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China's Foreign Technology Wish List

CSET Issue Brief



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Executive Summary

Within the People's Republic of China's broader strategy to acquire foreign technology, "science and technology diplomats" (科技外交官) act as brokers. Stationed in PRC embassies and consulates across 52 countries, S&T diplomats monitor host country technological breakthroughs, identify investment opportunities for Chinese firms, and serve as the overseas arm of the International Cooperation Department of China's Ministry of Science and Technology (MOST).

S&T diplomats occupy a unique role in China's technology acquisition strategy, forming a bridge between foreign and domestic entities. At home, MOST personnel interface with Chinese firms and track the scientific bottlenecks holding back China's development. Abroad, they coordinate with overseas scientists, professional associations, diaspora guilds, and elements of the United Front Work Department in the countries where they are stationed, to identify opportunities where Chinese firms can grow relationships and invest. In short, S&T diplomats form the outward-facing portion of China's broader technology transfer ecosystem, and monitor scientific breakthroughs, technology enterprises, and other forms of innovation that may be of interest to the Chinese government.¹

By drawing on the resources and infrastructure of the state, ostensibly private Chinese companies can more easily gain access to technologies abroad. MOST's international outreach efforts have helped Chinese companies sign investment, licensing, and production agreements with foreign tech companies; hire foreign research and development (R&D) personnel to work in China; and identify cutting-edge research among academia and government laboratories. These accomplishments, in turn, contribute to the PRC's "going out" strategy and goals set forth in state policies including Made in China 2025.²

We arrive at this conclusion by examining 642 "international technological cooperation opportunities" (国际技术合作机会) identified by China's S&T diplomats from 2015 to 2020. Filed by PRC embassy and consulate staff, these reports reflect the Chinese

government's assessments of more than 300 foreign companies, universities, research institutions, and individuals who are pioneering technology products in a variety of fields—and how likely they would be to partner with Chinese firms, share intellectual property (IP), or establish joint ventures in China. We offer the following observations about the methods by which S&T diplomats seek technology, the content of the projects that interest them, and the locations and success of their technology acquisition efforts:

- **Methods:** S&T diplomats use a variety of state-sponsored methods, including the PRC's expansive foreign influence apparatus, to monitor technology developments overseas. After identifying or cultivating "international technical cooperation opportunities," they often advise Chinese firms to purchase equity, invest specific amounts of money, or strike patent license agreements with foreign companies.
- **Content:** When vetting potential partners, S&T diplomats tend to recommend investment positions that advance Chinese equity in supply chains relevant to the Chinese Communist Party's (CCP) stated development objectives. Half of all projects assessed in this report are related to biotechnology or artificial intelligence (AI). PRC diplomats also frequently sought to acquire components and systems currently used by the militaries of the United States and U.S. allies.
- **Locations:** Nearly half of all technology projects referred by Chinese S&T diplomats originated in Russia, the United States, the United Kingdom, and Japan. Prior to its closure in July 2020, the PRC consulate in Houston, Texas, referred the most S&T projects of any Chinese diplomatic post in the world. Still, fewer than 12 percent of projects in our dataset originated in the United States. NATO members and U.S.-designated Major Non-NATO Allies hosted more than 70 percent of the S&T projects targeted by Chinese diplomatic personnel from 2015 to 2020, underscoring the need for U.S. policymakers to coordinate with allies and partners,

who share the brunt of Chinese technology acquisition efforts.

- **Success:** Chinese diplomats seem to be successful in acquiring foreign technology. After investigating a limited sample of 30 companies identified as “cooperation opportunities,” we find that about half actually establish partnerships with enterprises in China or otherwise expose their IP after S&T diplomats identify them as potential partners.

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Introduction

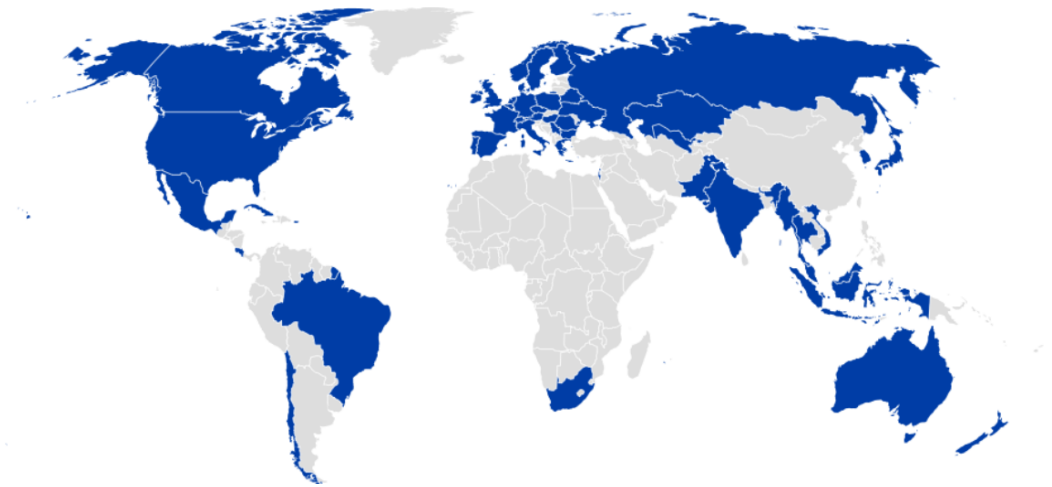
China has pursued a half-century effort to build its S&T infrastructure. Foreign technology acquisition continues to play a large role in this effort, with commercial technology products becoming increasingly attractive targets.³ Numerous books, academic studies, and think tank reports have chronicled how Beijing’s “hybrid innovation system” blends forms of academic collaboration, industry partnerships, cyber espionage, direct investment, and influence operations to enhance China’s comprehensive national power.⁴ However, while China’s S&T ambitions are well-known, what has been more elusive is how exactly the CCP’s strategic goals are carried out in practice—including which government personnel broker and support foreign technology acquisition. This is a key piece of the puzzle for U.S. and allied policymakers as they try to balance the importance of openness and transparency with the necessity of protecting against policies that undermine global norms around science and commerce.⁵

This study will outline the scope, mission, and efficacy of China’s global science and technology gathering operation, with a focus on the formalized bureaucracy that oversees these efforts. By examining trends in more than six hundred reports filed by the S&T directorates of PRC embassies and consulates, this report quantifiably assesses the types of technologies the Chinese government is most focused on acquiring and the worldwide locations that are the sources of that technology. Still, it is important to understand China’s foreign technology wish list as a signal of intent, not capability. Quantifying the impact of state support for ostensibly private Chinese firms remains challenging, as many of the PRC’s technology transfer processes are opaque by design.

The Role of China’s Science and Technology Diplomats

For more than six decades, the Chinese government and ruling Communist Party have worked to construct a formalized bureaucracy dedicated to absorbing foreign technical information and identifying partners able to provide it.⁶ The International Cooperation Department of China’s Ministry of Science and Technology today employs more than 140 “science and technology diplomats” stationed in the S&T directorates of PRC embassies and consulates worldwide.⁷ Their charge is to monitor developments in global S&T, and to seek out opportunities for Chinese firms to “make full use of international resources” and “expand channels for international science and technology cooperation.”⁸ Put succinctly, China’s S&T diplomats are an extension of the country’s industrial policy. They aim to identify the people, products, technologies, and companies that Chinese firms should invest in or acquire to advance China’s quest to become an economic and scientific powerhouse.

Figure 1. Countries Hosting Chinese Science and Technology Directorates (2020).



Source: Adapted from International Cooperation Department of the Chinese Ministry of Science and Technology.⁹

IDENTIFYING NEEDS AT HOME

China's S&T diplomats begin by identifying technology needs at home. They are explicitly tasked with implementing major policies like the Medium- and Long-Term Plan for Science and Technology Development (2006–2020) and Made in China 2025.¹⁰ MOST solicits and maintains databases of information about the scientific shortfalls of Chinese enterprises and research institutions, and shares that information with S&T diplomats working abroad. Specifically, MOST asks China-based organizations to fill out “[foreign] partner search forms” specifying the technical achievements that would accelerate their growth—examples of such paperwork can be found in Appendix II of this report. S&T diplomats also coordinate closely with other CCP and government organizations, including the Science and Technology Commissions of Party Committees in each province, science and technology “innovation parks” (i.e., commercialization enclaves), and “maker spaces” established and supported by the Chinese government.

