

Science & Technology Briefs

Radio-Telescope Array Images Black Hole at the Center of Our Galaxy

At the center of our Milky Way galaxy is a supermassive black hole. The first direct [imaging](#) of its surrounding gas by the Event Horizon Telescope (EHT)—a linked array of nine radio telescopes creating a synthetic aperture the size of the Earth—was simultaneously announced May 12 at six press conferences around the world.

An international team of astronomers and other specialists—led by the Harvard-Smithsonian Center for Astrophysics (CfA) and representatives of the EHT project—unveiled the first direct visual image of this giant, 27,000 light-years away, 4 million times more massive than our Sun. It was described in a special issue of *Astrophysical Journal Letters*.

CfA's [press release](#) notes: “The result provides overwhelming evidence that the object at the heart of our galaxy is indeed a black hole, and yields valuable clues about the workings of such giants, which are thought to reside at the center of most galaxies.”

Although the black hole itself can't be seen because it is completely dark, the glowing gas around it reveals a telltale signature: a dark central region surrounded by a bright, ring-like structure. The image captures light bent by the powerful gravity of the black hole.

“We were stunned by how well the size of the ring agreed with predictions from Einstein's Theory of General Relativity,” said EHT Project Scientist Geoffrey Bower of the Institute of Astronomy and Astrophysics, Aca-

demia Sinica, Taipei.

The researchers' final image is the average of thousands of images created using different computational methods to account for the rapid movement of gas.

This is the second black hole at the center of a galaxy that the EHT has imaged. An image of the first, at the center of the more distant galaxy M87, was released in April 2019.

Radio-Wave Imaging Detects Skin Cancers

High-resolution, millimeter-wave imaging—the technology used in airport body scanners—can detect skin cancers, according to a [study](#) reported in *Nature* March 23.

It found that millimeter-wave imaging can distinguish malignant tissues from benign skin lesions *in vivo*, with diagnostic accuracy comparable to clinical examination and biopsy.

When the radiowaves hit a skin lesion, they create backscatter patterns that are different if the tissue is cancerous. The imaging takes about 20 seconds and can differentiate between types of cancers.

Poverty Breeds Avian Flu, Monkeypox

The wages of failing to eliminate poverty—which must include building up a modern health care system and its related infrastructure in all nations of the world—is the emergence of two new viral threats to mankind: an avian flu and monkeypox.

Today, Europe is struggling with its largest H1N1 avian (bird) flu epidemic ever, and the end is not in sight, warns

the German Friedrich-Loeffler Institute. As of March 26, some 18 European countries had registered one or more outbreaks in farm poultry, many of the highly pathogenic form. Wild birds and their seasonal flyways are a constant source of transmission.

Losses to the food chain and farm operations are huge. Even in a vaccinated flock, the virus may exist quietly in a very few birds. According to Jean-Luc Guérin, professor in avian pathology at the National Veterinary School of Toulouse, “You could arrive at a situation where the virus would continue to circulate and mutate. This is really the concern [we have] with influenza viruses. If they are allowed to prosper, even at a low level, they will continue to mutate and tomorrow possibly become more virulent, and possibly the day after tomorrow, certain forms could become pathogenic for humans, which is absolutely not the case today.”

Texas is the latest of 34 U.S. states to be hit. Iowa Governor Kim Reynolds issued a disaster proclamation for southwest Iowa, America's biggest egg producer. Nationally, egg prices have risen 52% since early February, when the first incidence of H1N1 was found in a turkey flock in Indiana.

The first human case of the avian flu (H5N1) was reported April 29 in Colorado.

Monkeypox. With monkeypox, the world is now experiencing the emergence of yet another potentially serious health threat. Until now, this rare viral infection has appeared largely in rural areas in Central and West Africa, spread among humans via direct contact with infected rats, squirrels, and other rodents. It is endemic in Nigeria.

At a May 27 press briefing, how-

ever, Sylvie Briand, WHO's Director of the Pandemic and Epidemic Diseases Department, warned that the hundreds of cases of monkeypox that have now occurred in over 20 countries in Europe and in America, Canada, Israel, and Australia, may be just "the tip of the iceberg."

