend to reside in mixed-sex groups that defend a common territory, but often these comprise only three or four individuals. In Britain and Ireland, many badgers now live in bigger groups of five to eight. In hotspots such as Wytham, the groups are even larger – sometimes more than thirty individuals. The reasons for the increase in the size of badger societies are particularly intriguing, and divisive.

Hans Kruuk is a legendary figure in the animal sciences and the presiding spirit at Wytham. He arrived here in 1972, fresh from studying the hyenas of the Serengeti, and with his doctoral student David Macdonald, who later became Oxford University's first professor of wildlife conservation, set up the most comprehensive long-term study of the badger ever undertaken. Kruuk was struck by the puzzle that badgers lived in groups but appeared to derive little benefit from doing so. Unusually for animals that might be considered 'social carnivores', badgers in northern Europe do not display much communicative or

cooperative behaviour: they forage alone and don't seem to unite to bring up offspring or defy enemies.

Seeking to discover what purpose their apparent sociability served in their evolution, Kruuk watched the Wytham badgers through a pair of infrared binoculars purchased with the Nobel Prize money awarded to the Dutch ethologist Niko Tinbergen, Kruuk's former tutor. Kruuk's time in Wytham led him to deduce that badgers represented a fairly 'primitive' or early stage of sociality, in which groups had formed but cooperation had not really begun. He described carnivore social groups in terms of the Scottish clan system. Eastern Scotland could support many clans in small territories because the fertile land supplied people with ample food, whereas the poorer soils of the north-west Highlands supported fewer people and so resulted in fewer clans spread across much larger tracts of land. Badgers arranged themselves in a similar way.

In answer to the question of why badgers would live together if they did not benefit from cooperation, Kruuk's explanation was ecological rather than behavioural: the composition of their groups depended on the distribution of their food – chiefly, the availability of earthworms. Because badgers required different types of terrain to locate earthworms in various weather conditions (for instance, boggy Thames Valley pastures could be mined for earthworms during a drought that rendered worms inaccessible on the dry woodland floor of Wytham), a territory set up by a pair of badgers was generally large, contained a mosaic of habitats and could support additional animals. As Chris Newman put it, if this large territory was abundant in food, it would

be both impossible and a waste of energy to hold exclusive rights to it. 'It would be like trying to defend Tesco from all the other shoppers,' he said. 'There's enough food for everyone.'

Kruuk's theory was called the Resource Dispersion Hypothesis and has been developed further by Professor Macdonald, who applied it to other carnivores, such as lions, which were also once solitary but became communal. Chris Newman and Christina Buesching were firm believers in the value of Kruuk's theory but admitted it was disputed in some quarters. I travelled to the South Downs to meet Tim Roper, the scientist whose recent badger book was the first volume of the famous New Naturalist series to be devoted to a single species. A compact man with a beard and speckled grey hair, Roper grew up in the Cotswolds, and at Cambridge University he studied how animals learned. 'I wanted to find out what it was like to be a wild animal,' he said. Later Roper joined Hans Kruuk's research team in Scotland over a summer. 'He is one of the world's best field mammalogists. It was a wonderful training,' said Roper, whose book is suffused with admiration for Kruuk.

The pair fell out, however, over Kruuk's theory. 'Scientists like ideas,' explained Roper. 'A lot of scientific activity in and of itself is extremely boring – it's the idea that comes out of it that is exciting. We all tend to over-interpret our results because we want them to be important.' Kruuk, he thought, over-generalised about badger diet, focused too much on earthworms, and 'jumped into explaining these patterns of behaviour too early'.

Roper's nights watching badgers on the South Downs led him to

question Kruuk's emphasis on the importance of earthworms in determining how they arranged their lives, and he argued that a badger's territorial scent-marking was motivated by mate defence rather than defence of food; it was rather like birdsong, which is all about protecting a partner. Kruuk's theory suggested that young badgers would stay in the home sett if there was enough food; Roper thought badgers would naturally disperse – leave home – if they could. He argued that the increasingly large groups of badgers in Britain were not created by plentiful food but through lack of dispersal opportunities. Badgers were trapped. Wytham, in fact, appeared to be vivid proof: so densely populated that there were few good vacant spots to dig new setts and establish new territories.

Roper's ideas about badgers were not revolutionary (comparable theories were generally accepted in the bird world) but he believed that 'the Oxford group', the badger watchers of Wytham, were still dogmatically fixated upon the idea that behaviour was determined by food supply. In their defence, Chris Newman pointed out that their genetic work showed that half of cubs born in one social group were fathered by males from another. 'So if groups are geared to mate defence then it is a rubbish strategy – and evolution doesn't favour ineffective strategies,' he said. Video evidence, he went on, showed that badgers did not defend mates, and without this mixing of mates between groups, inbreeding would weaken populations. Wytham's scientists maintained that Roper's argument could be incorporated within Kruuk's Resource Dispersion Hypothesis. Food was only one 'resource'; other resources shaping a badger's social group were the

availability of mates, sett habitat and even bedding material. 'A parish needs a baker, a butcher, a church, a pub, a dairy, maidens, jobs,' as Chris Newman put it.

This seemed to make sense but I wondered if it left Kruuk's theory so broad that it lacked much predictive value. 'We tend to try and categorise every aspect of animal biology,' observed Chris Cheeseman, the biologist who established the legendary badger research station at Woodchester Park in the Cotswolds. 'This is not a wise or necessarily helpful approach, especially with species as adaptable as badgers. Nature is far more complex than our capacity to understand it.' I was beginning to see just how many badger mysteries were still to be solved. Had unusually large social groups coalesced in Britain because badgers had nowhere else to go? And did such large subterranean communities give rise to diseases such as bovine TB?