TRACKING BREAKTHROUGHS ABROAD

S&T diplomats leverage overseas Chinese professional associations, Chinese Student and Scholar Associations, and a network of CCP-sponsored organizations known as the “United Front” to gain a nuanced understanding of the state of the art in fields of science, as well as the specific entities and individuals with the skills and information necessary to accelerate China's development.¹¹ The United Front carries out a wide array of influence operations aimed at ethnic minority groups inside China, Chinese living abroad, and foreigners.¹² In the context of China's foreign technology acquisition strategy, elements of the United Front monitor scientific breakthroughs in research communities worldwide, and offer a variety of incentives for foreign and overseas Chinese scientists to share technical information with entities in China.¹³ By making use of “government-organized non-governmental organizations,” the CCP is able to build trust and gain access to people, information, and equipment where an overt

government or military organization would normally be met with resistance.¹⁴

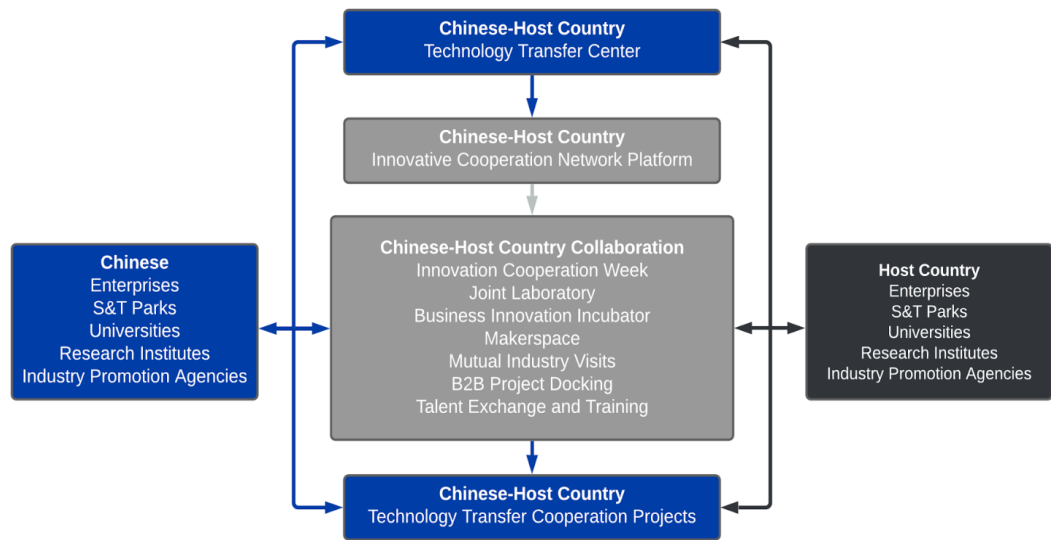
Although Chinese diplomats often downplay the role of their overseas influence operations, budget and expenditure documents from CCP committees and offices affiliated with the United Front confirm that they do make payments to overseas scholars, and sometimes pass funding through Chinese universities, obfuscating the role of the CCP and government.¹⁵ For example, in 2017, the Human Resources and Social Security Bureau of the Hunan Provincial Committee of the CCP made at least \$178,000 in payments to fund research projects in nine countries, first passing the funds to Chinese universities, which underwrote the payments.¹⁶ The United Front Work Department in Hunan likewise funds an “overseas friendship association” as a way to advance the CCP’s influence overseas, using funds earmarked as “special funding for the introduction of foreign knowledge” (引进国外智力专项经费) to cosponsor research projects with foreign scientists.¹⁷ The flow of money from Hunan is just one example of how the Communist Party indirectly and comprehensively extends influence overseas. The United Front engages in indirect funding transfers at both the central and local levels of Chinese governance. By tapping into a vast network of foreign resources, China’s S&T diplomats are able to fill strategic gaps in China’s technology industries while obscuring the role of the CCP and government.¹⁸

PLAYING MATCHMAKER

Acquiring foreign technology is a central mission of Beijing’s public diplomacy and international influence campaign. After identifying foreign partners able to fill the technical gaps of Chinese enterprises, S&T diplomats coordinate with overseas professional associations and United Front groups to host “matchmaking” events, where Chinese investors engage in “one-on-one negotiations” with foreign businesses looking to enter the Chinese market.¹⁹ In 2014, for example, a diaspora association in Sweden hosted an event attended by four hundred European businesses, and recommended several dozen technology projects for Chinese firms to invest in.²⁰ Dozens, if not hundreds of similar events take

place each year, including in the United States.²¹ Figure 2, a Chinese-language graphic on the website of the PRC Technology Transfer Center in Italy, illustrates some of the resources and infrastructure that Chinese S&T diplomats tap into during “matchmaking” and business-to-business (B2B) “project docking” events.

Figure 2. Resources and Infrastructure Available to China’s S&T Diplomats.



Source: Adapted from China-Italy Technology Transfer Center.²²

CONVERTING FOREIGN SCIENCE INTO DOMESTIC GAINS

China’s S&T Conversion Law, originally enacted in 1996 and amended in 2015, aims to accelerate the conversion of S&T achievements into “actual productive forces” (生产力). The law works in tandem with China’s 2015 Innovation-Driven Development Strategy (创新驱动发展战略) and military-civil fusion (MCF; 军民融合) development strategy to promote the integration of S&T between China’s economic and security apparatuses, thereby improving China’s ability to compete economically and militarily with the United States. Article 12 of the S&T Conversion Law lays out the types of S&T projects that can be considered for state support, such as those that enhance industrial technology

levels, and those that enhance national security and public security capabilities. Several types of institutions, including universities, state-owned firms, government-run research institutions, and non-state-owned enterprises are encouraged to participate in S&T conversion. State support in this context ranges from participation in S&T achievement conversion to government guidance funds,²³ as well as access to loan subsidies, grants, venture capital, incubation opportunities, coaching, and other benefits. Beyond Chinese entities, Article 6 also stipulates that overseas organizations fall under the purview of this law, meaning that their IP and S&T achievements may be considered fair game for conversion efforts.²⁴

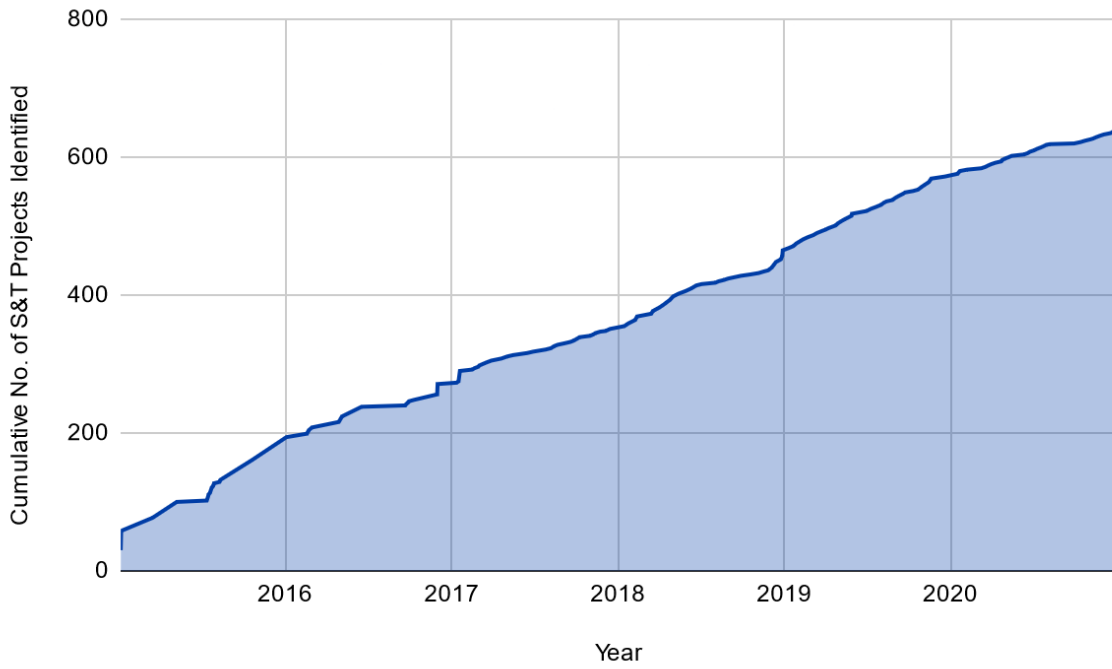
All facets of China's S&T infrastructure are responsible for implementing these policies. For instance, the Chinese Academy of Sciences in 2016 announced the "Key Special Project for the Transfer and Conversion of Scientific and Technological Achievements" (转移转化重点专项项目), otherwise known as the "Hongguang Special Project" (弘光专项). According to CAS, this project is designed to prioritize support for the transfer and conversion of S&T achievements within CAS. It lays out due diligence and accountability mechanisms, and timelines for the implementation of S&T conversion projects (around 12-18 months per project). It also lays out the benefits provided to projects under the Hongguang umbrella, such as subsidies, resources, and easier access to collaboration opportunities with other CAS entities.²⁵

