Testimony before the House Committee on the Judiciary, Subcommittee on Courts, Intellectual Property, and the Internet
on
"managing the dual challenges of Chinese technology appropriation and China's progress toward general artificial intelligence (AGI)"

William C. Hannas
Research Professor and Lead Analyst
Center for Security and Emerging Technology, Georgetown University
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Introduction and Summary

Chairman Issa, Ranking Member Johnson, distinguished members of the subcommittee and staff, I am grateful for the opportunity to join today's hearing on two topics that have fascinated—and terrified—me over the past decades, namely, China's use of foreign technology to fuel its science and technology enterprise, and China's drive to be the world's leader in artificial intelligence.[1]

I am a founding member of Georgetown University's Center for Security for Emerging Technology (CSET), where I work with a small team to identify threats posed by Chinese AI. Prior to that, I was an SIS officer in the Central Intelligence Agency, where I managed open source exploitation of Chinese S&T materials and built a program to track China's transfer of U.S. technologies. These efforts culminated in two books on *Chinese Industrial Espionage*[2] and *China's Quest for Foreign Technology*,[3] which became *de facto* handbooks, and the recent volume *Chinese Power and Artificial Intelligence*,[4] a comprehensive look at China AI.

China's technology transfer programs date from 1956[5] and cover every imaginable practice and venue. The link with AI, besides China's use of its collection apparatus to tap global AI know-how, is the likelihood that China will soon—if it has not already—use AI for cyber exploits to further its transfer agenda, an unholy marriage in which advances in the one promote progress in the other, multiplying existing threats to U.S. and allied security.

My testimony covers this topic in three parts:

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[1] PRC State Council, "New Generation AI Development Plan" (国务院关于印发《新一代人工智能发展规划》的通知), PRC State Council, 2017.
[2] William C. Hannas, James Mulvenon, and Anna Puglisi, *Chinese Industrial Espionage*. (New York and London: Routledge, 2013).
[3] William C. Hannas and Didi Kirsten Tatlow, eds. *Beyond Espionage: China's Quest for Foreign Technology* (New York and London: Routledge, 2021).
[4] William C. Hannas and Huey-Meei Chang, eds., *Chinese Power and Artificial Intelligence* (New York and London: Routledge, 2023).
[5] "1956-1967 年科学技术发展远景规划纲要 (Outline of the Long-term Plan for the Development of Science and Technology from 1956 to 1967), State Council," August 1956. Ratified in December 1956.

1. China's technology transfer practices. It's impossible to condense 700 pages of book narrative, terabytes of (unclassified) data, a mile-long list of known cases, and two decades of horror stories into this brief space. My testimony accordingly is limited to an overview of how the Chinese transfer system operates, with emphasis on "extralegal" or gray area maneuvers, at which China excels and which are devilishly hard to track.

2. Chinese artificial intelligence. My team does not share the perception that China's alleged lag in "generative" AI large language models (LLMs) absolves us from concern, because (a) China need not be at the cusp to *adapt* these models wherever it wishes; (b) it can literally "beg, borrow and steal" what it needs; and (c) China is aggressively pursuing alternate paths to advanced AI aimed at AGI and a "first mover advantage.".

3. China's use of tech transfer to further its AI program. While respecting China's home-grown efforts to build advanced AI—which we have come to greatly admire—China has not shied from acquiring AI technology from abroad. My team has documented China's use of each of its acquisition venues to advance its AI program. *Legal* venues of support, provided by U.S. multinationals, are on a scale that shocks even this jaundiced observer.

A case against China's efforts to relieve the world of proprietary technology is easier to make now than years before, as evidenced by today's hearing. But myths die hard, such as the notion that China can't create—in AI or other high-tech disciplines, that it will always be behind, or that exposure to democracy will lead to responsible behavior. The USIC, of which I was a part—and to that extent responsible—should also be held accountable for its failure to seriously pursue so-called S&T intelligence, i.e., identifying and ***monitoring*** foreign S&T threats, and for relegating open source intelligence to an "enabler" of classified collection.

In sum, I'm arguing *you can't make good policy if you don't have good data*. Our efforts to monitor foreign science and technology, inherently an open source exercise, are pathetic. They are worse than useless because these cosmetic efforts are seen as evidence of measures in place, where there are few or none. China by contrast runs a world-class open source S&T intelligence network with a staff of more that 100,000 professionals, that is light-years ahead of us.

Accordingly, I recommend establishing an entity within the USG—a "National Science and Technology Analysis Center"— outside the USIC or, if that is impossible, as a standalone unit directly under the DNI, to collect, analyze, forecast, give timely policy support and, as needed, help mitigate or interdict foreign S&T threats. Since China's ability to appropriate technology is part of its S&T posture, the Center would also track these transfers using unclassified data and tradecraft honed by open source experts.

