

**TIMES  
EVOKE**

**GAINED IN TRANSLATION**

Humans have much to say — but so do Earth's other creatures, great and small. From birds chirruping to frogs croaking, the cackling of monkeys making off with your water bottle to the strange, plaintive songs of whales living deep in the seas, Earth is a noisy place. Every species speaks to its own, expressing voluminous information, from where to locate food to the risks of predators and the thrills of budding romance. But animals also communicate deeper feelings, from grief over losses of loved ones to anxiety and fear as their habitats are marauded by men. Scientists find animal grammars, syntaxes, intonations, even dialects are far more sophisticated than once imagined — beings in the animal kingdom speak to each other in polished vocal deliveries, bound by formal rules, delivered in rigorous phonetics.

Understanding this rich world is important for human beings. This communication is much older than us — while humans appeared on Earth six million years ago, the smallest bird began evolving 150 million years earlier. The amount of information, wisdom and emotion stored within the archives of animal language are mindboggling — as is the intriguing question of how and why human language split from its primate relatives to grow another way. Discovering our shared linguistic roots — we each laugh, cry, adore and perhaps pray using words — with other animals can help us feel greater empathy towards all. It can also help us destress, realising we aren't the only ones with something important to say.

However, the opportunity to appreciate animal communication might be shrinking rapidly. As Times Evoke's global experts point out, anthropogenic or human-caused factors, from climate change to the destruction of habitats and the sheer racket our activities make, are impacting animal communication in multimodal ways. We are now impeding species' abilities to live peacefully by resolving conflicts through conversation, to propagate or find food. The fear of losing this magical world, and the chance to experience Earth from an animal's 'umwelt' or perception, is now driving scientists, from bioacousticians to AI inventors, to map animal sounds. But there's a lot we can do each day, from reducing our hefty carbon footprints on Earth to simply learning to be quiet — and listen. Join Times Evoke in honing our senses to all the wondrous non-human words gleaming around us. These are the true stories of our planet.

# 'Animal communications evolved in their own world — human clamour now impacts this'

Nicolas Mathevon is Distinguished Professor of Neurosciences and Animal Behavior at the University of Saint-Etienne, France, and visiting professor at the University of California, Berkeley. Speaking to Srijana Mitra Das at Times Evoke, he discusses the world of animals speaking:

**What is the core of your research?**

I am a bioacoustician. I study how animals use sound to communicate. The idea is to understand how animals exchange information using sound signals and vocalisations. We record animals and analyse the acoustic structure of their sounds, searching for certain information therein.



We have found two main types of information thus — static and dynamic. Static information is related to vocal signatures, like individual information, species and group identity, etc. Dynamic information is about an animal's motivation, stress, etc. Using analytical tools, we quantify the acoustic features that carry such data. Once we identify a specific signal, we use this in tests, asking animals if the feature identified indeed carries such information and if an animal can use this to recognise its friends, family members and so on.

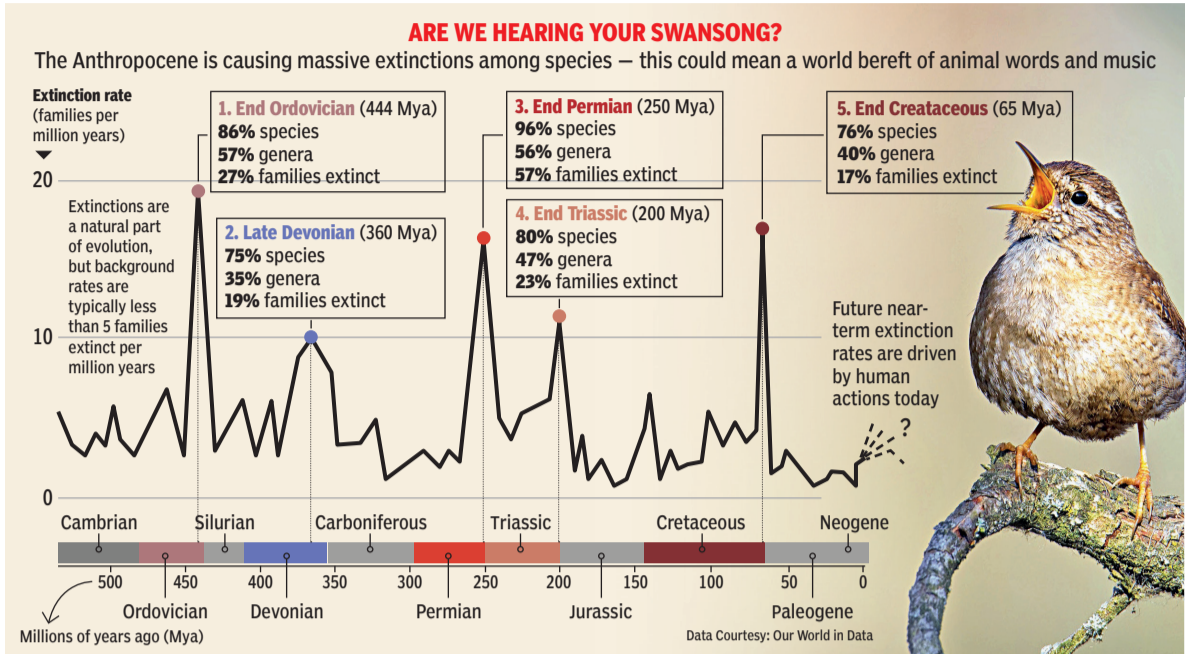
**Does each animal have a special sound?**

