

When Lightning Strikes, Spark Branches Reconnect

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Bolts of lightning often resemble the forked, branches of trees. Similar to tree branches, lightning sparks typically spread apart. Recently, physicists at Centrum voor Wiskunde en Informatica and Eindhoven University of Technology in the Netherlands have for the first time determined the conditions that allow for spark branches to reconnect, by overcoming the electrostatic repulsion that usually causes them to separate.

These branches, known as streamers, are the building blocks of sparks and lightning. They are actually made of air that has been converted into long, thin, twisty rods of plasma. These streams of plasma serve as a medium or path for electricity to travel through.

The physicists recreated their own lightning environment using sophisticated computer simulations. They studied the dynamics of 3-dimensional streamers in nitrogen-oxygen mixtures like air. They found that with varying air composition and pressure, streamers can either repel or attract each other unexpectedly.

Under the right conditions, the streamers can either branch out or recombine, like two rivers coming to together. They concluded that branches reconnect because of a process called photo-ionization, where a cloud of electrons is created between two streamers that eventually makes the coalesce into a single, wider one.

Their study offers new a perspective into understanding lightning's variable behavior.

Citation: A. Luque, U. Ebert, and W. Hundsdorfer, *Physical Review Letters* (15 August 2008), link.aps.org/abstract/PRL/v101/e075005

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