Opinion

U.S. and China Should Collaborate in Space

Edited by QI Liming

This year is definitely a standout for China's space industry, and the country's achievements in the arena of outer space continue to make headlines across the globe.

Moreover, China's space culture has begun to gain early international influence, potentially breaking NASA's decades long international monopoly in this area.

At present, a number of American scientists and experts called on science magazine *Scientific American* and other portals, saying that the U.S. and China should collaborate in space for the mutual benefits.

Less race, more collaboration

The China Manned Space Agency (CMSA) has reportedly given provisional approval to more than 1,000 scientific experiments. And it is inviting foreign participation via the United Nations (UN).

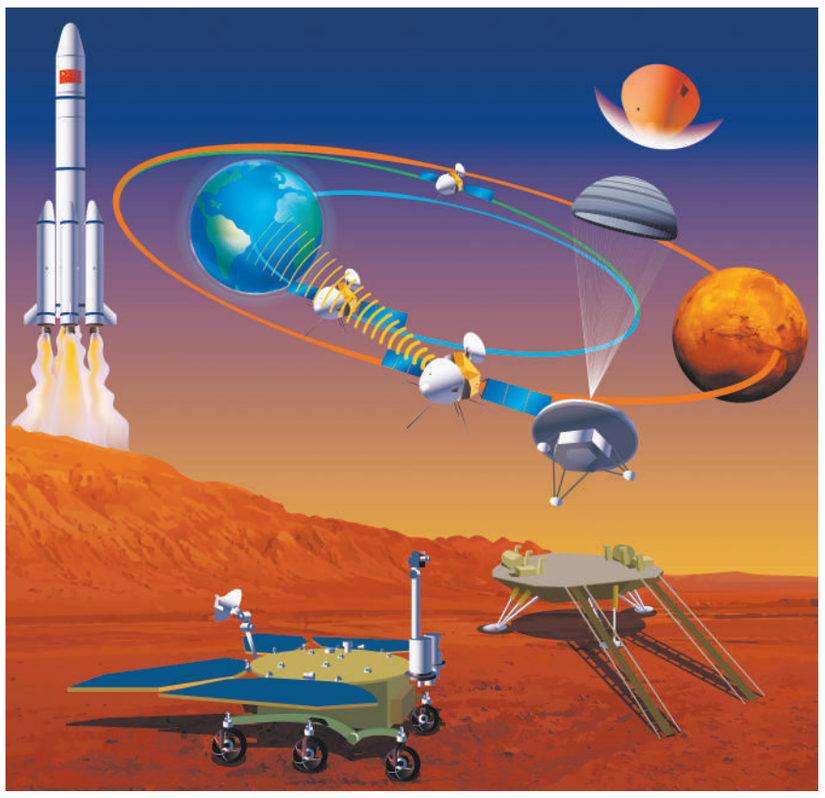
Will Marshall, CEO of Planet (operates 200 satellites that image the entire Earth landmass on a daily basis) and former NASA official on lunar missions and space debris, and Colonel Chris Hadfield, Commander of the International Space Station (ISS) shared their joint opinions on the Times.com, saying that Sino-American space cooperation is desirable at present.

It could improve ties as it did for the U.S. and Russia, and help sustain other areas of cooperation, Marshall and Hadfield mentioned .

Since China and the U.S. seem to clash on many issues, however space, by its nature, is different. Orbit isn't something tangible that one can seize. Instead, space works like a commons, where for any one state or company to be able to operate safely, all have to act responsibly. We need peaceful cooperation to enjoy its benefits said Marshall and Hadfield.

According to popular science magazine Scientific American, some experts suggest it might be time for the U.S. to search for common ground in shaping a more inclusive multi-nation space agenda.

John Logsdon, a professor emeritus at George Washington University's Elliott School of International Affairs and founder and former long-time director of the university's Space Policy Institute, said that the U.S. should use diplomatic and scientific channels to test the waters for future work with China, establishing whether any partnership could be mutually beneficial, let alone possible.



"Chinese visitors" on Mars. (PHOTO: VCG)

Ways to collaborate

Marshall and Hadfield suggested that in order to make China and the U.S. to work together in space, some things would have to change. Firstly, the *Wolf Amendment*, would have to be repealed-nothing meaningful can happen until that goes. Cooperation might then begin in lower profile areas such as sharing remote sensing data and reducing orbital debris.

The U.S. and China could also discuss joint efforts to reduce the belt of space junk that circles the planet and threatens everyone's satellites. Most importantly, cooperation could extend to joint human spaceflight missions and the U.S. could also invite China to conduct a crewed visit to ISS, or to join in the human exploration of the Moon, targeted to happen in this decade and which both nations are now working on separately, so the goal would be a joint Moon base rather than a space race, said Marshall and Hadfield.

Bill Nelson, NASA's 14th administrator, strongly recommended that one area where collaborating with China is feasible, is facilitating sharing some of China's prized specimens from its recent and highly successful Chang'e-5 lunar-sample-return mission.