Compiling China’s Wish List: Methodology and Scope

China’s S&T diplomats publish a monthly bulletin of “international technological cooperation opportunities” (国际技术合作机会). Dating back to 2008, the dataset reflects Chinese embassies’ assessments of nearly one thousand companies, universities, research institutions, and individuals who are pioneering tech products in a variety of fields—and how likely they would be to partner with Chinese firms, share IP, or establish joint ventures in China. We reviewed information from every “international technical cooperation opportunity” published by MOST from 2015 to 2020. The resulting list comprises 642 science and technology projects pioneered by 335 unique targets in 37 countries.

These documents include all aspects of the technology development cycle and range from basic research ("selectively triggering apoptosis of tumor cell proteins"), to patentable inventions ("implantable chip vaccine technology"), and even end products to be commercialized and sold ("automatic floor cleaning machine"). To better understand the scope and objectives of China’s global S&T gathering operation, we manually sorted these 642 projects into the 10 technology categories specified as industry targets under Made in China 2025: information technology, computerized machines and robots, aerospace, marine equipment and ships, railway transportation, new energy and energy-efficient vehicles, energy equipment, agricultural machines, new materials, and biopharmaceuticals and medical devices.²⁶ Projects that did not fit into these categories were marked “other.”²⁷

Figure 3. Number of Tech Cooperation Opportunities Referred by Chinese S&T Diplomats (2015–2020).



Source: CSET dataset of 642 technology projects identified by Chinese S&T diplomats.

Overall Assessment

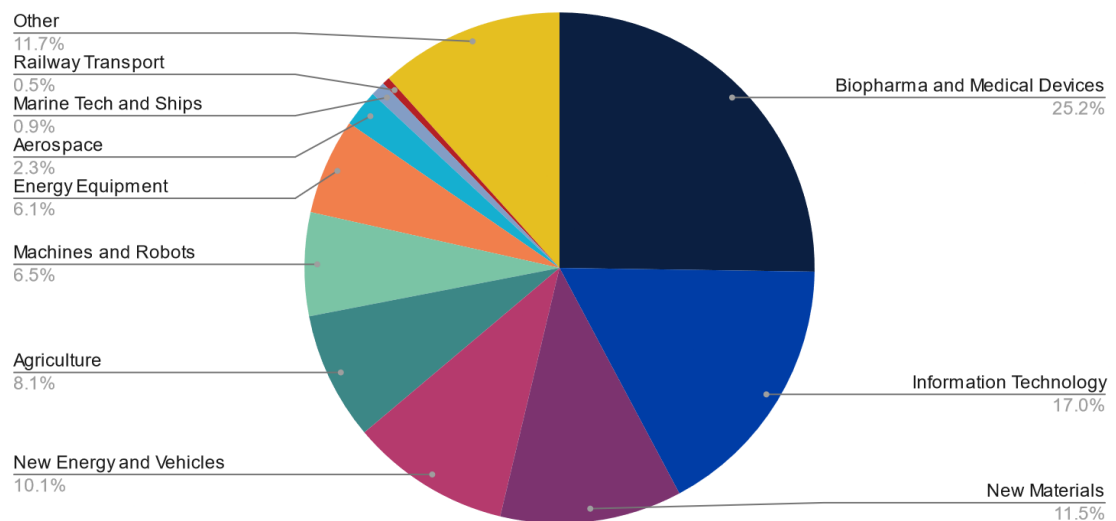
China's S&T diplomats are largely successful in acquiring foreign technical information, some of which may jeopardize U.S. and allied national security and economic competitiveness. After investigating 30 randomly selected companies identified by PRC embassies and consulates, we found that Chinese firms had successfully acquired technologies in 14 cases, either by entering exclusive finance and licensing deals, establishing a joint venture, acquiring the IP in question, or buying the company that developed it. China's S&T diplomats identify breakthroughs in S&T not only at the world's leading companies and universities, but also government-run laboratories, nonprofit organizations, law firms, and even by individual researchers. Some of these projects relate to purely commercial goods and services, with few direct military implications—such as vacuum cleaners or wine extractors. But several of the projects we reviewed could improve Chinese security services' military and intelligence gathering operations, if successfully acquired.

We find that Chinese diplomats are leveraging government resources and infrastructure to broker technology investment deals for ostensibly private Chinese companies. The main beneficiaries of MOST's international outreach are the Chinese firms that sign investment, licensing, and production agreements, which in turn contribute to the PRC's "going out" strategy and goals set forth in state policies including Made in China 2025.²⁸

Targeted Technologies Reflect China’s Central Development Plans

The Chinese government most frequently targets technologies that align with goals set out under major policies like Made in China 2025,²⁹ the Medium- and Long-Term Plan for Science and Technology Development (2006–2020),³⁰ and Strategic Emerging Industries Strategy.³¹ Of the projects in our dataset, most related to industries specified in Made in China 2025, including biopharmaceuticals and medical devices (25 percent), information technology (17 percent), or advanced materials (12 percent). Still, we found that nearly one in eight projects referred by China’s S&T diplomats did not fit neatly into any of these industries, but frequently related to other high-priority fields such as water sanitation and air purification. Beyond the Made in China 2025 industries, we observed that the Chinese government was most interested in acquiring technologies related to biotechnology and pharmaceuticals, AI and machine learning (ML), and projects with potential military applications.

Figure 4. Technologies Targeted by Chinese S&T Diplomats, by Industry (2015–2020).



Source: CSET dataset of 642 technology projects identified by Chinese S&T diplomats.

BIOTECHNOLOGY AND PHARMACEUTICALS

China's S&T diplomats most frequently identified projects related to biotechnology, with 190 projects (25 percent) being related to the "biopharmaceuticals and medical devices" Made in China 2025 industry target. Consistent with prior CSET research findings, we noted that several projects involved brain-inspired research, and several others dealt with cerebrovascular health.³² The majority of biotechnology projects identified by PRC embassy and consulate staff originated in Israel, Poland, the United Kingdom, and the United States. Examples include the following:

- In 2015, the Chinese Embassy in Greece noted the pharmaceutical company UniPharma SA was "looking for Chinese partners and distribution agents." Three years later, UniPharma wrote that a Chinese delegation consisting of 11 pharmaceutical companies visited UniPharma's new plant facilities to evaluate potential business opportunities.³³
- U.S.-based Drylet is a bioremediation technology firm that develops biocatalysts for use in wastewater treatment. In September 2016, the Chinese Consulate in Houston encouraged Chinese firms to seek partnerships with Drylet.³⁴ One year later, Drylet announced a partnership between itself and Nanjing Hoyo Municipal Utilities Investment Administration Group that resulted from a delegation of CEOs, led by a former U.S. cabinet official.³⁵
- In July 2020, the Chinese Embassy in Israel noted that it wished to cooperate with Israel-based Hospitech Respiration to export their ventilator device, AnapnoGuard.³⁶ In November that year, Hospitech Respiration announced the establishment of a joint venture with China's AwakeZone Medical to improve R&D production of AnapnoGuard in China. AnapnoGuard has already been in use in China since 2018 and has been used to help treat patients with COVID-19.³⁷

