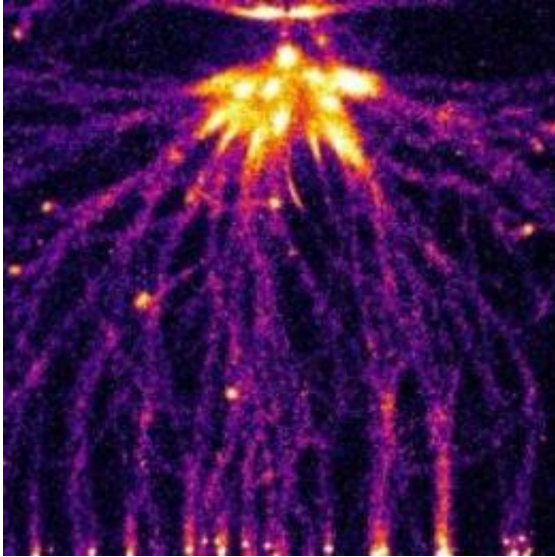


# Lightning sprites are out-of-this-world

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This is a sprite "streamer" as it might appear in the atmosphere of Saturn, created in a Tel Aviv University lab. Credit: American Friends of Tel Aviv University (AFTAU)

Only a few decades ago, scientists discovered the existence of "sprites" 30 to 55 miles above the surface of the Earth. They're offshoots of electric discharges caused by lightning storms, and a valuable window into the composition of our atmosphere. Now researchers at Tel Aviv University say that sprites are not a phenomenon specific to our planet.

Jupiter and Saturn experience [lightning](#) storms with flashes 1,000 or more times more powerful than those on Earth, says Ph.D. student Daria Dubrovin. With her supervisors Prof. Colin Price of TAU's Department

of [Geophysics](#) and Planetary Sciences and Prof. Yoav Yair of the Open University of Israel, and collaborators Prof. Ute Ebert and Dr. Sander Nijdam from the Eindhoven Technical University in Holland, Dubrovin has re-created these planetary atmospheres in the lab to study the presence of sprites in space.

The color of these bursts of electricity indicate what kinds of molecules are present and may explain the presence of exotic compounds, while providing insight into the conductivity of distant planets' atmospheres. This research, which was presented in October at the European [Planetary Science](#) Congress in France, could lead to a new understanding of electrical and [chemical processes](#) on Jupiter, Saturn, and Venus.

## **A bolt of extraterrestrial life?**

Though a little-known atmospheric phenomenon, sprites are quite common on Earth, says Dubrovin. Because they occur in the mesosphere — a layer of the atmosphere that is not regularly observed by satellites and too high to be reached by atmospheric balloons — the discovery of these electric discharges, which are red in color and last only a few tens of milliseconds, was a stroke of luck.

Lightning, as a generator of organic molecules, is credited for contributing to the "primordial soup" that, according to current theories, led to the emergence of life on Earth. Researchers are keen to know more about the possibility of lightning on other planets, explains Dubrovin, not only because it impacts the technological equipment used by space programs, but because it is another clue that could indicate the presence of [extraterrestrial life](#).

To test for the viability of extraterrestrial sprites, Dubrovin and her fellow researchers re-created the atmospheres of Jupiter, Saturn, and Venus in small containers. A circuit that creates strong short-voltage

pulses produced a discharge that mimics natural sprites. Images of these discharges, known as streamers, were taken by a fast and sensitive camera, then analyzed. Quantifying factors such as brightness, color, size, radius, and speed could help researchers measure how powerful extraterrestrial lightning actually is, she notes. "We make sprites-in-a-bottle," says Dubrovin, smiling.

## **Continuing a legacy**

Dubrovin believes that the team's predictions could convince scientists operating the Cassini spacecraft — now orbiting Saturn as part of an ESA/NASA mission — to point their cameras in a new direction. Currently, she says, there is a huge lightning storm occurring on Saturn producing at least 100 lightning discharges per second — a rare event that happens approximately once in a decade. Above the lightning-producing clouds in Jupiter's and Saturn's atmosphere, Dubrovin explains, lies a layer of clouds which partly obscure the light from the flashes. If researchers were able to obtain an image of the higher-up sprites from the Cassini craft, it would enable them to gain more information about the storm below.

TAU's research is funded by the Israeli Science Foundation (ISF) and by an Ilan Ramon Scholarship and Endowment, named after the Israeli astronaut who flew on the Columbia space shuttle, through the Israeli Ministry of Science. Part of the scientific research aboard that shuttle was on sprites, notes Dubrovin, who is happy to continue the famous Israeli astronaut's legacy.

Provided by Tel Aviv University

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