As for the *Wolf Amendment*, Nelson said that as long as the U.S. researchers do not utilize any NASA funds and keep NASA-funded university projects separate from any Chinese-related projects, there is no prohibition on American researchers asking for, and receiving, those lunar collectibles.

Similarly, China's Martian-sample-return initiative is another future prospect. "Their Mars samples would be coming back about the same time that ours would, so that would be a great opportunity," Nelson suggests.

Brown University planetary scientist Jim Head, a leading expert on space exploration, working multilaterally with both Russian and Chinese space scientists, advised that rather than waiting for the White House to change the *Wolf Amendment*, Head suggests it could be more fruitful for scientists to petition Congress for an exception so that they can work bilaterally with their Chinese peers on space projects.

A way forward could be through the Inter-Agency Consultative Group for Space Science (IACG), an informal collective of researchers from major space agencies that executes inter-agency coordination on select missions. Additionally, having China become a signatory of the *Artemis Accords* (a guideline for the responsible exploration of the moon) might be a productive pathway, too, Head adds.

"The solar system is such a big place. If we're all duplicating everything individually, that is just stupid. So collaboration, cooperation, coordination- I think that's absolutely the way to go," said Head.

Voice of the World

The World's First 'Clean' Commercial Nuclear Reactor to Be Tested in China

By QI Liming

For the first time since 1969 the world will see a thorium-powered nuclear reactor tested this September, when the system, built at Wuwei in northern China, is ready.

The new molten-salt technology will be "safer" and "greener" than regular uranium reactors, and so could help to meet China's climate goals.

Operated by the Shanghai Institute of Applied Physics (SINAP), the Wuwei reactor is designed to produce just two megawatts of thermal energy, which is only enough to power up to 1,000 homes. But if the experiments are a success, China hopes to build a 373-megawatt reactor by 2030, which could power hundreds of thousands of homes.

What is a thorium-fuelled nuclear reactor?

At the end of August, the construction of its first thorium-fuelled molten-salt nuclear reactor was completed, with plans to begin the first tests of this alternative technology to current nuclear reactors within the next two weeks, according to a statement from the Gansu provincial government. China's molten-salt reactor program was first launched in 2011, investing some three billion RMB (about 500 million USD).

Thorium is a metallic element with radioactive properties, close to uranium on the periodic table, which was considered as an alternative fuel source.

Molten salt plants don't use water for cooling like traditional nuclear power plants and so can be built in desert areas, such as China's sparsely populated western regions. If the experimental reactor is a success, it could lead to commercialization and help China meet its climate goals.

Comments from scientists and media

Scientists are excited about an experimental nuclear reactor using thorium as fuel. Although this radioactive element has been trialed in reactors before, experts say that China is the first to have a shot at commercializing the technology.

The reactor is unusual in that it has molten salts circulating inside it instead of water. It has the potential to produce nuclear energy that is relatively safe and cheap, while also generating a much smaller amount of very long-lived radioactive waste than conventional reactors.

Thorium is a weakly radioactive, silvery metal found naturally in rocks, and currently has little industrial use. It is a waste product of the growing rare-earth mining industry in China, and is therefore an attractive alternative to imported uranium, say researchers.

If the upcoming tests succeed, then China could become an exporter of a reactor technology that has been the subject of much discussion for over 40 years, according to French financial newspaper *Les Echos*.

According to FRANCE 24, Jean-Claude Garnier, head of France's Alternative Energies and Atomic Energy Commission (CEA), "Almost all current reactors use uranium as fuel and water, instead of molten salt and thorium," which will be used in China's new plant.

With molten-salt technology, "It is the salt itself that becomes the fuel," said Sylvain David, research director at the French National Centre for Scientific Research (CNRS) and nuclear reactors specialist. The salt crystals are mixed with nuclear material – either uranium or thorium – heated to over 500°C to become liquid, and are then be able to transport the heat and energy produced.

Theoretically, this process would make the installations safer. "Some accident risks are supposedly eliminated, because liquid burning avoids situations where the nuclear reaction can get out of control and damage the reactor structures," Garnier added.

Les Echos also noted that there's another advantage for China: this type of reactor does not need to be built near watercourses, since the molten salts themselves "serve as a coolant, unlike conventional uranium power plants that need huge amounts of water to cool their reactors." As a result, the reactors can be installed in isolated and arid regions, like the Gobi Desert.

Great potential

Thorium has been tested as a fuel in other types of nuclear reactors in countries including the U.S., Germany and the U.K. and is part of a nuclear program in India. But it has so far not proved cost effective because it is more expensive to extract than uranium and, unlike some naturally occurring isotopes of uranium, needs to be converted into a fissile material.

Opinions shared on Nature.com said that China's reactor would be "a test bed to do a lot of learning," from analyzing corrosion to characterizing the radionucleotide composition of the mixture as it circulates. "We are going to learn so much new science," agreed Simon Middleburgh, a nuclear materials scientist at U.K. Bangor University.

Wuwei, Gansu province. (PHOTO: VCG)

Merits of the Belt and Road Initiative

Edited by BI Weizi

This year marks the 8th anniversary of the Belt and Road Initiative.

