

Science & Technology Briefs

This Peptide Inhibits All Major COVID-19 Variants

Scientists at five universities in the U.S. and Finland [reported](#) Sept. 19 an experiment showing that a novel “heptad repeat 2” peptide inhibits COVID-19 without chemical modifications, and is not deterred by mutations. A peptide is a long chain of amino acids. A “heptad repeat” peptide is one with regions having a repeating pattern of seven amino acids. The results appeared in the U.S. *Proceedings of the National Academy of Sciences*.

The virus must come into physical contact (“fusion”) with the cell to deliver its payload of virus DNA or RNA. The spikes of the virus bend or flex to lower the virus onto the cell. The scientists found that this particular peptide chain wrapped itself around the spikes, preventing them from flexing, and thereby prevented infection.

The authors write that COVID-19 infection “requires fusion of viral and host membranes, mediated by the viral spike glycoprotein (S). Due to the importance of viral membrane fusion, S has been a popular target for developing vaccines and therapeutics. We discovered a simple peptide that inhibits infection by all major variants of SARS-CoV-2 [COVID-19] with nanomolar efficacies.

“In marked contrast, widely used shorter peptides that lack a key N-terminal extension are about 100 times less potent than this peptide. Our results suggest that a simple peptide with a suitable sequence can be a potent and cost-effective therapeutic against coronavirus disease 2019, and they provide new insights into the virus entry mechanism.” More is available [here](#).

Stalagmite Study Shows Droughts in India Not From Human Activity

A new geochemical analysis of stalagmites in caves has provided a physical chronology of Summer monsoons in India, confounding today’s narrative about droughts being a function of anthropogenic global warming. The study also provides a backhanded confirmation of the British Empire’s perpetration of deadly famines. The study, “Protracted Indian Monsoon Droughts of the Past Millennium and Their Societal Impacts”—by scientists in China, UK, Austria, and the U.S.—was [published](#) Sept. 19 in the U.S. *Proceedings of the National Academy of Sciences*.

The background: Contrary to British disinformation, India’s famines were not caused by droughts, but by the British stealing food out of people’s mouths, forcing crop changes, imposing draconian taxes, and confiscating “criminal hoarding” of rice set aside for emergencies. Then when droughts came, Indians died like flies. The British blamed the droughts on God.

But not all droughts brought famines. After the Treaty of Allahabad in 1765, the British East India Company took over taxation and raised taxes from 10% to 50%. Early in 1770, famine broke out, killing 10 million in Bengal alone. The British continued looting throughout their rule, blaming the droughts for the deaths of at least 50 million Indians. After the British were kicked out in 1947, periodic droughts continued, but famines did not.

In this study, the scientists found, from stalagmites (calcium carbonate towers in caves built by deposits from

water droplets falling for hundreds of years) that there has been virtually no change in the monsoon pattern from long before the British conquests in India until today; droughts have been fairly regular for the last 1,000 years. (Monsoons have both wet and dry phases.)

So much for blaming monsoon intensity on human activity. And as for famines, the argument that God or nature was responsible is out the window.

U.S. NRC Certifies NuScale Small Modular Reactor Design

The U.S. Nuclear Regulatory Commission (NRC) [issued](#) Aug. 28 a final safety evaluation certifying NuScale’s small modular reactor (SMR) design for use in the U.S. This is the first SMR design certified by the NRC.

World Nuclear News had [reported](#) Aug. 2: “Design certification means that the NRC has determined that a nuclear power plant design meets all its applicable safety requirements, independent of an application to construct or operate a plant.”

NuScale can now apply to build plants in the U.S. NuScale President and CEO John Hopkins said:

“The affirmation of NuScale’s design and strong safety case could not have come at a more crucial time—when around the world, people are struggling from the compounding crises of volatile energy prices and climate change-driven extreme weather events. We are pleased with this continued recognition of our technology’s inherent safety design and our potential as a timely, carbon-free energy solution to meet our global community’s needs.”

