October 2th, 2020

Drift, information and biological evolution: History of drumming acoustic signals in woodpeckers

Press release

Credit: Nicolas Mathevon

The diversity of animal acoustic signals is fascinating. How do animals produce and perceive sounds? To what extent does acoustic structure change during species evolutionary histories? In an article just published in the prestigious *Nature Communications* journal, researchers from the university of Saint-Etienne, together with American, Dutch and Swiss collaborators, reconstruct the evolutionary patterns of animal communication signals' function and diversification.

In 1949, Claude Shannon and Warren Weaver developed *The Mathematical Theory of Communication*, which aimed to predict the amount of information transferred in a signal. Although originally applied to telecommunications, this theory has revolutionized our understanding of animal communication. For the first time it became possible to quantify the amount of information encoded in an animal signal. Researchers have taken this opportunity to explore the evolutionary mechanisms underlying the evolution of an animal acoustic communication system.

Choosing a biological model is a decisive aspect and the authors selected woodpeckers' drumming as their ideal candidate. This bird family has the particularity of producing stereotyped and quick striking of the beak on tree trunks to communicate. The team then combined acoustic analyses, information theoretic calculation, evolutionary reconstructions, investigations at the level of ecological communities as well as field playback experiments. Their aim was to test whether drumming structure has evolved to increase species-specific information, i.e. to improve species recognition.

Results indicate that drumming did not fundamentally change during woodpeckers' evolution, and that the amount of information about species identity remained relatively constant for 22 million years! Woodpeckers' drumming was thus not selected to facilitate species recognition, yet evolved while preserving specific information as the number of species increased over time. Evolutionary processes have often led to the emergence of new drumming types. As a result, the closer two species are genetically, the more similar their drumming behavior is. Currently, most of the species living in the same community drum differently, which may not be only because of communication purposes: it might simply be that closely related species will compete over access to foraging resources, thereby mutually excluding one another. In turn, acoustic competition is reduced, if at all present.

This fascinating study shows that random and unpredictable changes in communication signals over time can occur while altogether maintaining signals informative potential within and across species.

Reference:

Garcia M, Theunissen F, Sèbe F, Clavel J, Ravignani A, Marin-Cudraz T, Fuchs J, Mathevon N, *in press*. Evolution of communication signals and information during species radiation.
Nature Communications.

Contact chercheur :

Nicolas Mathevon - **mathevon@univ-st-etienne.fr**
Equipe de Neuro-Ethologie Sensorielle ENES - CRNL : Centre de Recherche en Neurosciences de Lyon (Université Jean Monnet Saint-Etienne / Université Lyon 1 / CNRS / INSERM)
https://www.eneslab.com/

Contact presse :

Sonia Cabrita - sonia.cabrita@univ-st-etienne.fr

Date de publication: **October 2th, 2020**

Embargo: **2020/10/02 - 10:00 (London time)**