

Did nature have a hand in the formation of the Great Sphinx?

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Historians and archaeologists have, over centuries, explored the mysteries behind the Great Sphinx of Giza: What did it originally look like? What was it designed to represent? What was its original name?

But less attention has been paid to a foundational, and controversial, question: What was the terrain the Ancient Egyptians came across when they began to build this instantly recognizable structure—and did these natural surroundings have a hand in its formation?

To address these questions, which have been raised on occasion by others, a team of New York University scientists replicated conditions that existed 4,500 years ago—when the Sphinx was built—to show how wind moved against [rock formations](#) in possibly first shaping one of the most recognizable statues in the world.

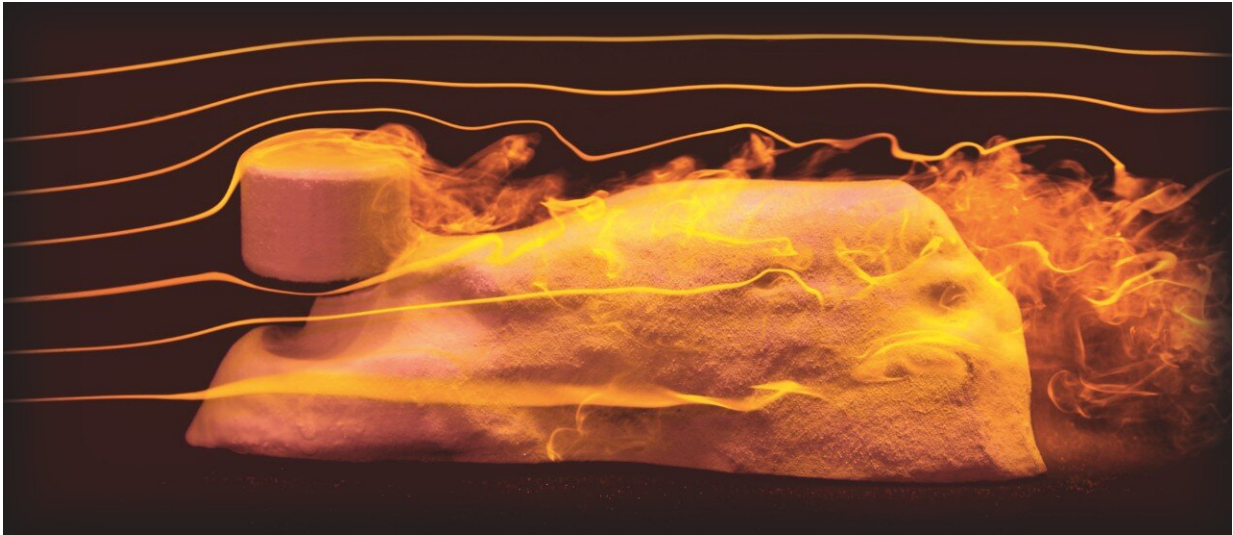
"Our findings offer a possible '[origin story](#)' for how Sphinx-like formations can come about from erosion," explains Leif Ristroph, an associate professor at New York University's Courant Institute of Mathematical Sciences and the senior author of the study, which has been accepted for publication in the journal *Physical Review Fluids*. "Our laboratory experiments showed that surprisingly Sphinx-like shapes can, in fact, come from materials being eroded by fast flows."

The work centered on replicating yardangs—unusual rock formations found in deserts resulting from wind-blown dust and sand—and exploring how the Great Sphinx could have originated as a yardang that was subsequently detailed by humans into the form of the widely recognized statue.

To do so, Ristroph and his colleagues in NYU's Applied Mathematics Laboratory took mounds of soft clay with harder, less erodible material embedded inside—mimicking the terrain in northeastern Egypt, where the Great Sphinx sits.

They then washed these formations with a fast-flowing stream of water—to replicate wind—that carved and reshaped them, eventually reaching a Sphinx-like formation. The harder or more resistant material

became the "head" of the lion and many other features—such as an undercut "neck," "paws" laid out in front on the ground, and arched "back"—developed.



A lab Sphinx is carved through an experiment that replicates the wind moving against once-shapeless mounds of clay, with harder material becoming the "head" of the lion and other features—such as an undercut "neck," "paws" laid out in front on the ground, and arched "back"—developing. Credit: NYU's Applied Mathematics Laboratory

"Our results provide a simple origin theory for how Sphinx-like formations can come about from erosion," observes Ristroph. "There are, in fact, yardangs in existence today that look like seated or lying animals, lending support to our conclusions."

"The work may also be useful to geologists as it reveals factors that affect rock formations—namely, that they are not homogeneous or uniform in composition," he adds. "The unexpected shapes come from

how the flows are diverted around the harder or less-erodible parts."

More information: Samuel Boury et al, Poster: Sculpting the Sphinx, *75th Annual Meeting of the APS Division of Fluid Dynamics—Gallery of Fluid Motion* (2022). [DOI: 10.1103/APS.DFD.2022.GFM.P0030](https://doi.org/10.1103/APS.DFD.2022.GFM.P0030)

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