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

We also noted a large number of projects related to AI and ML. Of the 642 project descriptions we analyzed, 171 (27 percent) mentioned keywords related to AI and ML, implying that AI-related technology projects are near the top of China's foreign technology wish list.³⁸ Among the bulletins, we found several companies that produced ML-based video recognition software and unmanned aerial vehicle (UAV) object recognition algorithms, which Chinese embassy and consulate staff judged would be willing to partner with Chinese counterparts. We also found several companies related to integrated circuit design, semiconductor fabrication, and computer-automated design tools. Examples include the following:

- Ukrainian startup Senstone is a voice-to-text company that produces a wearable voice transcriber. Its product uses AI to detect and record emotions in speech. In 2015, the company relocated to Redwood City, California.³⁹ In June 2018, the Chinese Consulate in Houston filed a report about Senstone, which noted that the company was seeking \$2 million in foreign-convertible bonds. That summer, Senstone began manufacturing product in Shenzhen, China. Senstone CEO Nazar Fedorchuk later complained that the manufacturing partner had been more costly than anticipated, and delays resulted from quality assurance issues.⁴⁰
- In January 2016, Chinese S&T diplomats in Belgium recommended establishing partnerships with Belgian Leuven Instruments, a semiconductor equipment supplier.⁴¹ Eleven months later, Jiangsu Leuven Instruments was jointly established by Belgian Leuven Instruments and the Institute of Microelectronics of the Chinese Academy of Sciences. The joint venture is headquartered in Jiangsu Province and operates an R&D center and sales department in Belgium.⁴² The CEO of Jiangsu Leuven Instruments, Dr. Kaidong Xu, received his PhD in Chemistry from the University of Leuven.⁴³
- Innoviz Technologies, founded in Israel in 2016, develops and produces LiDAR sensors and perception software for

mass production of autonomous vehicles.⁴⁴ LiDAR is critical for the development of autonomous vehicles, and the Chinese government labeled LiDAR as a “strategic emerging industry” in 2020.⁴⁵ The Chinese Embassy in Israel recommended that Chinese firms partner with Innoviz to promote their LiDAR products in 2019.⁴⁶ In February 2020, Innoviz announced that it had been selected by Shaanxi Heavy Duty Automobile Co. to provide solid-state LiDAR for an autonomous truck project at a Chinese port.⁴⁷

TECHNOLOGIES WITH MILITARY APPLICATIONS

China’s S&T diplomats are clearly interested in acquiring projects with potential military applications. We did not code whether each of the 642 projects was militarily relevant; as it is difficult to predict which technologies may become relevant to geopolitical competition and future warfare. But several listed technologies were developed by defense contractors based in the United States and other countries, and PRC embassies and consulates frequently sought to gain equity in companies that produce components or systems currently used by the militaries of the United States and its allies. Examples include the following:

- Aerostar Tactical UAV is an unmanned aerial vehicle produced by Aeronautics Group in Israel. In April 2019, the PRC embassy in Tel Aviv recommended that Chinese firms seek out cooperation opportunities with Aeronautics Group, noting the company has “leading manpower and technology reserves in the field of military and civil aircraft research” and “regards China as the main development market and hopes to cooperate in various fields such as production, marketing, and research and development.”⁴⁸ The Dutch, Mexican, Polish, and U.S. militaries have each operated the Aerostar UAV.⁴⁹
- ARTEMIS is a cloud-based simulation tool for combat training and emergency response planning. In 2018, the PRC consulate in Calgary, Canada, recommended that Chinese firms cooperate with an unspecified company that

produces the software.⁵⁰ The report notes that a predecessor to ARTEMIS “is currently the main tool of the U.S. government for disaster relief training,” and concludes that “the goal of this project is to localize and customize the training expert system, related technologies, and knowledge to the specific conditions of different provinces and cities in China.”⁵¹

- The Institute of Pacific Oceanography of the Far East Branch of the Russian Academy of Sciences has developed a “polarized video system” designed to “evaluate the temporal and spatial characteristics of waves.” The project is specifically designed for littoral surveillance and monitoring. The PRC consulate in Vladivostok, Russia, recommended that Chinese firms consider purchasing shares of a new company that may sell the technology, noting that it is especially useful for “assessing the activities of small offshore fleets.”⁵²

Figure 5. Examples of Technologies with Military Applications Targeted by Chinese S&T Diplomats.



Aerostar Tactical UAS.⁵³



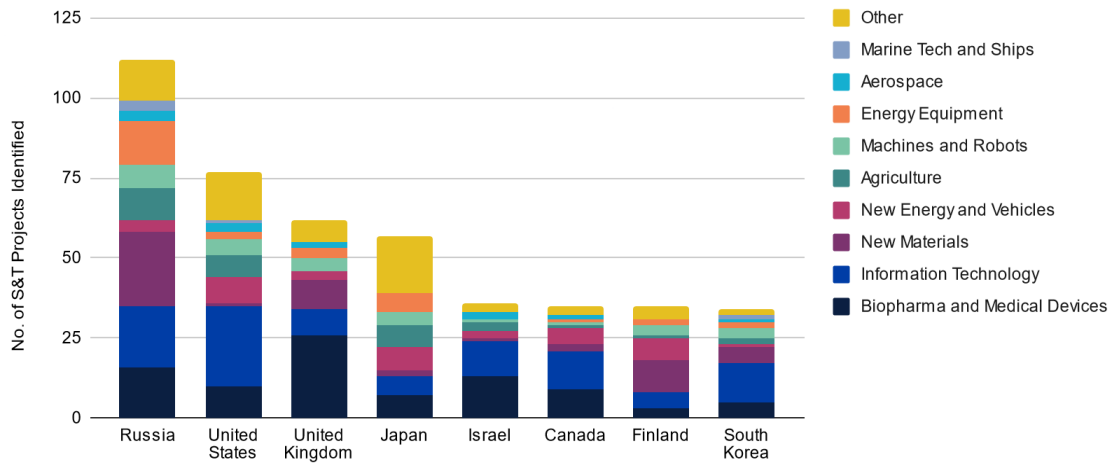
RAS “Polarized Video System.”⁵⁴

Locations and Types of Courted Institutions

China's S&T diplomats operate out of PRC embassies and consulates located in at least 52 countries, predominantly those in North America, Europe, and East Asia. Unsurprisingly, the Chinese government most often seeks out projects in countries with robust technology sectors and high research output. Nearly half of the technical projects identified by S&T diplomats originated in Russia (112), the United States (77), the United Kingdom (62), and Japan (57).

Two locations in particular—the PRC consulate in Houston, Texas, and the collection of Chinese diplomatic posts in Russia—stood out for their outsized contributions to the Chinese government's bulletin of overseas S&T achievements. On net, however, fewer than 12 percent of projects in our dataset originated in the United States, underscoring the need for U.S. policymakers to coordinate with allies and partners, who share the brunt of Chinese technology acquisition efforts. In particular, Chinese S&T diplomats frequently sought to broker investments in biopharmaceutical and information technology projects based in the United Kingdom, Israel, Canada, and South Korea; and projects related to new materials and clean energy in Japan and Finland. Of the 37 countries that hosted S&T projects targeted by Chinese S&T diplomats, 19 are members of NATO or U.S.-designated Major Non-NATO Allies.⁵⁵ U.S. allies hosted more than 70 percent of the S&T projects targeted by Chinese diplomatic personnel from 2015 to 2020.

Figure 6. Most Common Locations of S&T Projects Identified by Chinese S&T Diplomats



Source: CSET dataset of 642 technology projects identified by Chinese S&T diplomats (the eight countries listed accounted for 448 projects).