As a grand idea and Chinese solution to promote global common prosperity and build a community with a shared future for humankind, the Belt and Road Initiative is a mutually beneficial project for China and the world.

Since the launch of the Belt and Road Initiative, positive results have been achieved in various fields of international cooperation.

Recently, media, experts and scholars from many countries have called on all parties to participate more actively in this initiative and hailed it as a great development opportunity for the international community.

Bringing real benefits along the route

The Belt and Road Initiative seeks to connect many countries and regions through large-scale infrastructure investments to achieve common development, said Tom Fowdy, a British political and international relations analyst, in an article published on the Russia Today website. The popularity of the Chinese initiative is due to the fact that China does not attach any political conditions to the investment and can coordinate the participation of relevant enterprises or financial institutions when promoting the project.

An article by the Spanish newspaper Rebellion said that by building the Belt and Road Initiative, the countries concerned have effectively improved their infrastructure development, promoted sustainable development and strengthened exchanges and ties among civilizations.

The U.S. magazine *Newsweek* described the Belt and Road Initiative as, "One of the most successful and influential economic projects." In an interview, Maya Majueran and Yashiru Ranaraja, co-founders of the Belt & Road Initiative Sri Lanka, pointed out that it promotes common development and prosperity through win-win cooperation, and enhances mutual understanding and trust through peace and friendship.

Tackling more complex global challenges

The China-Europe shuttle train has operated more than 40,000 trains with a combined value of more than 200 billion USD, opened up 73 operational routes and reached more than 160 cities in 23 European countries, providing an economic lifeline amid the pandemic.

According to an article on the website of the German Transportation Daily, the latest research results of the International Union of Railways show that the rail freight volume between Europe and China has increased five-fold in the past five years under the impetus of the Belt and Road Initiative, a development momentum that is still ongoing.

Greener projects help a green recovery of the global economy

China's economy has withstood the severe test of the pandemic, and the country's outstanding capabilities in telemedicine, e-commerce and financial technology have played a key role in the fight against COVID-19, said Radiotelevisione Italiana, the national public broadcasting company of Italy. China is the largest consumer of medicine in the Asia-Pacific region and the second largest in the world, and its continued investment in infrastructure, healthcare and high technology will drive the construction of a healthier community.

Environmentalist Jennifer Calais, editor-in-chief of the French website the Conversation, said that the Belt and Road Initiative has received an enthusiastic response from many countries, and many high-quality cooperation projects have been implemented. Today, China is taking climate change seriously and actively promoting cooperation on environmental protection, and greener investments and projects in the Belt and Road Initiative will help the global economy recover in a green way.

Your Clothes May Soon Charge Your Phone

By BI Weizi

Wirelessly charging your phone through the smart clothes you wear is a scenario that may sound like science fiction, but is gradually becoming a reality. This is one of the research projects of a team headed by Peng Huisheng, director of the Department of Macromolecular Science, Fudan University.

The research results were published in Nature on September 1, under the title of "Scalable production of high-performing woven lithium-ion fibre batteries."

Energy from wearable devices

As the heart of modern electronic devices, energy storage devices represented by lithium-ion batteries are an indispensable part of the modern electronics industry and people's lives. Since 2008, Huisheng Peng's team has been researching new flexible battery systems, and in 2013, they proposed and realized a new fiber lithium-ion battery, which provides the opportunity to meet the energy supply needs of wearable devices, such as smart electronic fabrics.

Application challenges

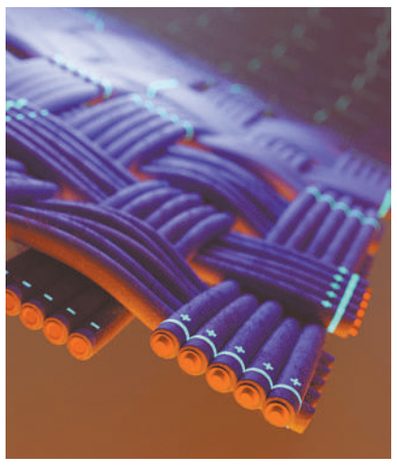
"Fiber lithium-ion batteries are like wool; to weave a sweater that can be charged, one must ensure that the wool is long enough," is how team members He Jiqing and Lu Chenhao, co-authors of the paper and doctoral students in the Department of Macromolecular Science at Fudan University, described the challenge.

The team members broke through previous research ideas by extensively trying out fiber collector materials with different electrical properties, through extensive pre-experimental screening, and finally discovered and revealed the change law, meaning that the internal resistance of fiber lithium-ion batteries first decreases and then gradually stabilizes with increasing length.

Fibre lithium-ion batteries can then be woven into safe and washable textiles by an industrial rapier loom, and can wirelessly charge a cell phone or power a health management jacket integrated with fibre sensors and a textile display.

Broad application prospects

The lithium-ion battery showed encouraging overall performance and shows broad application prospects. It can continuously and effectively power wearable electronic devices such as smartphones, bracelets, heart rate monitors and blood oxygen meters for long periods of time, and even maintain a more stable performance under harsh environments such as repeated washing and extrusion.



A picture of lithium-ion battery fibre. (PHOTO: Fudan University)