Yes. Consider the song of any songbird — the first information here is about the bird's species. Each songbird species has its own song. Then, this has other types of information too — one is the individual identity of the singer, where it says, 'I am so and so'. Territorial birds find this useful as neighbours who can identify each other's vocalisation don't need to fight and can live harmoniously.

This extends to other animals as well. We have a research program on the elephant seal in California which lives in colonies on beaches. The males compete for females and the former have a very specific call, a 'cluck-cluck'. Every male knows the voice of every other male. They can recognise their calls, which enables them to avoid fights because they know, for instance, 'Oh, that's Peter speaking' or 'It's Paul calling'. They also know if the male speaking is stronger or weaker and can properly evaluate if a fight is even required. They can thus navigate the social system on the beach.



**GOSSIP GIRLS:** Information about food or predators often travels across species



**Do animals have languages — and why does this possibility generate so much debate?**

That depends on what we call 'language'. You could have a very restricted way of defining language, saying this is only human with very specific characteristics and a great deal of complexity through which we express almost an infinite amount of information. But just as humans live in their own world, each animal species inhabits its specific world. Each species' communication evolved in this — if we use a less restricting definition and say language is a system that uses sounds to exchange information, then you can say any species that has developed acoustic communications, which always conveys information, has a specific language.

People get excited about this because many try to search for the same rules we find in human language among non-human animals. Interestingly, some features are shared by all beings, like the redundancy of information or the fact that we all repeat the same thing many times over. But specific rules do govern animal languages and the complexity of their acoustic system also correlates to their social system.

**Do animals convey emotions through sound?**

Absolutely. You can classify these under dynamic information, related to the current state of the individual — this could also be its emotional state, be it courtship, hunger or happiness. Charles

Darwin wrote about this and it's been amply demonstrated since. Of course, anyone who has a pet dog or cat knows animals code emotional information in their voice. This is true for wildlife as well, who can also enhance their emotional coding. When birds give alarm calls, different birds repeat these — thus, information travels across landscapes. Once, we did an experiment with the black caiman in the wild. We played back distress calls from very young juveniles recorded before — the other juveniles responded by emitting their own distress calls. This increased the response of the mother who hurried back to the nest extremely fast.

**Why should animal communication matter to human beings?**

First, we humans want to understand the world in which we and animal communication is simply fascinating. Second, we are interested in the evolution of human language. Analysing how animals communicate can give us some indications of how our own language evolved. There are practical applications

**How do animal parents communicate with their offspring?**

Parent-offspring communication is widespread in species where there is parental care. In crocodiles, for instance, the female lays eggs in the sand and stays on the nest for three months. At the end of this duration, the eggs are about to hatch — but even before that happens, the young in their shells start emitting hatching calls. In reaction, the mother digs up the sand and takes the eggs in her mouth, helping the young escape the shells — imagine the enormous mouth of a crocodile, just gently cracking the eggs because she's heard those calls.