HOUSTON AS A GLOBAL S&T HUB

Before its closure in the summer of 2020, the Chinese Consulate in Houston, Texas was a major hub in China’s global S&T information gathering operation. From January 2015 to July 2020, Houston Consulate staff identified more S&T projects than any other PRC diplomatic post in the world, and referred 89 percent of the projects originating from the United States.⁵⁶ During that time, the United States was the largest source of information technology projects targeted by Chinese S&T diplomats.⁵⁷ From 2017 to 2019, the Houston Consulate cosponsored a series of “matchmaking” events with several Chinese technology transfer centers, attracting approximately three hundred U.S. businesses each year.⁵⁸ Since the consulate’s closure in July 2020, the MOST bulletin of “international technical cooperation opportunities” has registered only one additional project from the United States, a virtual reality therapy company in Massachusetts.⁵⁹

RUSSIA AS A TECHNOLOGICAL BREADBASKET

Taken collectively, the PRC embassy and consulates in Russia were the top source of “cooperation opportunities” identified by China’s S&T diplomats. PRC diplomatic staff were most interested in early-stage technology projects developed by Russian government-backed researchers. Of the 112 projects referred by PRC embassies and consulates in Russia, more than one-third (40) were with researchers working at the Russian Academy of Sciences, primarily at institutes in the Far East Branch. Chinese S&T diplomats were particularly interested in acquiring Russian projects related to information technology and advanced materials. Despite their apparent close cooperation, however, the exact nature of Russian-Chinese technical collaboration is unclear. The two countries have signed several agreements pledging to deepen strategic cooperation in S&T, but based on the actions of China’s S&T diplomats, it seems likely that China views the Russian science community as a breadbasket from which to acquire technology, rather than a partner suitable to jointly pioneer new inventions.

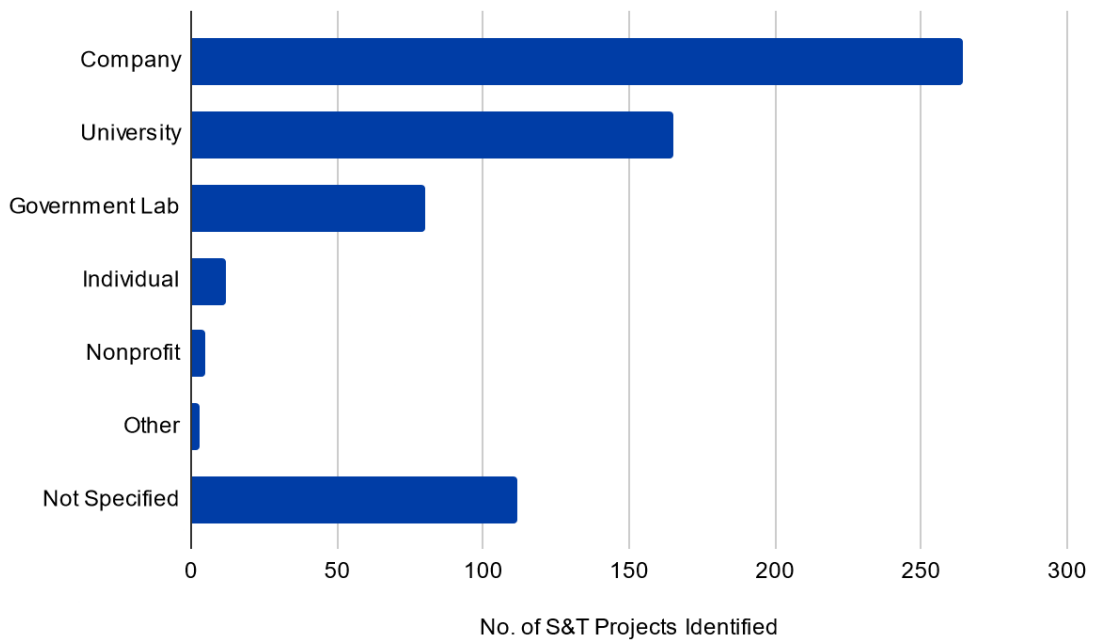
GOVERNMENT-SPONSORED RESEARCH

Beyond country of origin, it is important for policymakers, researchers, and entrepreneurs to recognize trends in the types of institutions China targets in pursuit of foreign technology. Of the 642 projects in our dataset, 529 reports included details about the institutions that sponsored the technology. We found that Chinese S&T diplomats overwhelmingly targeted research projects at companies (264 projects; 50 percent) and universities (165 projects; 31 percent). In particular, they were most interested in early-stage companies, and flagged opportunities for Chinese firms to invest during venture rounds of financing. Still, we found that more than 80 research projects (15 percent) were conducted at government-sponsored laboratories—including those in Bulgaria, the Czech Republic, Finland, Greece, Italy, Indonesia, Japan, Russia, Singapore, South Korea, Spain, and Sweden.⁶⁰

Among the projects sponsored by government-run labs, 41 percent were related to AI, ML, or “intelligent” systems and

equipment. In particular, Chinese diplomats recommended several projects related to unmanned underwater vehicles and autonomous navigation systems at the Institute of Automation and Control Processes within the Russian Academy of Sciences, and at the Korea Electronics and Telecommunications Research Institute.

Figure 7. Types of Institutions Identified as Potential Partners by Chinese S&T Diplomats

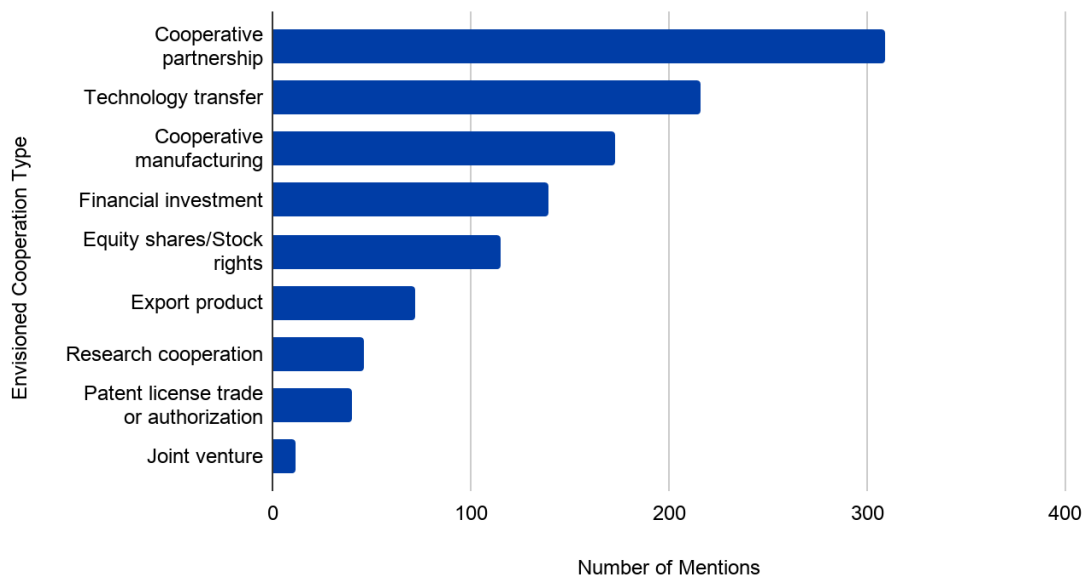


Source: CSET dataset of 642 technology projects identified by Chinese S&T diplomats (113 did not specify the type of institution being targeted).

Forms of Envisioned Cooperation

While the types of suggested cooperation varied on a case by case basis, some patterns emerged from analysis of the projects. Figure 8 below lays out the most common types of collaborations mentioned by Chinese S&T diplomats—ranging from broad terms like “cooperative partnerships,” to more specific details about amounts of investment, ownership or sharing of equity, the establishment of joint ventures, and others.

Figure 8. Methods of Cooperation Mentioned by Chinese S&T Diplomats



Source: CSET dataset of 642 technology projects identified by Chinese S&T diplomats.

Note: Most reports list more than one method of cooperation.

For example, Chinese S&T diplomats in 2015 displayed an interest in an unspecified Australian advanced manufacturing firm, stating that the company was “seeking foreign partners for cooperation,” suggesting an interest in partnering with Chinese firms.⁶¹ In contrast, an S&T diplomat report from 2016 noted that a specific U.S.-based drilling company was looking for a \$10 million investment from Chinese partners, which suggests a desire for funding from Chinese entities.⁶²

Joint ventures with ostensibly private Chinese companies are another type of envisioned cooperation. One report from 2018 references Carmell Therapeutics, a U.S. biotechnology firm, and describes the conditions under which the company would set up a joint venture in China. It states that the joint venture firm would be responsible for product certification, production, and clinical trials in China, and that it would exclusively own all of Carmell's IP in China, as well as its technology and sales rights.⁶³ U.S. and European firms frequently report being coerced into sharing IP when attempting to do business in China.⁶⁴ Reports from PRC embassies and consulates, such as the Houston Consulate's report on Carmell Therapeutics, reveal that China's S&T diplomats are central to these processes. An English-language translation of the Houston Consulate report can be found in Appendix III.