I had another question. Kruuk described badgers as 'primitively social' – did he mean that badgers are a bit stupid? 'I can't abide this term,' said Chris Newman. 'They are just as well adapted along a path that has suited their evolutionary trajectory as any other weasel.' Chris saw the British badger as the product of a farming system that served up such plentiful supplies of worms that a once solitary animal was now squeezed into high-density living. In these conditions, its fundamentally weasel-like mating system of 'mate with who you meet' created a promiscuous badger society. I was later to encounter plenty of badger enthusiasts who observed what they believed to be monogamous pairs, but the scientists of Wytham were having none of it. In fact, a study by Hannah Dugdale, a former student at Wytham, con-

cluded that female badgers living at high densities allowed themselves to be regularly mounted by many different males to mask paternity and reduce the risk of infanticide, as well as cut back on male aggression. This, at least, sounded smart.

'So many of our ideas about intelligence are anthropomorphic,' pointed out Tim Roper on the question of the brains of a badger. 'Much of it has to do with social communication. Cats have little of that because they are solitary animals. Dogs have a lot of social communication because they interact with their owners.' We may anthropocentrically judge intelligence by how much animals interact with us, but animal behaviourists do actually view species' levels of social interaction as one broad gauge of it. Another is to look at an animal's way of life: active hunters need to be cannier than foragers or grazers, and so in taxonomic terms carnivores are seen as the next-smartest group after primates and monkeys. *Meles meles* may be carnivorous and live in groups, but given that they have a limited social life and are less predatory than other mustelids 'you would not expect badgers to be very intelligent,' judged Roper. Scientists agree that the badger's social life is limited. As Chris Newman said, they do not live together because they enjoy one another's company. 'They don't do meerkatty things.'

I was soon to learn that badger lovers cannot resist ascribing emotions and family lives to the badgers they watch; but scientists say that badgers display little altruism and don't, for instance, warn each other of danger as other mammals such as meerkats do.

Kruuk also called badgers 'inarticulate'. His successors at Wytham

were slightly kinder, analysing badger sounds and identifying at least sixteen discrete noises, from high-pitched yelping to low-pitched bubbling and a bossy quack that resembles the call of a moorhen. One noise in particular has intrigued naturalists over the years: the badger's eerie wail. Eric Simms, a BBC natural history sound-recordist, who taped twelve distinct forms of badger chat in the 1950s, watched a boar and a sow come to an abrupt halt when they met one night. 'Half a minute went by, and then the still summer night was ripped apart by a most dreadful scream,' he remembered. 'Louder and louder it became; on and on it went. My scalp tingled while this terrifying scream went on without interruption for over four minutes. At last it stopped and a strange silence rolled over me like a swirling fog.'

This scream appeared in another mystery first mentioned by post-war badger watchers. One night in the 1940s, the naturalist Brian Vesey-Fitzgerald heard a sow who had apparently lost her mate make a 'weird unearthly cry' at the entrance to her sett. He watched, transfixed, as the badger excavated a large hole in a nearby rabbit warren. After a tense, apparently ritualistic, encounter with a boar badger, both animals disappeared. A short time later, the boar came back dragging a dead badger by a hind leg as the sow helped from behind. They reached the warren, placed the carcass in the hole and covered it with earth. Was this a funeral? Do badgers bury their dead?

The countryman Phil Drabble, who reared and wrote about badgers in the 1960s and 70s, recounted many instances of badgers 'walling in' dead comrades, sealing up the chambers where they had died. Another naturalist of that era, F. Howard Lancum, wrote of a Shropshire badger

watcher who excavated a sealed-up hole in a sett and discovered the large body of an old badger, blocked off from the rest of the sett on the inside as well as the outside, which no human killer of a badger would bother to do. While scientists usually have little time for such anecdotes, Chris Newman said they often found exhumed skeletons of badgers at Wytham that had been walled into underground mausoleums and later excavated by their descendants. Tim Roper also noted that badgers had been spotted moving carcasses from the roadside.

These accounts may be another facet of the badger's pragmatic cleanliness and self-interested desire to minimise the parasites that quickly infest an underground home. And in human circles, the endurance of the idea of a badger 'funeral' speaks of many people's determination to believe there must be a social or even spiritual side to this stubbornly mysterious animal.

Back in Wytham it was almost dark, and time to leave Chris and Christina to continue their studies. 'While we were talking,' said Christina as we turned away from our position standing on the hill above the great oak sett, 'there was a badger down there looking up at us.' The animal had long slipped away, completely unnoticed by me, and I was amused that these scientists who worked so closely with badgers would not think to excitedly point one out – unable to conceive of a person for whom they were not an everyday occurrence.

Going out to watch badgers, Chris admitted, bored him senseless and he and Christina obviously didn't fancy holding my hand until I

saw one. Despite failing to spy a single resident of the badger citadel of Wytham, there was something enchanting about the long dusk on the hill over Oxford. 'It's not a bad office really,' shrugged Chris as he clunked the Land Rover into gear and bounced us back towards the city. 'Another day, another badger' was their avowedly unromantic motto during the trapping season. But even these academics, who possessed the detached, slightly irreverent attitude of many scientists towards their subject of study, conceded there was something special about the badger. As Chris and Christina deposited me in the pub car park beyond the boundary of Wytham, I asked what they thought of badgers. 'If you were an animal, what would you be?' pondered Chris. 'I would be a badger – a stomach on legs, motivated mostly by food, that sleeps a lot.'

'And,' added Christina with a glint in her eye, 'nothing can get in your way.'

Nothing, she might have added, except man, and his dogs.