Parent-offspring communication is also very strong in birds. Interestingly, chicks who call most intensely for feeding

receive the maximum from their parents. In mammals, we've found among fur seals, pups emit a call for the mother whose voice they can recognise. If a pup has been fed and you playback the voice of its mother to it, it won't react much. After a few days, when it gets hungry, it reacts to its mother's call but ignores other females. After a while, if the mother is still in the sea, an irate pup responds to all female calls until its mother returns and feeds it. So, acoustic communication between parent and offspring is very plastic — it depends on the situation.

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**DID YOU SAY SOMETHING?** Hippos identify friends' voices, thus avoiding area fights

**A BOOK OF TAILS**

Animals speaking have long been a source of wonder — and wisdom — for humans. Lewis Carroll wrote of the Cheshire Cat in 'Alice in Wonderland' in 1856 — this eerily grinning feline, sometimes vanishing as it spoke, symbolises the unreal nature of power, with rules disappearing at will. All that was often left of the Cheshire cat was its smug grin

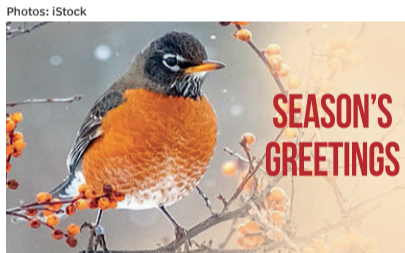
George Orwell wrote 'Animal Farm' in 1945, describing how pigs, horses and hens take over a farm, declaring 'All animals are equal'. Soon, this deteriorates into plots, privileges and purges of rebels — the startling book was a satire on Stalinism in the former Soviet Union

Perhaps the finest wisdom came from ancient India's 'Panchatantra' stories. Each offered a moral, like a rabbit outwitting a lion by showing him his 'rival' in a well, the enraged lion jumping in, freeing the jungle of a cruel king. The moral — even a brave little being can win against a low-IQ tyrant

too — if you understand the distress calls of birds, you can build tools to amplify these, which is done at many airports for safe take-offs and landings. In my lab, the French train company funds a PhD thesis, the goal of this being building systems to scurry deer off train tracks and avoid any accidents.

**Are climate change and habitat loss now impacting animal communication?**

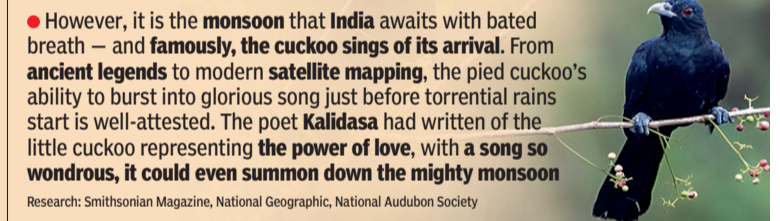
Certainly. These are having global effects on all ecosystems which are altering the composition of animal populations — and their communication. The main impact now is human noise — our activities really disturb animals in the air, terrestrially and even more intensely underwater as sound travels very fast and easily in water. The sea is very noisy now with ships, underwater explosions, mining, sonar work, etc. These are damaging the hearing of whales and dolphins — and their extraordinary acoustic communications.



**SEASON'S GREETINGS**  
We normally associate birdsong with the soft air of summer — but the robin in North America sings in the harsh winter too. Migrating robins travel in flocks, seeking berry-bearing woodlands. While some cluck to maintain contact among flock members, others chuckle in the snow, their 'whiny' compared by bemused humans to helpless victims of tickling, nature thus reminding us to be merry, no matter what the climate



**Spring** is associated with romance — and why leave the little frog out? After spending winter buried under mud or leaf litter, frogs emerge to sing. With warming weather often heralded by rain, frogs shake off their sleepiness to croon happily, assured that the rainwater will provide enough resources for tadpoles to survive into adulthood — thus, wood frogs, chorus frogs and the aptly named spring peepers sing a song of springtime



However, it is the monsoon that India awaits with bated breath — and famously, the cuckoo sings of its arrival. From ancient legends to modern satellite mapping, the pied cuckoo's ability to burst into glorious song just before torrential rains start is well-attested. The poet Kalidasa had written of the little cuckoo representing the power of love, with a song so wondrous, it could even summon down the mighty monsoon

# 'Animals think up intricate syntax for combining their sounds — we thought only humans could do that'

Arik Kershenbaum, zoologist, is Director of Studies at Girton College, Cambridge University. Speaking to Times Evoke, he discusses sounds — and silences — among non-human animals:

Arik Kershenbaum is sitting in a typical Cambridge don's room, with book-lined walls, stacks of pencils strewn about, stacks of lecture notes and research papers atop tables, shelves, even armchairs, a university robe hung on the door behind him, a reminder of tutorials, high table and formal college rites. Yet, Kershenbaum's face lights up as he thinks of wild beings far from the manicured beauty of Oxbridge. 'My work seeks to understand why animals communicate the way they do — why do they talk? Some animals say more, some less, but being an animal means you communicate,' he emphasises, 'All animals evolved to be in touch with other members of their species. The question then arises, what are they saying?'

This remains a mystery for the most part. 'Some communications are very beautiful, like birdsong,' he explains. 'But we don't think much about what birds are saying because we're sure this is basically about courtship. One species I work closely with — Kershenbaum uses the collaborative 'with' when he describes animals he studies, rather than a top-down 'on' — 'are wolves. What's incredibly fascinating about wolf howls is that these are infinitely varied. No two wolf howls are the same and, unlike bird song, these have different purposes. Trying to untangle these is a promising direction. The other species I follow is gibbons — they have very complex calls. They're apes and not too distantly related to humans. There is something special with primates — they compel you to wonder, what are they saying and how different is this from us?'

Kershenbaum also researches hyraxes, small herbivorous mammals mostly known in the Middle East and East Africa. 'From the mathematical analyses we've done, we know the way they construct their mating songs is extremely elaborate — they have a syntax, some notes follow particular notes, with rules about what note can follow which. That is much more complex than you'd expect. At first sight, it seems like an evolutionary puzzle as to why they developed such complicated ways of saying something as simple as, 'I'm a big strong guy, consider me as a mate' — but what it does reveal is that this kind of syntax or elaborate combination of sounds is much more widespread in the animal world than people thought. Animals are very good at thinking up new and complex rules for how they combine their sounds — this means some of the things we thought only humans could do, such as putting together words in particular ways, even hyraxes — and many other animals — can,' Kershenbaum smiles.



**GOT A MO, BRO?** Chimps share complex communication, from subterfuge to plots



**HOWLING IN THE WIND:** Wolf howls are usually considered daunting by human beings who cannot discern the wealth of emotions these contain — no wolf howl is the same as another and while one might express anger or fear, another could communicate freedom and joy

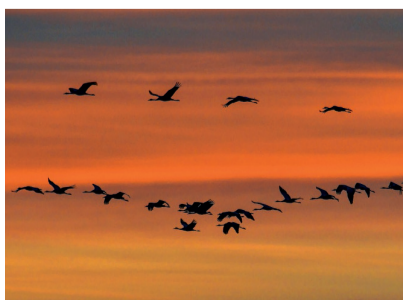
associate with rational, logical thinking. So, animals are even more emotional than we are. When you watch wolves in the wild, it's clear they howl with emotion. There is joy there, often concern, anxiety, anger. When a pack howls at a rival pack, this is a consensual, some notes follow particular notes, with rules about what note can follow which. That is much more complex than you'd expect. At first sight, it seems like an evolutionary puzzle as to why they developed such complicated ways of saying something as simple as, 'I'm a big strong guy, consider me as a mate' — but what it does reveal is that this kind of syntax or elaborate combination of sounds is much more widespread in the animal world than people thought. Animals are very good at thinking up new and complex rules for how they combine their sounds — this means some of the things we thought only humans could do, such as putting together words in particular ways, even hyraxes — and many other animals — can,' Kershenbaum smiles.

Animals are also emotional. 'Emotions sit in a part of our brain that is far more ancient than the cerebral cortex which we

associate with rational, logical thinking. So, animals are even more emotional than we are. When you watch wolves in the wild, it's clear they howl with emotion. There is joy there, often concern, anxiety, anger. When a pack howls at a rival pack, this is a consensual, some notes follow particular notes, with rules about what note can follow which. That is much more complex than you'd expect. At first sight, it seems like an evolutionary puzzle as to why they developed such complicated ways of saying something as simple as, 'I'm a big strong guy, consider me as a mate' — but what it does reveal is that this kind of syntax or elaborate combination of sounds is much more widespread in the animal world than people thought. Animals are very good at thinking up new and complex rules for how they combine their sounds — this means some of the things we thought only humans could do, such as putting together words in particular ways, even hyraxes — and many other animals — can,' Kershenbaum smiles.

something happened that led to a very rapid development of our communicative abilities. Our common ancestor with chimpanzees was quite similar to the modern chimp. Around six million years ago, while some of its descendants kept living in the jungle, some moved into grasslands and evolved adaptations for very different environments. That lineage evolved this language ability which dovetailed with complex social structures. This made a huge difference,' Kershenbaum emphasises. 'Our language set us apart from every other animal.'