Furthermore, multiple types of cooperation may be specified in a given report. For example, a 2016 report on cooperation with the Brno International Clinical Research Center in the Czech Republic states that, beyond a desire for the two sides to conduct collaborative research, the Czech side is potentially willing to promote Chinese medicine and research therapies.⁶⁵ For a more detailed overview of the Chinese terms used for each cooperation type, please see Appendix I.

Case Studies: Does China Get What It Wants?

To answer this question, we examined 30 random international technical cooperation opportunities identified by China's S&T diplomats in 2015 and 2016 to determine whether the companies they targeted had sold equity or established joint ventures or licensing deals with firms in China, or otherwise exposed their IP by attending PRC-sponsored conferences and matchmaking events.⁶⁶ We focused narrowly on technology projects developed by companies because we could not systematically confirm whether researchers at state-backed laboratories or universities were sharing information with Chinese counterparts. Companies, on the other hand, typically produced press releases about investments, licensing deals, mergers, and acquisitions.

Of the 30 cases we investigated, 14 targeted companies indicated that they had actually partnered with a Chinese firm or otherwise exposed their IP to Chinese counterparts, eight did not, and eight lacked sufficient information for us to determine one way or another.⁶⁷ At least two indicated that they also provided products or services to the U.S. military,⁶⁸ and after attending a PRC-sponsored matchmaking event in 2016, one went on to receive U.S. Navy funding under the Small Business Innovation Research program.⁶⁹ Table 1 details the timelines surrounding these 14 cases, to illustrate how the technology transfer process works in practice.

Companies on China's foreign technology wish list typically established partnerships with Chinese firms one to three years after S&T diplomats identified them as potential partners. In a few cases, we noticed S&T diplomats filed reports after the target announced a partnership with a Chinese firm or attended a PRC-sponsored business-to-business matchmaking event. It is not clear whether these projects with reversed timelines were actually the results of PRC diplomats' efforts—and they simply encountered delays in publishing their reports on the internet—or if PRC diplomats were capitalizing on these companies' preexisting relationships with Chinese industry to propose entirely new partnerships.

Table 1. Firms Targeted by Chinese S&T Diplomats Typically Share Their Technology.

| Company | PRC Diplomatic Report | Indicator of Chinese Partnership |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Drylet (United States) sells products for wastewater treatment and bioremediation.</p> | <p>September 29, 2016: S&T diplomats at the PRC consulate in Houston filed a report recommending Chinese firms cooperate with Drylet.</p> | <p>November 9, 2017: Drylet signs a strategic cooperation agreement with the Nanjing Hoyo Municipal Utilities Investment Administration Group in Nanjing, China.⁷⁰</p> |
| <p>EcoTech Group (France) specializes in environmental monitoring technology for smart cities.</p> | <p>March 16, 2015: S&T diplomats at the PRC embassy in Paris filed a report recommending Chinese firms cooperate with EcoTech Group.</p> | <p>May 30, 2017: An EcoTech press release advertises the company's partnership with the Chinese Ministry of Ecology and Environment, as well as exclusive licensing and manufacturing deals with companies in China.⁷¹</p> |
| <p>BioGenerator (Canada) is an investment conglomerate composed of 12 biotechnology companies.</p> | <p>January 4, 2016: S&T diplomats at the PRC consulate in Toronto filed a report recommending Chinese firms cooperate with BioGenerator.</p> | <p>July 31, 2019: BioGenerator announces one of its affiliates, MediBeacon, has entered an exclusive \$30 million investment and commercialization partnership with Huadong Medicine in Hangzhou, China.⁷²</p> |
| <p>Goodtech (Norway) has developed a method to reduce heat leakage during aluminum production.</p> | <p>October 21, 2015: S&T diplomats at the PRC embassy in Oslo filed a report recommending Chinese firms invest in Goodtech.</p> | <p>October 16, 2015: Goodtech is acquired by Anhui Guozhen Environmental Protection Energy-Saving Technology Company, Ltd. for approximately \$5 million.⁷³</p> |
| <p>RotaChrom (Hungary) is a pharmaceutical company focused on drug purification.</p> | <p>January 4, 2016: S&T diplomats at the PRC embassy in Budapest filed a report recommending Chinese firms cooperate with RotaChrom.</p> | <p>June 22, 2019: RotaChrom exhibits at an industry conference in China and advertises its entry to the Chinese pharmaceutical market.⁷⁴</p> |

| | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Tribosonics (United Kingdom) produces the “Ultra Sensor,” an advanced sensor capable of measuring film thickness.</p> | <p>January 5, 2015: S&T diplomats at the PRC embassy in London filed a report recommending Chinese firms cooperate with the University of Bristol in developing advanced sensors based on Tribosonics’ Ultra Sensor.</p> | <p>July, 2016: The original developer of the Ultra Sensor, a Tribosonics iOS software developer named Jiawei Yao, takes a job as an e-commerce product manager in Shenzhen, China.⁷⁵</p> |
| <p>RUSNANO (Russia) is a state-backed development corporation dedicated to nanotechnology.</p> | <p>December 1, 2016: S&T diplomats at the PRC embassy in Moscow filed a report recommending Chinese firms cooperate with RUSNANO.</p> | <p>June 6, 2019: The Russia-China Investment Fund announces an investment in Rusalox, a subsidiary of RUSNANO.⁷⁶</p> |
| <p>GREENCOMM (South Korea) produces intelligent home electronics and office supplies.</p> | <p>September 23, 2016: S&T diplomats at the PRC embassy in Seoul filed a report recommending Chinese firms invest in GREENCOMM regarding a new line of wearable sports equipment.</p> | <p>December 16, 2016: GREENCOMM attends the International Conference on Green Computing and Communications in Chengdu, China.⁷⁷</p> |
| <p>Hanpak Limited (Ireland) produces the “Butterfly Cup,” a biodegradable coffee cup.</p> | <p>January 4, 2016: S&T diplomats at the PRC embassy in Dublin filed a report recommending Chinese firms establish a production agreement with Hanpak.</p> | <p>February 17, 2019: In an interview, Hanpak CEO Tommy McLoughlin says the company has licensed the Butterfly Cup for production in China.⁷⁸</p> |
| <p>BlueGreen Water Technologies Limited (Israel) is a water remediation company that treats algal bloom.</p> | <p>November 30, 2016: S&T diplomats at the PRC embassy in Tel Aviv filed a report recommending that Chinese firms cooperate with BlueGreen Water Technologies.</p> | <p>2018: BlueGreen Water Technologies enters into a strategic partnership with China Israel Jizhi Technology Co., Ltd.⁷⁹ to clean Nanhu Lake in Hunan, China.⁸⁰</p> |
| <p>Oberaigner Group (Austria) is a heavy industry supply company that produces four-wheel drive vehicles and aircraft. It also supplies vehicles to</p> | <p>January 4, 2016: S&T diplomats at the PRC embassy in Vienna filed a report recommending Chinese firms cooperate with Oberaigner Aerospace</p> | <p>September 27, 2012: Oberaigner unveils the concept of a fiber-carbon commercial passenger jet at the 2012 AOPI Shanghai International Air Show. Oberaigner Head of Design Aerospace Juergen</p> |

| | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>the defense forces of the United Kingdom and other NATO member states.⁸¹</p> | <p>on a new commercial passenger aircraft.</p> | <p>Schluemer says he sees “big potential” for the plane in the Chinese market.⁸²</p> |
| <p>CYBERNET Systems Corporation (Japan) is a military research and development company, which also contracts with the U.S. Office of Naval Research.⁸³</p> | <p>May 8, 2015: S&T diplomats at the PRC embassy in Tokyo filed a report recommending that Chinese firms cooperate to gain access to CYBERNET’s Flat Panel Display Inspection System (FPiS), a high-performance sensor.</p> | <p>May 2, 2016: CYBERNET’s subsidiary, Noesis Solutions, opens a subsidiary branch in Shanghai, China, and announces it will host an industry conference “for engineers from manufacturing companies and research institutions across China.”⁸⁴ The company’s FPiS sales increase 130 percent, year-over-year, mainly among Chinese companies.⁸⁵</p> |
| <p>Orbital Traction LLC (United States) designs transmission systems for ship engines. In November 2020, it completed an SBIR contract for the U.S. Navy.⁸⁶</p> | <p>December 1, 2016: S&T diplomats at the PRC consulate in Houston filed a report recommending that Chinese firms acquire and use Orbital Traction’s engine transmission system.</p> | <p>May 20, 2016: Orbital Traction COO Chuck Russell seeks to raise \$20 million from Chinese investors at a PRC-sponsored matchmaking event in Houston.⁸⁷</p> |
| <p>DENSO (Japan) produces mobile cold storage and preservation vehicles.</p> | <p>March 16, 2015: S&T diplomats at the PRC embassy in Tokyo filed a report recommending Chinese firms cooperate with DENSO to promote mobile cold storage solutions.</p> | <p>2015: DENSO’s annual report states that the company “relocated, upgraded, and expanded our technical center in Shanghai” to facilitate better access the Chinese market.⁸⁸</p> |

