Best of last year: The top Phys.org articles of 2021

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2021 was a good year for research of all kinds. The strongest coronal mass ejection in years made headlines this past May, prompting experts around the world to urge world leaders to take it as a warning. Future storms, many noted, could wreak havoc on electrical grids, satellites and the internet. The time to act is now, they strongly suggested.

Back in 2017, a strange, elongated object entered the solar system. It was

subsequently named "Oumuamua" and the event set off a debate among members of both the science community and the public at large regarding its origins and makeup. Some suggested it was the remains of an object colliding with a comet; noted astronomer Avi Loeb, however, made the controversial suggestion early this year that it might be an alien space probe or vessel sent to study our solar system.

More recently, Steven Desch and Alan Jackson, astrophysicists at Arizona State University, announced that they had located the origin of Oumuamua, refuting the idea of its alien origin. They believe it's a remnant of an ice chunk broken from a Pluto-like planet from another stellar system a half-billion years ago.

A team from the University of Central Florida College of Optics and Photonics, IMEC U.S. and the University of Arizona reported that infrared imaging makes it easier to identify Burmese pythons in the Florida Everglades. For more than 25 years, the invasive snake population has been growing in number in the region, disrupting the delicate ecosystem. And for nearly as long, state officials have been trying to find a way to get rid of them.

Stella Koch Ocker, a doctoral student in astronomy at Cornell, detected a plasma hum coming from Voyager 1. The spacecraft launched 44 years ago, and is still transmitting signals, even after flying into the heliopause (at 14 billion miles away); its distance is now great enough that it can detect interstellar plasma waves, audible as a constant drone.

Scientists around the world noticed that the Earth is spinning faster than normal—faster than has ever been recorded before. Over the past few decades, atomic clocks have provided time so accurately that the day/night cycle can be measured more precisely than ever before—precisely enough to notice minute changes. And lately, the planet seems to be spinning faster for unknown reasons.

An international team of physicists, led by a group at MIT, brought a human-scale object to a near-standstill, reaching a quantum state. Prior efforts had super-cooled only very tiny objects, such as clusters of atoms, to a near standstill. In this new effort, the team cooled a combined intangible object with a mass of 10 kilograms and measured it using the Laser Interferometer Gravitational-Wave Observatory.

A team at the University of Cambridge developed a mathematical model that predicts the best way to build muscle. The method proved capable of selecting the optimum exercise regime for adding muscle. The math employs methods of theoretical biophysics to predict the amount of exertion needed to grow a certain amount of muscle and how much time it would take.

A group at Washington University in St. Louis found evidence indicating that America's first civilization was made up of "sophisticated engineers." They found that Native Americans living in what is now northern Louisiana at a place known as Poverty Point over 3,000 years ago built earthen structures that required a high degree of engineering sophistication.

An international team of space scientists discovered strange radio waves emitted from the direction of the galactic center. The signals were unusual and did not fit with currently understood patterns of radio waves from known sources, suggesting they could represent a new class of stellar object. They also noted it had much higher polarization than other signals, suggesting it is coming from a source that oscillates in just one direction.

A team of researchers at University of Arizona Health Sciences developed a novel nanotechnology that could be used to enhance the fight against colorectal cancer and melanoma. Their approach involved a nanotherapeutic platform that can switch tumors from "immune-cold" to

"immune-hot," which stimulated a stronger immune response.

An international team studying data from the Curiosity rover found patches of the rock record on the surface of Mars that had been erased, revealing new clues about its watery past. They found evidence of ancient salty water that had seeped through cracks in the bed of what had once been a lake in Gale Crater. The water altered the mineral-rich clay below.

A team of researchers from Switzerland, Germany and Luxembourg, discovered a historical novelty—a fossil of an ancient squid eating a crustacean while it was, itself, being eaten by an ancient shark. The interesting configuration gave the researchers a unique look at aquatic life approximately 180 million years ago. The combined fossils were discovered in a German quarry by an amateur collector.

An autonomous sailing vehicle called Saildrone, made by a company of the same name, captured the first-ever footage of the open ocean's surface as it was churned up by a hurricane. The drone managed to capture video and other data as it sailed through the category 4 Hurricane Sam in the Atlantic Ocean. As part of its journey, it stayed afloat as waves reached 15 meters amid winds blowing at 120 mph.

In September, NASA reported that Ingenuity, the tiny helicopter sent to Mars, was still flying missions. The helicopter, which arrived with the rover Perseverance, had at that time completed 12 flights successfully and was on track to carry out several more. NASA has been using the tiny craft to help with travel plans for the rover and to capture images and video of the red planet from a new vantage point.

A team working at Eötvös Loránd University's Department of Ethology discovered which dogs more often establish eye contact with humans .They identified four physical traits that characterize dogs that tend to

look their human companions in the eye: those that have short heads, are cooperative, and are young and playful. They found that in general, dogs with shorter noses most often establish eye contact.

In April, researchers working at two sites on separate projects (one in the U.S. and one in Europe) found that muons do not always behave the way that physics theories expect them to—sometimes, there are unexpected proportions of particles left over after high-speed collisions. The results suggest that certain theories related to the way the universe works may not be right.

A team with members from multiple institutions in the U.S. and one in the U.K. reported an accidental discovery hinting at a hidden population of brown dwarf stars. They found one, which they named "The Accident," that stood out from other brown dwarf stars. It was fainter in some ways and brighter in others, suggesting it was both hotter and colder than expected. Also, it was much older. The researchers suggest that there may be more brown dwarfs in the galaxy than previously thought.

A team at MIT developed a new material made from carbon nanotubes that generates electricity by scavenging energy from its environment. The group used tiny carbon particles that interact with the surrounding liquid to create a current. The liquid, an organic solvent, pulled electrons out of the particles and used them to drive chemical reactions or to power nanoscale robots.

A team of animal researchers from the Max Planck Institute for Evolutionary Anthropology and Osnabrück University reported on the first known observation of a lethal attack by chimpanzees on a gorilla. It was not known why the attack occurred, but the researchers suggest that declining resources due to climate change may have prompted the attack.

A team at Cornell University set a world record by tripling the resolution of a state-of-the-art electron microscope. The group reported observations of atoms at a record resolution. To achieve the new resolution, the team added an algorithm-driven process called ptychogra—the catch was that it only worked with samples a few atoms thick.

A team of Polish scientists studying animal behavior recorded a polar bear chasing a reindeer into the sea to drown it before dragging it ashore to eat it. Other researchers suggest the behavior is an indication of polar bears adapting to a warming climate—they normally eat seals.

A team of researchers from the University of Aveiro and the University of Porto, both in Portugal, working with a group from the University of Birmingham in the U.K., found that for humans, the brain and testis have the highest number of common proteins. A closer look showed that most of them were related to the development of tissue and communications.

A team of researchers affiliated with several institutions in the U.S. and Spain has found that most human origin stories are not compatible with known fossils. They further suggest that the narrative for hominin origins is a "big mess." The lack of consensus, they contend, has led to researchers in different places working under different paradigms—an approach that they note cannot be sustained.

And finally, a team of evolutionary biologists and biomedical researchers at Harvard University outlined how longer lives are tied to physical activity. They found evidence showing that physical activity later in life shifts energy away from processes that can compromise health and toward mechanisms in the body that extend it. They further suggest that humans have evolved in a way that allows them to remain physically active as they age.