

# Primate of the opera: What soprano singing apes on helium reveal about the human voice

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Have you ever heard an opera singing ape? Researchers in Japan have discovered that singing gibbons use the same vocal techniques as professional soprano singers. The study, published in the *American Journal of Physical Anthropology*, explains how recording gibbons singing under the influence of helium gas reveals a physiological similarity to human voices.

The research was led by Dr Takeshi Nishimura from the Primate Research Institute at Kyoto University, Japan. His team studied the singing of a white-handed gibbon (*Hylobates lar*) at Fukuchiyama City Zoo, in northern Kyoto.

A gibbon's song is acoustically unique among primates, with a loud melody which can be heard over two miles away. In the wild [gibbons](#) use their songs to communicate with neighboring pairs, strangers and potential mates through impenetrable jungle where visibility is poor.

"The complexity of human speech is unique among primates as it requires varied soft sounds made by the rapid movements of vocal tracts," said Dr Nishimura. "Our speech was thought to have evolved through specific modifications in our vocal anatomy. However, we've shown how the gibbons' distinctive song uses the same vocal mechanics as soprano singers, revealing a fundamental similarity with humans."

To explore these similarities the team conducted the first acoustic investigation on non-human primates using [helium gas](#). The gas is

famous for making human voices appear high pitched by shifting the resonance frequencies of the [vocal tract](#) upwards. The gas is useful for studying animal vocal mechanisms as it increases sound velocity and resonance frequencies.

The team recorded 20 gibbon calls in normal air atmosphere, before recording 37 calls in a helium-enriched atmosphere. The resulting sounds, which are available as audio files, reveal how gibbons can consciously manipulate their vocal cords and tract to make their distinctive sound.

"The lowest frequency of harmonics is amplified in a gibbon's song when performed in normal air," said Nishimura. "However, in a helium-enriched atmosphere the tuning of the vocal cord vibration and the resonance of the vocal tract are altered as the gas causes an upward shift of the [resonance frequencies](#)."

This supports the theory that, as with humans, there is independence between the origin of the sound and the vocal tools used to manipulate it.

This shows that gibbons use the same process for producing speech as humans, whereby acoustic sound originates from the larynx and is controlled by a filter, determined by the shape of the supralaryngeal vocal tract. This manipulation forms speech and is known as the 'source-filter' process of speech production.

Singing gibbons always, and with minimal effort, adopt the complex vocal techniques which are only mastered in humans by professional soprano singers. This discovery suggests the development of complex vocal abilities in humans was not due to unique evolutionary modifications. Instead it shows that humans share the biological fundamentals of vocalisation with other primates, but in speech have simply acquired another of its most sophisticated forms.

"This is the first evidence that gibbons always sing using soprano techniques, a difficult vocalisation ability for humans which is only mastered by professional opera singers," concluded Nishimura. "This gives us a new appreciation of the evolution of speech in gibbons while revealing that the physiological foundation in human [speech](#) is not so unique."

**More information:** Hiroki Koda, Takeshi Nishimura, Isao T. Tokuda, Chisako Oyakawa, Toshikuni Nihonmatsu, Nobuo Masataka, 'Soprano singing in gibbons', American Journal of Physical Anthropology, Wiley, July 2012, [DOI: 10.1002/ajpa.22124](https://doi.org/10.1002/ajpa.22124)

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