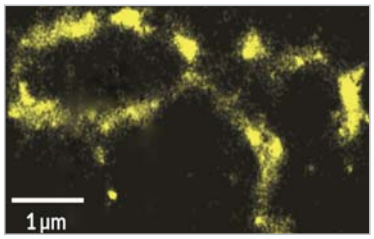
New rose species

Botanists in Plant Ecology Department of Damghan University have discovered a new species of rose in Damghan, Semnan Province.

New imaging technique catches DNA 'blinking' on

A new imaging technique takes advantage of DNA's natural ability to 'blink' in response to stimulating light.



sciencenews.org

When stimulated with light, DNA 'blinks' on, making cellular structures (chromosome shown) visible without the need for fluorescent dyes.

The new approach will allow unprecedented views of genetic material and other cellular players, sciencenews.org wrote.

It's the first method to resolve features smaller than 10 nanometers, biomedical engineer Vadim Backman said at the annual meeting of the American Association for the Advancement of Science.

DNA and proteins don't naturally give off light, conventional wisdom holds, so scientists have developed fluorescent dyes to attach to such molecules to make them visible in the darkness of a cell.

But Backman and Hao Zhang, both of Northwestern University in Evanston, Ill., discovered that when DNA is tickled with particular wavelengths of light, it 'blinks' on, momentarily shining brighter than it would with the most powerful fluorescent tags.

Backman and Zhang designed a setup that excites cells with light and then collects the spectra of the emitted light, allowing them to discern different kinds of biomolecules.

The scientists are calling their setup SICLON, for spectroscopic intrinsic-contrast photon-localization optical nanoscopy.

They have already used it to peer at the inner walls of microtubules, structures that help separate chromosomes during cell division.

The approach has allowed the researchers to collect images of structures a mere 6.2 nanometers across (a DNA molecule is roughly three nanometers across).

"The researchers hope to explore physical changes that occur when cells become cancerous," Backman said.

Scientists study stick insects to better understand speciation

What makes a new species unique? When does a subspecies become a species?

Recently, researchers at Utah State University sequenced the genomes of more than 1,000 stick insects in an effort to better understand the process of speciation, UPI wrote.

Evolutionary Biologist Zach Gompert said, "Having sequenced the genomes of a thousand individuals, we were able to pick up signals and variations that might have been missed in a smaller sample."

Gompert added it was one of the largest non-human genomic surveys yet conducted.

A stick insect disappears among a row of pine needles. UPI

Their analysis — detailed in the journal Nature Ecology and Evolution — showed the emergence of a new species is dictated by a combination of genomic differentiation and mate selection.

They found slight color variations among Timema specimens — a genus of stick insects found in the western US — can signal intermediary phases of the speciation process.

Timema specimens use cryptic color patterns to blend into their natural surroundings.

Gompert added, "Our work on these insects suggests speciation can be initiated by a few genetic changes associated with natural selection on cryptic color-patterns.

"While speciation is much more complicated than these changes, Timema's color-patterns provide a window for studying the early phases of the formation of a species."

Researchers found coexisting stick insect populations tended to feature either broad genomic differences or only slight genomic differences. But intermediary speciation phases were found in places were populations don't overlap.

He said, "We still have a lot of unanswered questions.

"While color variations in organisms, such as stick insects, can be striking and inform us of phases of evolution, they're one small aspect of a multi-faceted speciation process."

Int'l science collaboration growing at astonishing rate

Even those who follow science may be surprised by how quickly international collaboration in scientific studies is growing, according to new research.

The number of multiple-author scientific papers with collaborators from more than one country more than doubled from 1990 to 2015, from 10 to 25 percent, one study found, according to phys.org.

And 58 more countries participated in international research in 2015 than did so in 1990.

Caroline Wagner, associate professor in the John Glenn College of Public Affairs at The Ohio State University, who helped conduct these studies, said, "Those are astonishing numbers.

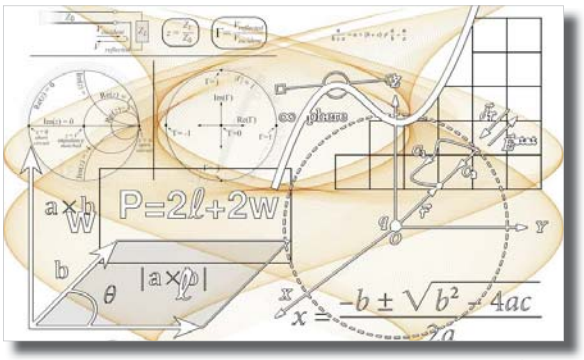
"In the 20th century, we had national systems for conducting research. In this century, we increasingly have a global system."

Wagner presented her research in Boston at the annual meeting of the American Association for the Advancement of Science.

Even though Wagner has studied international collaboration in science for years, the way it has grown so quickly and widely has surprised even her.

One unexpected finding was that international collaboration has grown in all fields she has studied.

One would expect more cooperation in fields like physics, where expensive equipment (think supercolliders) encourages support from many countries. But in mathematics?



phys.org

Wagner said, "You would think that researchers in math wouldn't have a need to collaborate internationally — but I found they do work together, and at an increasing rate.

"The methods of doing research don't determine patterns of collaboration. No matter how scientists do their work, they are collaborating more across borders."

In a study published last month in the journal Scientometrics, Wagner and two coauthors examined the growth in international collaboration in six fields: Astrophysics, mathematical logic, polymer science, seismology, soil science and virology.

Their findings showed that all six specialties added between 18 and 60 new nations to the list of collaborating partners between 1990 and 2013. In two of those fields, the number of participating nations doubled or more.

