dwarf — the two celestial bodies would spiral towards each other and merge together before exploding.

Researchers have been searching for evidence of these processes by hunting for newly formed supernovae. That's because a supernova created in the first scenario would leave evidence behind: material travelling out from the stellar explosion would light up as it hit the still-intact companion star. But a supernova formed by the merger of a white dwarf and a small companion would obliterate all traces of the stars involved in its birth.

Astronomers had seen evidence for only the second scenario — until now. Griffin and his team's paper is the first to report a supernova formed by a white dwarf leaching material from a massive companion star. The results add weight to the idea that type Ia supernovae can form through two different stellar assembly lines.

ON THE HUNT

The first hint of the discovery came on 10 March, when a supernova appeared on the outskirts of the spiral galaxy NGC 5643, 16.9 million parsecs (55 million light years) from Earth. David Sand, an astronomer at the University of Arizona in Tucson and a co-author of the study, found it as he pored over data from the DLT40 supernova search, which scans roughly 500 galaxies every night.

Sand quickly took another image to verify that what he had seen was a stellar explosion, not an unknown asteroid. Within a few minutes, he knew it was time to alert the Las Cumbres Observatory — a network of 18 telescopes around the world that allows astronomers to monitor objects continuously as they move across the sky.

Hosseinzadeh, Sand and their colleagues observed the supernova every 5 hours for roughly 6 days and then once a night for another 40 days — allowing them to map its changing luminosity. During this period, they saw a temporary jump in brightness caused by material ejected from the supernova striking the companion star.

"This is the best evidence yet for a shock due to a companion star in a normal type Ia supernova," Garnavich says.

But the discovery is just the start of the process to unravel the mystery behind these not-so-standard candles. To better pin down their measurements of the cosmos, astronomers will keep searching for more of these dim young supernovae.

"It's like having a tool that you know how to use, but you don't know how it works," Hosseinzadeh says. "Understanding the physics of the tool that you're using seems better than just using it blindly." ■


THEO ALLOFS/GETTY

Field sites in the Simpson Desert are part of Australia's Long Term Ecological Research Network.

ECOLOGY

Research cuts rile Australian ecologists

Move could hamper efforts to predict ecosystem changes.

BY NICKY PHILLIPS

Every year since 1990, ecologist Glenda Wardle of the University of Sydney has ventured to the same expanse of desert in central Australia to take stock of its flora and fauna. But this year could be the last time she collects data there. The consortium that operates her research area and 11 other long-term sites will stop funding this network by the end of the year because of budget cuts and shifting priorities, say its leaders.

Without the support, which totalled nearly Aus$1 million (US$800,000) for 2016–17 and covers a large portion of the sites' operating costs, half will probably close, says network science director David Lindenmayer, an ecologist at the Australian National University in Canberra. This would break data sets that scientists have collected over decades, he says.

"It's a foolish decision given the environmental effects that are occurring throughout the world, and especially in Australia," says Gene Likens, an ecologist at the Cary Institute of Ecosystem Studies in Millbrook, New York.

As Australia plans to cut its ecosystem-surveillance network, other countries are expanding theirs. The US National Science Foundation announced in March that it would add 3 new sites to the 25 in its own long-term ecological research (LTER) network. "Terminating Australia's LTER network is totally out of step with international trends and national imperatives," wrote Lindenmayer and 68 co-authors in a letter in *Science* on 11 August (D. Lindenmayer *et al. Science* **357,** 557; 2017).

The cuts in Australia follow years of piecemeal support for ecological research infrastructure. Five years ago, the government tasked a consortium known as the Terrestrial Ecosystem Research Network (TERN) with bringing together the country's existing LTER sites. The dozen locations in the resulting Long Term Ecological Research Network (LTERN) cover a variety of landscapes from deserts to rainforests (see 'Endangered network').

In June, TERN director Beryl Morris and chair of the advisory board Lyn Beazley sent a letter to LTERN's executive director, Emma Burns, stating that the network would not be funded beyond 2017. "I was completely blindsided," says Burns, an ecologist at the Australian National University.

