Messages exposed

The Texas-based TrueDialog, a database housing millions of Americans' private text messages, was left open online for an extended period of time, a team of researchers at the online privacy company vpnMentor said.

Astronomers detect familiar feature in a far-away solar system

How typical is our solar system? The question bedevils planetary scientists, but making detections of analogous features in other planetary systems is pretty hard.

Yet astronomers have just made one — of a Kuiper Belt-like feature around a star 320 light-years away, arxiv.org reported.

It is, they say, the first polarmetric detection of the inner ring circling the star we call HD 141569A. And it's revealing new details about a crucial period of planetary development.

HD 141569A is actually a pretty interesting and well-studied object. It has two very old companions in a trinary system, both red dwarfs at the end of their lives. But HD 141569A is just 5 million years old, around three times the mass of the Sun, of a blue spectral type burning hot and bright.

In 1999, a disc was discovered around the young star, with two rings peaking at 220 and 360 astronomical units, respectively. These are the remnants of material that swirled around and accreted into the star as it was forming; over time, bits of material start sticking to each other, accreting into planets.

M. KORNMESSER/ESO

This is an artist's impression of the Kuiper belt.

In HD 141569A's disc, a gap between the two rings suggested that a planet was forming, gravitationally hoovering up all the material in its orbit.

Here in the solar system, we also have remnants of the Sun's accretion disc from its formation 4.6 billion years ago. We call it the Kuiper Belt, and it's a puffy disc of icy debris out beyond the orbit of Neptune. Pluto, at an average distance of 39.5 astronomical units, is in the Kuiper Belt.

Toward the end of this planetary accretion process, what is left is known as a debris disc, and it can extend hundreds of astronomical units across. The disc around HD 141569A is a hybrid — it's in transition between a protoplanetary disc and a debris disc.

Hybrid discs are fascinating to planetary scientists, since they can tell us about how gas giants form, and how growing planetesimals interact with the gas and dust in the disc.

Now, by studying scattered and twisted electromagnetic radiation from the region around the star, astronomers led by Juan Sebastian Bruzzone of The University of Western Ontario in Canada have imaged a similar ring around HD 141569A, peaking at a distance of 44 astronomical units from the star.

And they have found not just evidence of planetary formation, but hints that there's another ring structure in the disc closer to the star.

Specifically, they found a spiral arm — a feature found in a few other protoplanetary discs, including the two outer rings of HD 141569A, and taken to be the evidence of a forming planet. Based on the features of the spiral arm, the researchers inferred the planet would be around Jupiter's mass or slightly smaller.

They also compared their observed emission to models to find the best fit for the type of dust that could have produced it. But, even with the best-fit models, there was emission that couldn't be accounted for.

However, when another ring located closer to the star was added to the calculations, this solved the problem. A belt between five and 15 astronomical units reproduced the emission beautifully.

Aside from the fact that it's pretty danged amazing that astronomers can even achieve such a detection, this is the sort of finely detailed study that can tell us how planets are born.

In turn, that can tell us more about our own solar system — and knowing how normal or unusual it is can help us figure out how the heck we got here at all.

"Considering resolved imaging data from other high-contrast facilities, the HD 1415169A debris disc shapes up to be made of at least three, and potentially four nested rings, with spiral structures on the three spatially resolved rings," the researchers wrote in their paper.

"As such, it is an excellent laboratory for studying dynamically perturbed discs."

Technology to keep lights on could help prevent wildfires

B. Don Russell wasn't thinking about preventing a wildfire when he developed a tool to detect power line problems before blackouts and bigger disasters.

The electrical engineering professor at Texas A&M University figured he might save a life if his creation could prevent someone from being electrocuted by a downed live wire, The Associated Press reported.

But fire prevention may be his product's biggest selling point in California and other places that have experienced devastating wildland blazes blamed on electrical equipment.

"If we can find things when they start to fail, if we can find things that are in the process of degrading before a catastrophic event occurs, such as a downed line that might electrocute someone or a fire starting or even an outage for their customers, that's kind of the Holy Grail," Russell said.

The technology he bills as a one-of-a kind diagnostic tool called Distribution Fault Anticipation is now in use in Texas and being tested in California by Pacific Gas & Electric Co. and Southern California Edison. The utilities have been blamed for some of the most destructive and deadliest fires in California.

Texas A&M said the technology will also be tested in New Zealand and Australia, which is currently reeling from destructive wildfires.

The tool detects variations in electrical currents caused by deteriorating conditions or equipment and notifies utility operators so they can send a crew to fix the problems, Russell said.

It can anticipate many problems in their early stages — sometimes years before they cause an outage or present a greater hazard during high winds when utilities are now pre-emptively shutting off power to prevent sparking wildfires.

Before the technology was developed, electric companies often didn't know they had a problem until there was a failure or a customer called to report sparks on power lines or a loss of electricity.

"The assumption the utility has to make today is it's healthy until we get a call that says somebody's lights (are) out," Russell said.

"By then the fire's started or the outage has happened or the person's electrocuted."