Conclusion

China is making strides toward realizing its dream of technological self-sufficiency and dominating in key technology areas. Chinese companies have caught up to and even surpassed U.S. firms in strategic industries such as 5G, and the country is poised to challenge the United States in a number of fields including genome editing, AI, quantum computing, and aerospace electronics.⁸⁹ A key part of this success are Beijing's S&T diplomats, who are demonstratively effective in gaining access to foreign technology projects and technological know-how.

But for all its success, China's foreign technology wish list is far from complete. S&T diplomats have been outspoken about the changes they believe China should adopt in its quest for foreign technology.⁹⁰ Some scholars recommend that China take a "diversified development path," which includes acquiring expertise in "aerospace, nuclear energy, new energy, drones, and 5G."⁹¹ The number of PRC diplomatic outposts that host S&T directorates continues to grow, even as countries like the United States take steps to improve research security.⁹²

As China continues to modernize its S&T infrastructure, the United States and its allies should be clear-eyed about the fundamental differences in the ways Beijing approaches science, technology, and diplomacy. China's S&T diplomats are one example of how the CCP extends its reach abroad—often in ways that are uncomfortable or alien to foreign governments. By leveraging the resources and infrastructure of the state, ostensibly private Chinese firms can identify investment opportunities more easily and strike deals on better terms than foreign private enterprises. In particular, MOST's mission to service private Chinese companies—and its use of diplomatic resources and state-run information gathering operations to advance that objective—differentiate it from the technology scouting efforts of most other countries. Moving forward, firms looking to do business in China will likely continue to deal with coercive technology transfer, and foreign companies may find it difficult to remain competitive with Chinese firms that benefit from state-backed technology brokers.

Authors

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Appendix I: Counting Forms of Envisioned Cooperation

The following terms were extracted from S&T diplomat reports in order to gain a better understanding of the types of cooperation initiatives that China envisioned for the identified targets. Terms were grouped according to common cooperation themes observed by the authors.

| Cooperation Type (Chinese) | Cooperation Type (English) |
|-----------------------------------------|------------------------------------------|
| 合作伙伴/开展合作/寻找伙伴合作/ 寻求中国伙伴/伙伴开展合作/技术合作 | Cooperative partnership |
| 技术转让/转让技术/技术转移 | Technology transfer |
| 合作生产 | Cooperative manufacturing |
| 融资/风险投资/投资 | Financial investment |
| 股权/技术入股 | Equity shares/Stock rights |
| 出口产品 | Export product |
| 研发合作/合作研究 | Research cooperation |
| 专利许可证贸易/专利授权 | Patent license trade or authorization |
| 合资 | Joint venture |

Appendix II: Example “Matchmaking” Partner Search Forms

The following documents are examples of “matchmaking” partner search forms, which Chinese firms are asked to fill out and submit to S&T diplomats; and internal MOST paperwork filled out by S&T diplomats. These documents were translated by Etcetera Language Group, Inc., and edited by CSET Chinese STEM Translation Lead Ben Murphy.

S&T Diplomat Service Action International Cooperation Requirements Tables

(A) Technology Cooperation Requirements Form

Province (Region, Municipality): _____ Date: _____

Postcode _____

- State-owned and state-controlled enterprise
- Private enterprise
- Sino-foreign joint venture
- Hong Kong, Macau, and Taiwan-invested enterprise
- Wholly foreign-owned enterprise
- Other enterprise _____ (please explain)

| | | | |
|-----------------------------|-------------------------------------------------|----------|---------------|
| Project unit information | Organization (单位) Name | Chinese: | Official seal |
| | | English: | |
| | Address | Chinese: | English: |
| | Enterprise Type | | |
| Higher-level governing unit | (May be left blank by non-state-owned entities) | | |

| | | |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Industry classification | <input type="checkbox"/> Agriculture <input type="checkbox"/> Information industry <input type="checkbox"/> Manufacturing <input type="checkbox"/> Construction <input type="checkbox"/> Transportation <input type="checkbox"/> Service industry <input type="checkbox"/> Other _____ | |
| Technological field | <input type="checkbox"/> Electronic information <input type="checkbox"/> Biotech and pharmaceuticals <input type="checkbox"/> New materials <input type="checkbox"/> Optical, mechanical and electronic integration <input type="checkbox"/> Resources and environment <input type="checkbox"/> New energy and high-efficiency energy saving <input type="checkbox"/> High-tech services <input type="checkbox"/> Other _____ | |
| Legal representative | | |
| Contact person | | |
| Telephone | | Fax |
| Email | | Mobile |
| Website | | |
| Project unit profile | (Profile should include Chinese and English, and cover information such as total fixed assets, sales in the previous year, scale of the enterprise by number of employees, and whether it has participated in international cooperation before. Additional pages may be attached if necessary.) | |
| Explanation of Undertaking | The project unit guarantees that the content entered is true and accurate, and does not involve state secrets. Signature of legal person's representative or agent: | |

| | |
|-----------------|----------|
| Name of project | Chinese: |
| | English: |

| | |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Region | <input type="checkbox"/> Electronic information <input type="checkbox"/> Biotech and pharmaceuticals <input type="checkbox"/> New materials <input type="checkbox"/> Optical, mechanical and electronic integration <input type="checkbox"/> Resources and environment <input type="checkbox"/> New energy and high-efficiency energy saving <input type="checkbox"/> High-tech services <input type="checkbox"/> Other _____ |
| Type of project cooperation | <input type="checkbox"/> Foreign mature technology <input type="checkbox"/> Pre-industrialization phase technology <input type="checkbox"/> Laboratory results <input type="checkbox"/> Other _____ |
| Technology sensitivity | <p>Is the needed technology one for which the other party is subject to export restrictions?</p> <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Degree to which technology is advanced | <input type="checkbox"/> Internationally leading <input type="checkbox"/> Internationally advanced <input type="checkbox"/> Domestically leading |
| Main technical indicator requirement | |
| Technology patent status | <input type="checkbox"/> No patent <input type="checkbox"/> Overseas patent <input type="checkbox"/> Domestic patent |
| Unique resources introduced | <input type="checkbox"/> Species <input type="checkbox"/> Samples <input type="checkbox"/> Data <input type="checkbox"/> Drawings |
| Effective period of the need | <input type="checkbox"/> Six months <input type="checkbox"/> One year <input type="checkbox"/> Long-term |
| Description of cooperation needs: | Please describe in detail: (Chinese, English) |

| | |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Form of cooperation | <input type="checkbox"/> Purchase of a complete set of technologies for digestion and absorption <input type="checkbox"/> Purchase of key know-how <input type="checkbox"/> Introduction of key technological equipment <input type="checkbox"/> Collaborative R&D <input type="checkbox"/> Establishment of collaborative demonstration base(s) <input type="checkbox"/> Going abroad for technical training <input type="checkbox"/> Information exchange, technical consulting <input type="checkbox"/> Introduction of unique resources <input type="checkbox"/> Other _____ |
| Content of assistance to be requested from diplomats | <input type="checkbox"/> Establish contacts <input type="checkbox"/> Communication and promotion <input type="checkbox"/> Search for partners <input type="checkbox"/> Other _____ |
| Proposed foreign unit for cooperation | Country: Organization: Address: Website: Telephone: Fax: Email: Basis for project cooperation: <input type="checkbox"/> Existing agreement <input type="checkbox"/> Contacts <input type="checkbox"/> None Detailed description of basis for project cooperation (if "None" is selected, this item may be left blank): |

