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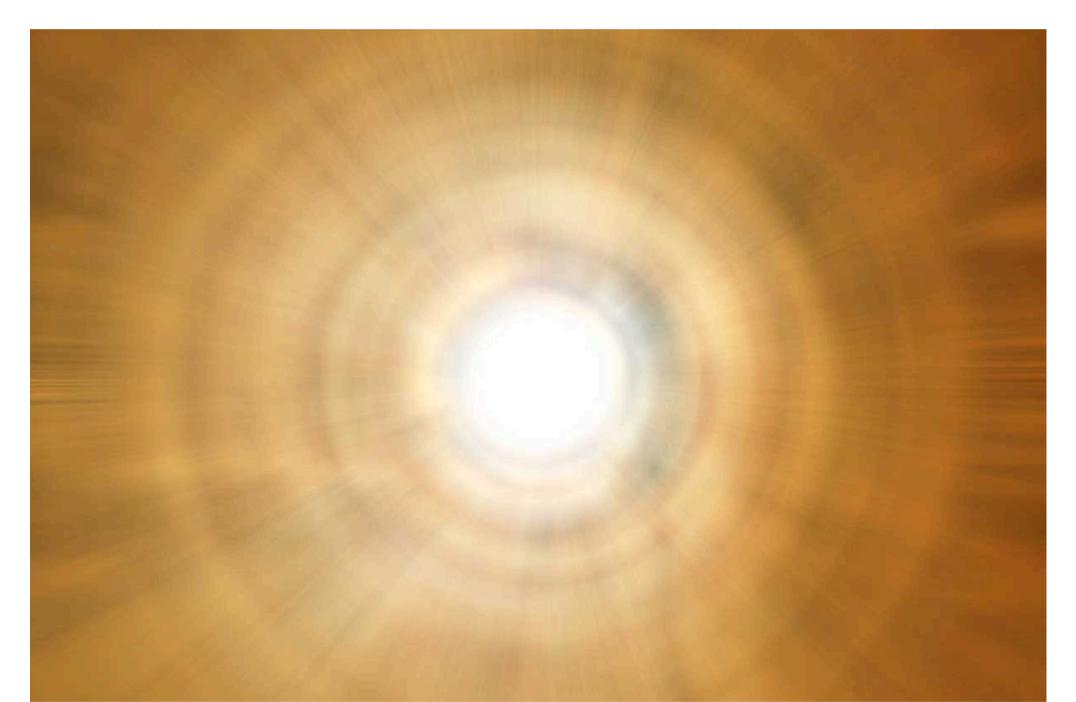
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NEWS BRAIN & BEHAVIOR

## Burst of brain activity during dying could explain life passing before your eyes

New study hints at how consciousness can continue after the heart stops

1 MAY 2023 · 6:15 PM ET · BY SARA REARDON



People who are resuscitated after death often report out-of-body experiences. MAX2611/GETTYIMAGES

Many people who have come close to death or have been resuscitated report a similar experience: Their lives flash before their

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study.

Although death has historically been medically defined as the moment when the heart irreversibly stops beating, recent studies have suggested brain activity in many animals and humans can continue for seconds to hours. In 2013, for instance, University of Michigan neurologist Jimo Borjigin and team <u>found</u> that rats' brains showed signs of consciousness up to 30 seconds after their hearts had stopped beating. "We have this binary concept of life and death that is ancient and outdated," Parnia says.

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Still, despite the numerous reports over hundreds of years from people who have been resuscitated following clinical death or nearly died, "I was shocked to realize we know almost nothing" about brain activity during the dying process, Borjigin says. For the current study, she and her team looked at the medical records of four people who were in comas and on life support on whom physicians had placed electroencephalography caps. None of the patients had any chance of survival.

The caps continually monitored the electrical signals moving across the surface of each patient's brain: before and after physicians removed their ventilators, during each patient's last measurable heartbeat, and up until all brain activity had ceased. Seconds after their ventilators were removed, two of the patients' brains suddenly lit up with a burst of neuronal activity in high-frequency patterns called gamma waves that continued as the heart stopped beating. Other studies <u>have found</u> the same pattern when a healthy person is actively recalling a memory, learning, or dreaming, and some neuroscientists have linked these oscillations with consciousness.

Ajmal Zemmar, a neurosurgeon at the University of Louisville, says gamma waves may signal that different brain regions are working together to combine disparate sensations into the conscious awareness of an object—putting together the sight and smell and sound of a car, for instance. How the brain does this, he says, "is one of the biggest mysteries in neuroscience," but seeing the same gamma waves in dying people suggests a biological mechanism for the reports of the brain replaying memorable events in those final moments. His lab previously <u>saw</u> similar gamma waves in one person who died of a heart attack while that person's brain was being monitored for seizures.

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"This paper is really important for the field and the consciousness field more generally," says biomedical scientist Charlotte Martial of the University of Liège, who studies near-death experiences. She is not surprised that only two of the four people in Borjigin's study showed the gamma activity, given that not all people who have survived near-death report memory recall or out-of-body experiences. Borjigin notes that the two people whose brains showed gamma activity also had a history of seizures, which she says could have primed their brains to experience abnormal rhythms.

Her team also saw increased electrical activity in a brain region called the temporo-parieto-occipital junction, which is believed to be involved in consciousness and is activated during dreaming, seizures, and out-of-body hallucinations. She thinks the burst of brain activity is part of a survival mode that the brain is known to enter once it is deprived of oxygen. Studies of animals undergoing brain death have found that the organ begins to release numerous signaling molecules and creates unusual brainwave patterns to try to resuscitate itself, even as it shuts down external signs of consciousness. "It shuts the door to the outside world and takes care of internal business because the house is on fire," she says.

Borjigin hopes to replicate her findings by collaborating with other medical centers to study brain activity in patients who are dying. Finding some answers to how the dying process occurs would be crucial, Zemmar says, because "death is sort of a mystery—we don't really know what it is."

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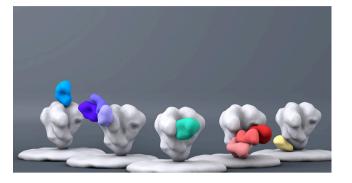
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Sara Reardon covers biomedical research and science policy for Science.

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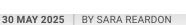
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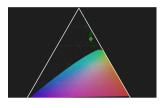
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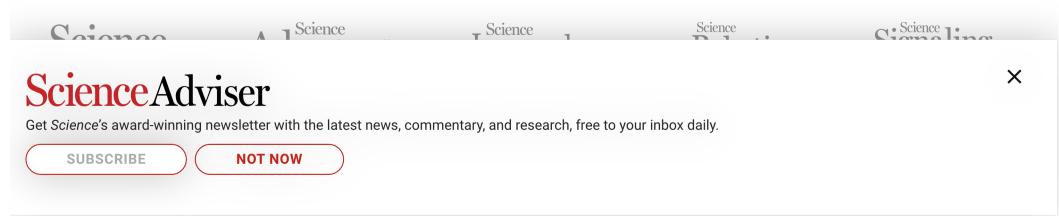
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