RICH PEDRONCELLI/AP

PG&G workers bury utility lines in Paradise, California. A new technology being tested by California utilities is aimed at diagnosing problems before they could cause power outages or spark wildfires.

Pedernales Electric Cooperative Inc. that serves about 330,000 customers outside San Antonio and Austin, Texas, began implementing the system after successful tests that began in 2015. The utility serves areas so rural that before the technology was installed, electricity powering a pump on a well could have been off for days before being detected by a farmer.

The devices installed at substations are now trouble-shooting all kinds of problems, said Robert Peterson, principal engineer for the utility.

"We've found tree branches on the line. Failing arrestors. Failing capacitors. Failing connections," Peterson said. "It's pretty amazing."

In California, the testing process has just begun and there are no results yet, according to PG&E and SoCal Edison.

In Southern California, the software is running on just 60 of Edison's 1,100 circuits in the utility's high-risk fire zone, which accounts for about a quarter of its total circuits.

It's just one of several tools the utility is testing to continue to modernize its system.

"There is no silver bullet," said Bill Chiu, managing director of grid modernization and resiliency at SoCal Edison.

"This is really more of a preventive measure. ... The important point is this will be one of the suite of technology that will help us better assess the condition of the grid."

Chiu said the technology was not at the point where it could be used to determine where to shut off power when dangerous winds are forecast during dry conditions. He also said it won't pinpoint problems but can help dispatch crews closer to the source of equipment that needs to be fixed, saving time that would be wasted patrolling miles of power lines.

One question is whether the technology is economically feasible to deploy across tens of thousands of miles of power lines, Chiu said.

At an expense estimated between $15,000 to $20,000 per circuit, it could cost the utility $22 million in its high-risk fire area and that doesn't include installation, operation and maintenance costs.

That's a fraction of what a moderate wildfire sparked by a utility could cost, Russell said.

PG&E, which is testing the technology on nine circuits, was driven into bankruptcy protection this year while facing at least $20 billion in losses from a series of deadly and destructive wildfires in 2017 and 2018.

SoCal Edison recently agreed to pay $360 million to local governments to settle lawsuits over deadly wildfires sparked by its equipment during the last two years. That figure doesn't include lawsuits by thousands who lost their homes in those fires or family members of 21 people killed when a mudslide tore down a fire-scarred mountain. Two other people were never found.

Bluebonnet Electric Cooperative found the cost was feasible and has installed it on about a sixth of its circuits for the utility that has about 100,000 customers in Central Texas, said Eric Kocian, chief engineer and system operations officer.

While the system has helped proactively diagnose problems and detect the cause of outages, the university team that developed it can often find problems the utility's control room operators don't detect.

Pedernales Coop is working with an analytics company to streamline the analysis of the myriad information the software evaluates to find and fix problems in a day, Peterson said.

Russell said he never had a hint the device his research team created 15 years ago would have fire prevention applications until a series of bad wildfires in Texas in 2011. They were focused on keeping power systems safe and the lights on.

"It's obvious now in today's context of the drought that we've had in California and other places," Russell said. "Serendipitously, that's where we find ourselves today."

Flightless birds' feathers offer clues to evolution of flight

SHAO HUAN LANG

A Taiwan blue magpie in flight

Flight feathers are masterpieces of evolution, helping penguins swim, eagles soar and hummingbirds hover.

Now, research from an international team led by University of Southern California scientists has shed light on how feathers developed and helped birds spread across the world, BBC Science Focus magazine reported.

"We've always wondered how birds can fly in so many different ways, and we found the difference in flight styles is largely due to the characteristics of their flight feathers," said lead researcher Cheng-Ming Chuong.

"We want to learn how flight feathers are made so we can better understand nature and learn how biological architecture principles can benefit modern technology."

Chuong rounded up a multi-disciplinary international team consisting of experts in stem cells, molecular biology, anatomy, physics and bio-imaging to study a range of bird species with different flight styles including ostriches, sparrows, eagles, ducks, penguins, and hummingbirds.

They focused their attention on the central feather shaft and on the vane — the lateral branches running along the shaft that give the feather its shape, and examined how evolution shaped the barbs, ridges and hooks that help a feather hold its form and lock with adjacent feathers like Velcro to form a wing.

For flighted birds they found that the shaft was thinner, lighter, and filled with porous cells resembling bubble wrap, forming a light, hollow and buoyant structure to enable flight. By contrast, feathers in flightless birds were simpler, consisting of a dense cortex exterior that is more rigid and sturdy with fewer internal struts and cells found in flying birds.

Feathers found in 100 million-year-old amber in Myanmar, also known as Burma, had barbs, which were able to form a feather vane by overlapping, but not the hooklets that act like clasps to turn fluffy feathers into a tight flat plane for high-performance flight, found in modern birds.

This means that although feathered dinosaurs and early birds could form a primitive vane, it wasn't robust enough to support flight. As more complex features evolved in the wing, feather shafts became stronger yet more lightweight, leading to the evolution of stiffer feathers and sturdier wings that powered flight to carry birds around the world.