Morris, who is based at the University of Queensland in Brisbane, says that TERN is funded as research infrastructure and so it must now develop an environmental prediction system open to all researchers. To do that, she says, it must collect data on a "continental scale that is generalized, not bespoke, so ▶

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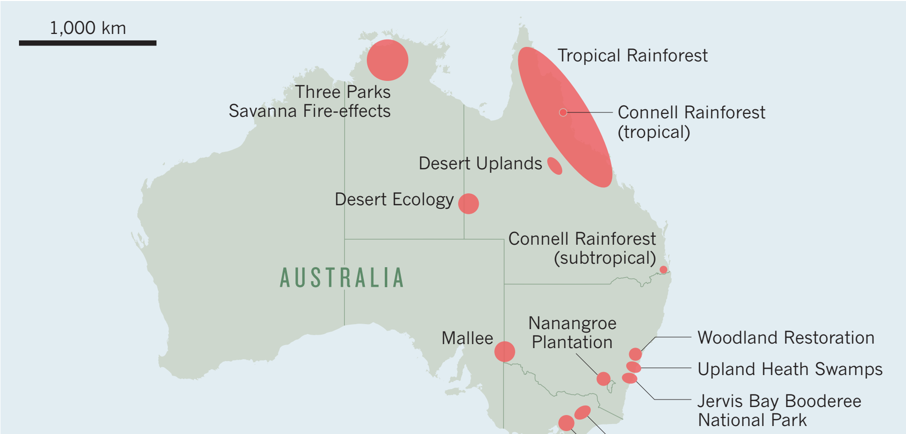

ENDANGERED NETWORK

Funding cuts imperil Australia's Long Term Ecological Research Network, which includes 12 sites comprising more than 1,100 individual field plots.

SOURCE: TERN

you can predict from it".

But Burns says the local and international scientific communities do not agree that TERN can deliver an environmental prediction system without LTERN.

Plans to withdraw funding from LTERN resurrect an ongoing debate in ecology about whether it is better to invest limited resources for environmental forecasting in broad-scale surveillance — generating lots of data by taking the same measurements in the same way at sites across the landscape — or in targeted ecological monitoring, which looks for drivers of change in specific ecosystems.

Proponents of the second view say that monitoring should be guided by asking questions tied to problems in individual regions. "You can't just measure the same things in different environments," says Lindenmayer.

Ecologist Ben Sparrow of the University of Adelaide and environmental chemist Mike Liddell of James Cook University in Cairns, both of whom direct other TERN facilities, say TERN doesn't have the money to keep all its facilities running. Sparrow says that arguing over the merits of broad-scale surveillance and targeted monitoring is not constructive because both are necessary. "The fundamental point is the lack of resourcing from the government," he says. ■

PHYSICS

On the trail of turbulence

Simulations examine how swirling eddies in a fluid transfer and dissipate energy.

BY DAVIDE CASTELVECCHI

"When I meet God, I'm going to ask him two questions: why relativity? And why turbulence? I really believe he'll have an answer for the first."

This probably apocryphal quote, attributed to physicist Werner Heisenberg, captures the confusion many scientists feel when studying turbulence, a phenomenon in which the orderly flow of a fluid — a liquid or a gas — disintegrates into seemingly unpredictable swirls, such as when a river flows round a rock, or when milk mixes with coffee.

But researchers are making progress on understanding the physics of turbulence. In a paper published on 17 August in *Science*[1], simulations by a Spanish team of aeronautical engineers help to solve a long-standing puzzle over how energy moves around in turbulent fluids. And in the past 12 months, mathematicians have made progress in explaining how turbulence helps to dissipate the energy of fluids and causes them to stop moving.

An improved understanding of turbulence and its implications for energy transfer could have big pay-offs for scientists — from astrophysicists who want to model how gas flows in galaxy clusters to climatologists simulating how ocean currents carry heat.

Turbulent flow — as in smoke — is hard to model.

ALEXANDER RIEBER/GETTY

In theory, the Navier–Stokes equations, developed almost 200 years ago, describe the physics of fluids well. But these equations are hard to solve, so engineers use simplified models or numerical simulations when they want to predict fluid flow. This approach has its limits: modelling turbulence bogs down even supercomputers. Now, aeronautical engineer José Cardesa of the Polytechnic University of Madrid and his collaborators say that they have been able to fully simulate for the first time how turbulence spreads kinetic energy across swirls of smaller scales. For water held in a large tank, for instance, their computer simulations could track how energy is transferred over about a minute from a 1-metre-diameter swirl into smaller eddies down to the 12-centimetre scale.

Their results validate a theory formulated by Russian mathematical physicist Andrei Kolmogorov in the 1940s. Among the theory's consequences is that turbulence occurs in a cascade: large eddies break down into smaller ones, which in turn split into even smaller ones, in a fractal-like fashion. Kolmogorov's picture implies that energy spreads from large swirls to smaller eddies nearby, rather than spreading farther away, which Cardesa's simulations now confirm. Cardesa says that understanding these dynamics could help to improve predictions of energy flow in phenomena such as aerodynamic drag.

TURBULENCE CASCADE

Researchers think that this 'turbulence cascade' explains how even fluids with low viscosity — such as gases — still quickly

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