Other animals have logical systems. 'Apes and chimpanzees exchange very complex information, directed at particular goals. We know the developed cognitive abilities of chimpanzees and what they are capable of thinking of each other — often, they manipulate each other, build alliances, disrupt other groups, etc. There is a lot more human-like communication there,' he explains, adding, 'Biologically, we humans aren't that different from chimpanzees, our nearest relatives. We brought a lot with us from that evolutionary past. However, our language is also qualitatively different from any other animal. At some point, between three to one million years ago,



**TAKE US HOME, COUNTRY ROADS:** Migratory birds guide each other home via their calls

The secrets of other species are difficult to study though. 'Think of dolphins — underwater, you can see a maximum of about ten metres. But dolphins can swim a lot better than you and so, it's hard to study them,' Kershenbaum smiles ruefully. 'Wolves are also very shy of humans, highly elusive, active at night when you can't see well and you certainly can't keep up if they run. The gibbons we work with in Vietnam live in thick jungles. It's hard to follow them as they swing through the trees. So, we place recording devices in the environment. Then, we can store their sounds and analyse what they are saying.'

Very few humans remain linked to the world of animal-speak. 'I was doing fieldwork in Nepal recently I saw the forest rangers were very attuned to the sounds of the jungle, to the meaning of a deer barking, a monkey calling. But even villagers weren't as attuned to these sounds. Many people in urban settings have lost contact with the natural world. Bioacoustics is one way of trying to reestablish that link.' However, Kershenbaum cautions the link, already tenuous, could entirely snap. 'The way the world is changing now — including climate change, deforestation and fragmentation of landscapes — is strongly affecting how animal communities work. Among the gibbons we work with in Vietnam, only 70 individuals are left in the world, inside a tiny patch of jungle. They are not dispersing and we don't know why. One reason could be the interactions between different groups are constricted, causing hesitation about whether dispersing adults would get territory of their own. Such queries used to get mediated by vocal communication. But when there are disturbances to an ecosystem, you get an abnormal vocal reaction from animals who can't cope. The old ways groups marked out their territory no longer work because the environment has changed,' Kershenbaum says. 'We need to learn more about these silences caused by anthropogenic impacts.'



**ONLY THE LONELY:** Gibbons talk less as their habitat is lost

**READERS WRITE**

Dear Times Evoke,  
I really liked TE's interview with Christopher Jones (10<sup>th</sup> February) about fossil fuel regimes. The 'materiality' of fossil fuels is very important, being mostly invisible to people using them. When we are better informed about where our energy is coming from, we'll use this only for essentials. Thank you for an excellent piece, TE!  
— Kavya Suvarna, Mumbai

The TE feature on inequality and the US fossil fuel regime beautifully brought out the concept of 'petromyopia', where oil, despite having just 35% utilisation worldwide, relegated other fossil fuels and animal and human labour to the background. A very eye-opening read, TE!  
— Govind Kumar, Hyderabad

TOI's TE helping readers learn more about fossil fuels is highly appreciable. These were the dominant energy sources for the 20<sup>th</sup> century but now, going by the science, they must be replaced by green energy. Thanks for a very interesting feature, TE.  
— Fateh Najamuddin, Lucknow

Thank you, TE, for the brilliant interview with Christopher Jones. This wonderfully dealt with users of energy versus producers and the hardships the latter face. I'm an electrical engineer and this article beautifully showcased inequalities in different fossil fuels. Kudos to you, TE, for such thought-provoking pages.  
— MK Goel, Delhi

TOI's TE is doing immense good in reshaping our information about fossil fuels. Christopher Jones outlined many 'invisibles' which have shaped fuel regimes. The transitional changes he discussed were spell-binding, along with the beautiful presentation that makes TE so unique.  
— V. Rajagopal, Chennai

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