The researchers expected astrophysics would grow the most in collaboration, given the need to use expensive equipment. But it was soil science that grew the most, with a 550 percent increase in the links between research groups in different countries in that time period.

She said, "We certainly didn't expect to see soil science have the fastest growth.

"But we saw strong increases in all areas. It appears that all the fields of science that we studied are converging toward similar levels of international activity."

The study found that virology had the highest rate of collaboration, with the most countries involved.

"They aren't working together because they need to share expensive equipment. They're collaborating because issues like HIV/AIDS, Ebola and Zika are all international problems and they need to share information across borders to make progress."

Wagner has started a new line of research that attempts to determine how much nations benefit from their scientific work with other countries.

For this work, she is looking at all the scientific articles that a nation's scientists published with international collaborators in 2013.

She is looking at each article's 'impact factor' — a score that measures how much other scientists mentioned that study in their own work.

Wagner said, "How much recognition a study gets from other scientists is a way to measure its importance."

She compared each nation's combined impact factor for its international collaborations to how much money the same country spent on scientific research.

This is a way to determine how much benefit in terms of impact each nation gets for the money it spends.

The US has the highest overall spending and shows proportional returns.

However, smaller, scientifically advanced nations are far outperforming the US in the relationship between spending and impact.

Switzerland, the Netherlands and Finland outperform other countries in high-quality science compared to their investment. China is significantly underperforming its investment.

Wagner said this isn't the only way to measure how a country is benefiting from international science collaboration. But it can be one way to determine how efficiently a country is using its science dollars.

In any case, Wagner said her findings show that international science collaboration is becoming the way research gets done in nearly all scientific fields.

"Science is a global enterprise now," Wagner said.

Biologists find cave life that may be 50,000 years old

foxnews.com

New Mexico Tech Professor Penny Boston crawls through the Mud Turtle Passage on the way to the Snowy River formation during an expedition in Fort Stanton Cave.

In a Mexican cave system so beautiful and hot that it is called both Fairyland and hell, scientists have discovered life trapped in crystals that could be 50,000 years old.

The bizarre and ancient microbes were found dormant in caves in Naica, Mexico, and were able to exist by living on minerals such as iron and manganese, said Penelope Boston, head of NASA's Astrobiology Institute, foxnews.com reported.

"It's super life," said Boston, who presented the discovery at the American Association for the Advancement of Science conference in Boston.

If confirmed, the find is yet another example of how microbes can survive in extremely punishing conditions on Earth.

Though it was presented at a science conference and was the result of nine years of work, the findings haven't yet been published in a scientific journal and haven't been peer reviewed.

Boston planned more genetic tests for the microbes she revived both in the lab and on site.

The lives forms — 40 different strains of microbes and even some viruses — are so weird that their nearest relatives are still 10 percent different genetically. That makes their closest relative still pretty far away, about as far away as humans are from mushrooms, Boston said.

The Naica caves — an abandoned lead and zinc mine — are half a mile (800 meters) deep.

Before drilling occurred by a mine company, the mines had been completely cut off from the outside world. Some were as vast as cathedrals with crystals lining the iron walls. They were also so hot that scientists had to don cheap versions of space suits — to prevent contamination with outside life — and had ice packs all over their bodies.

Boston said the team could only work about 20 minutes at a time before ducking to a 'cool' room that was about 38 °C.

NASA wouldn't allow Boston to share her work for outside review so scientists couldn't say much. But University of South Florida biologist Norine Noonan, who wasn't part of the study but was on a panel where Boston presented her work, said it made sense.

Noonan said, "Why are we surprised? As a biologist I would say life on Earth is extremely tough and extremely versatile."

This isn't the oldest extreme life. Several years ago, a different group of scientists published studies about microbes that may be half a million years old and still alive.

Boston said, "Those were trapped in ice and salt, which isn't quite the same as rock or crystal."

The age of the Naica microbes was determined by outside experts who looked at where the microbes were located in the crystals and how fast those crystals grow.

It's not the only weird life Boston is examining. She is also studying microbes commonly found in caves in the US, Ukraine and elsewhere that eat copper sulfate and seem to be close to indestructible.

"It's simply another illustration of just how completely tough Earth life is," Boston said.

SpaceX successfully launches, lands Falcon 9 rocket

UPI

SpaceX on Sunday successfully launched and landed its Falcon 9 rocket a day after aborting the mission seconds before launch.

SpaceX on Sunday successfully launched and landed its Falcon 9 rocket a day after aborting the mission seconds before launch.

Falcon 9 was carrying the Dragon spacecraft, which successfully detached from Falcon 9's second stage, UPI reported.

SpaceX said, "Falcon 9 first stage has landed at LZ-1. Dragon confirmed in good orbit."

SpaceX aborted the launch on Saturday at the T-minus 10 second mark before liftoff due to a second stage thrust vector control issue.

SpaceX added, "SpaceX's Falcon 9 rocket will launch the Dragon spacecraft to low-Earth orbit to deliver critical cargo to the International Space Station for NASA.

"Dragon will separate from Falcon 9's second stage about 10 minutes after liftoff and attach to the station roughly two days later."

The launch is SpaceX's first in Florida since one of their rockets exploded in the summer of 2016.

The launch is also SpaceX's first launch from the historic Launch Complex-39A at Kennedy Space Center.

SpaceX said, "Dragon will be filled with more than 2,267kg of supplies and payloads, including critical materials to directly support dozens of the more than 250 science and research investigations.

"Among the investigations are experiments with potential to help fight human disease, monitor climate data, and improve autonomous spacecraft docking with the orbiting laboratory."