WHO says that mortality rates are 1-10%, with most fatalities occurring among younger people. There is no specific vaccine or specific treatment for monkeypox; but because it is a close cousin to smallpox, smallpox vaccines do provide protection. Smallpox is the only disease to be eradicated from the human species, thanks to vaccinations worldwide.

Monkeypox virus is known to spread through close contact with the lesions, bodily fluids, and respiratory droplets of infected people or animals. Although it is not considered a sexually transmitted disease, doctors have noted that the majority of infections to date have been in homosexual and bisexual men. Scientists warn the virus could infect others if transmission isn't curbed. A top adviser to WHO said the outbreak in Europe was likely linked to sex at two recent raves in Belgium and Spain. Other officials have expressed concern that due to Summer festivals in which "free love" is encouraged, the number of monkeypox cases is expected to increase rapidly.

There are still many unanswered questions about what has triggered the unprecedented outbreak of monkeypox outside of Africa, but there is no evidence that any genetic changes in the virus are responsible.

The rise and spread of avian flu and monkeypox are grave reminders of the failure to heed warnings published in 1974 by Lyndon LaRouche's Biological Holocaust Task Force, that IMF austerity policies unleashed in Africa (and since, worldwide) would create conditions in which pandemics of new and old diseases could begin.

Ancient Enzyme Might Increase Crop Yields in Hot Climates

Making photosynthesis more efficient has been a long-standing goal of plant productivity engineering.

A plant enzyme, known as Rubisco (short for ribulose-1,5-bisphosphate carboxylase/oxygenase), is the enzyme that incorporates CO₂ into plants during photosynthesis, by transforming that CO₂ into a form plants can use to build their tissues. As it constitutes about 30% of the total protein in a plant leaf, Rubisco is probably the most abundant protein on Earth, and a major sink for plant nitrogen.

However, plants' release of oxygen also interacts with Rubisco, producing toxic byproducts that slow down photosynthesis. Scientists have been working on methods to mitigate this process, with limited success.

In a new study, "Improving the Efficiency of Rubisco by Resurrecting Its Ancestors in the Family Solanaceae," [published](#) April 15 in *Science Advances*, scientists at Cornell University have found a way to resurrect an ancient form of the enzyme, which facilitated photosynthesis in plants millions of years ago when Earth was experiencing one of its hottest climates.

A *Daily Beast* [posting](#) April 18, titled "An Ancient Protein Could Keep Our Crops Alive During a Searing Future Climate," suggests the application of this ancient enzyme to modern crops:

"The next big step for the research team will be to transfer the reconstructed versions of the Rubisco genes into plants from the Solanaceae family—like tomatoes and potentially others, like rice or soybean—and see whether photosynthesis activity improves and props up crop yield."

According to an April 15 [article](#) in the *Cornell Chronicle*, if successful,

these new-generation crops could potentially green the deserts of the world, providing abundant food for humanity.

Ending Nuclear Fusion's 'Greenwald Limit' Leaves Plasma Instability Problem

Since 1988, scientists have accepted the conclusion of fusion scientist Martin Greenwald that the amount of hydrogen fuel that can be accommodated in a magnetic confinement fusion device (tokamak) is directly correlated to its radius, known as the "Greenwald Limit." Exceeding a given quantity for a given radius, he said, causes loss of confinement.

But the Greenwald Limit is only an empirical limit, meaning a rule-of-thumb based on observations made in past experiments. Paolo Ricci and his team at the Swiss Plasma Center, one of the world's leading research institutes in fusion located at the *École Polytechnique Fédérale de Lausanne* (EPFL), have challenged this long-held belief in a new paper, "First-Principles Density Limit Scaling in Tokamaks Based on Edge Turbulent Transport and Implications for ITER," [published](#) May 6 in *Physical Review Letters*.

They say that the Greenwald Limit can be raised—to double the amount of hydrogen fuel that can go into a tokamak to produce plasma—because the fuel-to-radius limit "shows a strong dependence on the heating power." This finding is promising for ITER (the International Thermonuclear Experimental Reactor) and for future fusion reactors such as DEMO—a successor to ITER that is currently in development.

The underlying problem remains the same: How to sustain magnetic confinement of the plasma as fuel density and temperature are increased to reach ignition?