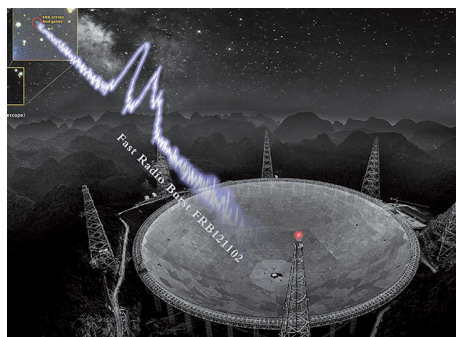


### Largest fast radio bursts

A research team from the National Astronomical Observatories of Chinese Academy of Sciences (NAOC) detected an extreme episode of cosmic explosions from the Fast Radio Bursts (FRB) 121102 through the Five-hundred-meter Aperture Spherical Radio Telescope (FAST), the world's largest single-dish radio telescope, within 47 days starting August 29, 2019.

This burst enabled astronomers to find the characteristic energy and its distribution of any FRB for the first time and study the central engine powering FRBs.

It discovered 1,652 independent burst events. The highest cadence during the burst was a peak of 122 FRBs over the span of an hour. It has been the largest set of FRB events so far.



**FAST catches a real pulse from FRB 121102. — NAOC**

FRBs are very short but intense pulses of radio waves and have been one of the greatest cosmic mysteries since the first one was observed in 2007. FRB 121102 is the first known repeater detected in 2012.

The result was published in Nature on October 13, 2021.

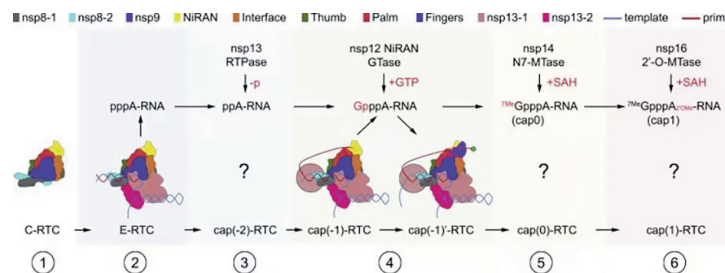
### Hopes raised for coronavirus antiviral drugs

The capping of mRNA and the proofreading, play essential roles in replication and transcription of SARS-CoV-2 causing the COVID-19 pandemic.

The research group led by Lou Zhiyong and Rao Zihe from the School of Medicine of Tsinghua University found not only a structural basis for understanding co-transcriptional modification of SARS-CoV-2 mRNA

but also how replication fidelity in SARS-CoV-2 is maintained.

These findings give an explanation of an intermediate state of the replication and transcription complex toward mRNA synthesis and help to understand the RTC architecture. The results also provide a new target and key scientific basis for antiviral development against SARS-CoV-2.



**The model for mRNA Synthesis by SARS-CoV-2 RTC. — Ti Gong**



**The silicone robot dived to 10,900 meters below the ocean's surface in the Mariana Trench.**

### Self-powered soft robot diving

A team from Zhejiang University has developed a silicone robot for deep-sea exploration, where water pressure is extreme.

It has survived a journey to 10,900 meters below the ocean's surface in the Mariana Trench.

The research achievement largely reduces the economic cost and weight of deep-sea robots and promotes the application of soft robots in deep sea.

The team members managed to improve the pressure resilience of the electronic components and soft actuators, enabling the system to adapt to the deep sea environment without any rigid vessel.

The robot's design is based on snailfish, one of the deepest-living creatures which has relatively delicate and soft bodies. It looks like a manta ray at 22 centimeters in length and 28 centimeters in wingspan.

### Production of lithium-ion batteries

Researchers from Fudan University have established the first production line of fiber lithium-ion batteries in the world.

It has been difficult to produce fiber lithium-ion batteries in lengths of more than a few centimeters because of higher internal resistances.

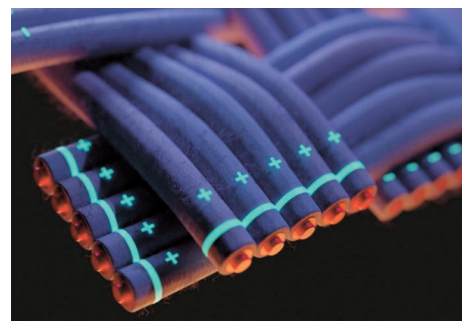
Fudan has realized the scalable production of high-performing woven lithium-ion fiber batteries, and increased the possibility of wireless charging electronic devices through clothes.

The research team is able to produce meters of high-performing fiber lithium-ion batteries.

The capacity retention reaches 90.5

percent after 500 charge-discharge cycles and over 80 percent capacity can be maintained after bending the fiber for 100,000 cycles.

The study was published in Nature in September 2021.



**A diagram of fiber lithium-ion batteries.**

### Quantum walks of 'Zu Chongzhi'

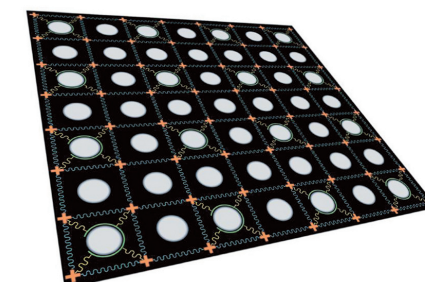
A research team from the University of Science and Technology of China has successfully designed a 62-qubit programmable superconducting quantum processor.

It is named Zu Chongzhi, after the Chinese mathematician and astronomer.

It makes China the first country to achieve a quantum computational advantage in two mainstream technical routes - photonics quantum computing technology and superconducting quantum computing technology.

The processor has realized two-dimensional programmable quantum walks on the system.

The team writes, in the article published in Science in May 2021, that the study increases the possibility of universal quantum computing. It also brings future larger scale quantum applications closer to realization on noisy intermediate-scale quantum processors.



**The 62-qubit programmable superconducting quantum processor Zu Chongzhi.**

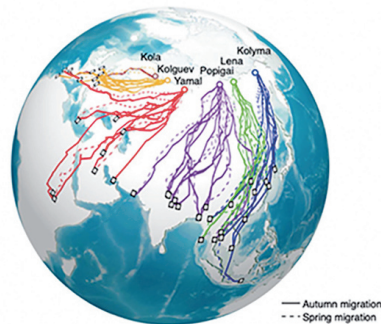


### Secrets behind birds' long-distance migration

A team from the Chinese Academy of Sciences and Cardiff University has identified a single gene associated with migration in peregrine falcons. The study was published in Nature in March 2021.

Their findings not only add further evidence that genetics plays a strong role in migrations, but also observed the predicted effect of climate change on migration.

With the help of satellites, the team found a gene ADCY8 associated with differences in migratory distance. ADCY8 is believed to increase powers of long-term memory and is essential for long-distance migration.



**The satellite system charting the migration of peregrine falcons.**