Huge New Radio Telescope To Study Sun's Coronal Mass Ejections

China will build the world's largest radio telescope array for study of the Sun. The Daocheng Solar Radio Telescope (DSRT), being built on the Tibetan Plateau in Sichuan province, will have 313 parabolic antennas, each 6 m across, forming a circle with a circumference of 3.14 km.

It will study primarily coronal mass ejections (CME), bursts of magnetized plasma from the Sun, traveling at speeds ranging from less than 250 km/s to nearly 3,000 km/s. When directed at Earth, a CME can wreak havoc on power grids, telecommunications, orbiting satellites (such as GPS), and even put the safety of astronauts at risk. Less dangerous CMEs can also create the breathtaking aurora displays around the Earth's poles.

It is expected to be finished by the end of this year. Updates are available from [Space.com](#) and *South China Morning Post*

The DSRT is part of a larger project, the Chinese Meridian Project (CMP), which includes the Chinese Spectral Radioheliograph for monitoring solar activity being constructed in Inner Mongolia. The radioheliograph will consist of 100 dishes in a 3-arm spiral arrangement and will study the Sun in a wider band of frequencies than DSRT, for research on the Sun, solar physics, and space weather.

The CMP also includes some innovative technologies, such as a three-station incoherent scattering radar to make a 3D measurement of the ionosphere, and a helium Lidar to measure atmosphere density up to an altitude of 1000 km.

The entire project aims to run close to 300 instruments deployed at 31 stations across China at specific longitudes and latitudes. It is led by the National Space Science Center of the Chi-

nese Academy of Sciences and involves more than 10 institutions and universities in China.

Mongolia Opens New Railway to China

Mongolia has finally [announced](#) the opening of a project underway for 10 years—a 233-km cross-border rail line between the Tavan Tolgoi coal field and Gashuun Sukhait in China. The new railway is expected to export between 30 and 50 million metric tons of coal to China annually, dramatically lowering the cost of transportation from \$32/metric ton (by truck) to \$8. It is expected to cause the overall price of coal in China to decrease as well.

Russia and China Integrate Satellite Navigation Systems

Russia's state space company Roscosmos announced Sept. 27 that Russia and China have signed contracts for each to set up three stations of their satellite navigation systems in each other's country, allowing closer coordination between Russia's GLONASS and China's BeiDou systems, which provide the same functions as the American GPS and the European Union's Galileo.

Megawatt Nuclear Reactor for Space Uses Passes Performance Evaluation

As [reported](#) by *Space News*, China recently approved a nuclear reactor for both operational power and propulsion in space. It generates 10 times the power required by the International Space Station (ISS).

The reactor, designed by the Chinese Academy of Sciences, passed a comprehensive performance evaluation by China's Ministry of Science and Technology on Aug. 25. With a whopping 1 MW output, it is the most potent power source in the space industry.

All other space agencies, including NASA, rely on solar cells or radioisotope thermoelectric generators (RTGs) to power the space station, satellites, probes, and crewed missions. Both provide long-lasting energy, but with serious downsides. Solar power produces a meager amount of energy, which diminishes at increasing distances from the Sun, making deep space exploration challenging. That is where RTGs come in: They use heat from radioactive decay to create electricity and can generate power for decades (the *Voyager* probes and *New Horizons* use RTGs). But they, too, produce only a trickle of power and leak so much radiation that they aren't suitable for crewed missions.

A nuclear reactor solves these problems. It can create vast amounts of power for extended periods, opening new operational possibilities, including nuclear-electric propulsion and the complex orbits it makes possible, high-power zero-g experiments, and even Moon bases and long-haul human space flight.

By contrast with the Chinese reactor, NASA and the U.S. Department of Energy are procuring a 40 kW reactor from a range of private companies that it might not receive until the end of the decade. The 1 MW reactor will enable China's *Tiangong* space station to conduct experiments that the ISS could not. China will conduct sample return missions from the lunar South Pole and many deep-space missions requiring significant power over years.

China Building Commercial Space Launch Facility

In a July 7 [article](#), the *South China Morning Post* reports on the ground-breaking ceremony for the Hainan Commercial Space Launch Site on Hainan Island, the island that is home to the Wenchang Space Launch Site utilized in recent missions to China's *Tiangong* space station.