(B) High-end Project Talent Recruitment Requirements

Province (Region, Municipality):

Date:

| | | | | |
|------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------|
| Basic information | Organization Name | | | Official seal |
| | Circumstances of the organization | <input type="checkbox"/> International S&T cooperation base <input type="checkbox"/> Government organization <input type="checkbox"/> High-tech industrial park <input type="checkbox"/> Innovation park <input type="checkbox"/> Enterprise <input type="checkbox"/> Other _____ | | |
| | Address | | | Postcode |
| | Contact person | | | |
| | Telephone | | Fax | |
| | Email | | Mobile | |
| | Description of requirement | Name of requirement | | |
| Number of talents | | | Are only ethnic Chinese (华裔) to be considered? | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Field in which there is need | | <input type="checkbox"/> Electronic information <input type="checkbox"/> Biotech and pharmaceuticals <input type="checkbox"/> New materials <input type="checkbox"/> Optical, mechanical, and electronic integration <input type="checkbox"/> Resources and environment <input type="checkbox"/> New energy and high-efficiency energy saving <input type="checkbox"/> High-tech services <input type="checkbox"/> Other _____ | | |
| Talent requirements | | <input type="checkbox"/> Brings in project(s) <input type="checkbox"/> Brings in funds | <input type="checkbox"/> Brings in technology <input type="checkbox"/> Other _____ | |

| | |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| To be recruited as a team? | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Recruitment method | <input type="checkbox"/> Enterprise establishment or leadership <input type="checkbox"/> Part-time lecturing <input type="checkbox"/> Scientific research and technology cooperation <input type="checkbox"/> Investment using technology in exchange for shares <input type="checkbox"/> Consulting <input type="checkbox"/> Other (please explain) |
| Work duration | <input type="checkbox"/> Six months <input type="checkbox"/> One year <input type="checkbox"/> Long-term |
| Specific description (in conjunction with corresponding project) | |
| Overview of relevant supporting policies | |

(C) S&T Diplomats Local Tour Requirements Form

Province (Region, Municipality): _____ Date: _____

Participation in forum Special topic report Field investigation

Discussion and exchange Other_____

Introduce the host country's technology cooperation policies, environment and channels;

Introduce the S&T cutting edge, S&T strengths and S&T information of the host country;

Carry out exchanges with government and enterprises, provide consulting on actual local needs:

Other _____

| | | | | |
|----------------------------|-------------------------|-----------------------------------|---------------|------------------------------------------------------------------------------------|
| Basic information | Organization Name | | Official seal | |
| | Address | | Postcode | |
| | Contact person | | | |
| | Telephone | Fax | | |
| | Email | Mobile | | |
| Description of requirement | Description of activity | (300 or fewer Chinese characters) | | |
| | Topic | | | |
| | Time | | | |
| | Requirements | Country: | | Rank: <input type="checkbox"/> Counselor <input type="checkbox"/> Secretary |

| | | | |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------|
| | | | Number of people: |
| | Form | | |
| | Content | | |
| Facilitative support (multiple selections allowed) | <input type="checkbox"/> Settlement of international round-trip tickets <input type="checkbox"/> Settlement of domestic round-trip tickets <input type="checkbox"/> Provision of local meals and accommodations <input type="checkbox"/> Other _____ | | |

(D) Exhibition Contact Schedule

Province (Region, Municipality): _____ Date: _____

| | | | | |
|-----------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--|
| Basic information | Organization Name | | Official seal | |
| | Address | | Postcode | |
| | Contact person | | | |
| | Telephone | | Fax | |
| | Email | | Mobile | |
| Description of requirements | Type of activity | <input type="checkbox"/> Exhibition <input type="checkbox"/> Forum <input type="checkbox"/> Meeting <input type="checkbox"/> Other | | |
| | Name of activity | Chinese: English: | | |
| | Time | | | |
| | Description of main activities | Include: size, level, main content, and other information (Chinese, English) | | |
| | Content of assistance to be requested from diplomats (multiple selections allowed) | <input type="checkbox"/> A. Publicity <input type="checkbox"/> B. Promotion <input type="checkbox"/> C. Invitation of experts <input type="checkbox"/> D. Invitation of overseas scientific research institutions <input type="checkbox"/> E. Invitation of overseas enterprises <input type="checkbox"/> F. Invitation of officials of other countries <input type="checkbox"/> G. Other | | |
| | Country | | Number | |

| | | |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Specific requirements | Field | |
| | Description of main work | (Chinese, English) |
| Facilitative support (multiple selections allowed) | <input type="checkbox"/> Settlement of international round-trip tickets <input type="checkbox"/> Settlement of domestic landing fees <input type="checkbox"/> Settlement of local expenses <input type="checkbox"/> Borne oneself <input type="checkbox"/> Settled by negotiation <input type="checkbox"/> Other | |

Appendix III: Example PRC Consulate Report: Carmell Therapeutics

The following translation comes from the China International Science and Technology Cooperation (CISTC; 中国国际科技合作网) website in 2018. The PRC Ministry of Science and Technology (MOST; 科技部) runs the CISTC website. This particular document appears in the "S&T Diplomat Service Action Special Topics" (科技外交官服务行动专题) section of the CISTC website. The document's file number, "2018-35-Houston-5" (2018-35-休斯顿-5), indicates that S&T diplomats working out of the Chinese Consulate General in Houston, Texas identified this cooperation opportunity in 2018. This document was translated by Etcetera Language Group, Inc., and edited by CSET Chinese STEM Translation Lead Ben Murphy.

Carmell C Round (Financing)

Carmell C轮 (融资)

Carmell is a biotechnology company dedicated to the development and commercialization of regenerative medicine technology. As a spin-off company of Carnegie Mellon University in Pittsburgh, Pennsylvania, Carmell Therapeutics has developed a unique and highly innovative patented technology that uses human plasma to make a kind of biologically active material. The plasma-based bioactive materials (PBMs) contain a certain concentration of natural regeneration factors, which can promote healing in various clinical environments, reduce infections, and reduce the probability of complications, thereby lowering medical costs.

Different from the previous method of providing auxin through wounds/surgery, Carmell's patented technology has made major breakthroughs in form, life span, and biological activity: 1) Regenerated materials can be made into various forms, such as putty, pastes, stents, plugs, screws, and sheets. 2) Its state of existence can be cross-linked with protein as part of the manufacturing process, and it can be broken down in the body across different periods (days, weeks, or months). 3) When the regenerative PBM is biodegraded locally, the active biological

ingredients can be released where the body needs it and at a specific time to accelerate healing.

Early clinical verification shows that Carmell's first product is effective, safe, affordable, and lasting. Carmell has successfully completed Phase II research, which shows that compared with standard care, this technology can better promote bone healing, wound healing, and reduce infection. A large number of animal studies have proven the role of regenerative PBMs.

In addition, human research data also shows that this technology can deliver biologically active substances to wounds within a period of time. Carmell's initial goal is to solve the key unsolved problem related to orthopedic trauma (open reduction surgery), which is to deliver a biologically active putty-like substance to accelerate healing and reduce infection rates and treatment costs. Carmell's long-term goal is to become an outstanding biotechnology regeneration platform. It is committed to optimizing the rehabilitation process in the medical field to meet various needs in the healing process, such as improving various types of healing, such as bone healing and healing related to spinal fusion, joint replacement, and knee joint repair, accelerating healing, and reducing surgical wound infections. From a long-term perspective, the company can improve the healing of chronic wounds.

Carmell recently held a very successful meeting with the U.S. Food and Drug Administration where the FDA approved Carmell for Phase III clinical studies in order to complete the regulatory approval process. Next, the company will begin clinical trials in the first quarter of 2018, begin one-year recruitment and one-year follow-up visits, and then submit an application to obtain approval for commercial sales qualifications. FDA approval is expected by 2021.

The technology is patented, and the foreign party is seeking a Series C investment of \$20 million. Meanwhile, the foreign party is also seeking to establish a joint venture in China as a "new company." This company would be responsible for product certification, production, and clinical trials in China. The joint venture would exclusively own all Carmell's intellectual property (in China), technology, and sales rights.

Endnotes

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