As for the threat to U.S. IP generally, we have appended some 18 "Proposed Legislative and Institutional Rememdies" to this testimony that address the problem in a nuanced fashion.

China's foreign technology transfer—in a nutshell

China's quest for the world's technology began in the mid-19th century as an effort to preserve its moribund polity, while relying on foreign nations for the means to defend it. Known as the "*ti-yong*" (体用) policy or "Chinese learning as substance, western learning for application," its spirit has persisted to the present. An excerpt from Xi Jinping's speech in 2013 to an overseas Chinese organization[6] charged with facilitating tech transfer typifies the mentality:

> "As Comrade Deng Xiaoping profoundly pointed out, 'We are carrying out socialist modernization to catch up with the developed capitalist countries economically and, politically, *create a higher and more effective democracy than the capitalist countries*. Moreover, we will train more and better skilled persons than in those countries." [7]

The message was clear: the goal of foreign "exchanges" is, as before, a stronger China; western democracy is not part of the agenda.

Between then and now China has steadily grown its state-supported apparatus for transferring foreign technology:

- 1950s: from its early "lean to one side" (一边倒) reliance on Soviet Russia;
- 1956: through the establishment of a world class open source document procurement system;
- 1978: joint R&D ventures and more overseas study after China's "opening;"
- From the late 1980s on: mobilization of diaspora networks and proliferation of foreign-based S&T support associations;
- 1994: multiple foreign "talent" (人才) outreach programs and the creation of Overseas Chinese Scholar (OCS) returnee parks, where ideas (and IPR) accessed abroad are commercialized in subsidized enclaves;
- 2001: National Technology Transfer Centers, which link Chinese developers to the latest foreign technologies; and,
- more recently, leveraged buyouts of technology-rich companies, state-funded "angel" investments, and sponsorship of international startup competitions—not to mention direct purchases, trade-for-technology clauses, overseas subsidiaries (tech spotting and talent acquisition), state-hosted technology exchange forums (physical and virtual), patent mining, "dual-base" labs, short-term consultative visits, appointments of foreigners to advisory staffs, and a host of illicit activities.[8]

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[6] The Western Returned Scholars Association (欧美同学会). The WRSA's charter focuses wholly on benefits the party and state expect to gain by sending students abroad, and on students' obligation to provide those benefits. (http://www.wrsa.net/content_39103492.htm).

[7] Xi Jinping, "使留学人员回国有用武之地，留在国外有报国之门 (This will enable overseas students to be useful when they return to China, and help them serve China if they stay abroad.)." *Xinhua*, October 21, 2013. My italics. http://www.xinhuanet.com//politics/2013-10/21/c_117808372.htm.

[8] Hannas and Chang, "Chinese technology transfer—an introduction" in Hannas and Tatlow, eds., *Beyond Espionage*, (Routledge, 2021), 5.

What follows is an abriged list of venues and practices China uses today to acquire foreign high-tech, categorized by type. Concrete examples of each are provided in our published studies.

Illegal transfers	
Breach of contract	Reverse engineering
Computer network exploitation	Traditional espionage
Copyright infringement	Willful patent infringement
Insider operations	Violation of NDAs

Legal transfers	
China-based U.S. subsidiaries	Loopholes in trade agreements
Competitions (companies, universities)	Patent mining and exploitation
Conferences and colloquia	PRC-backed venture capital funds
Direct technology purchases	Startup accelerators and incubators
Enrollments at U.S. universities	State-backed investments in U.S. research
Investments / acquisition of companies	Tech exchanges, trade-for-tech agreements
Joint Sino-U.S. research organizations	U.S.-based labs, representative offices

While China's illicit transfers—theft and cyber operations especially—capture most of the public's attention, many such transfers happen right under our noses, forming a gray area of "extralegal" operations, whose legality cannot be determined because no one is looking. The following are their organizational components.

Extralegal transfers (organizations)	
Document acquisition facilities	Technology transfer centers
Front organizations for PRC offices	Technology transfer forums
Overseas scholar returnee facilities	Transfer incentive programs
PRC ministry offices (national, local)	U.S.-based facilitation companies
Recruiting and brokerage websites	U.S.-based student/alumni associations
Sino-U.S. professional associations	University-linked "innovation" parks

I omit for lack of space a breakdown of a dozen *classes* of personnel engaged professionally in these extralegal activities;[9] a discussion of the triangular relationship between China's enabling bureaucracy, foreign-based professional support guilds, and 900+ technology transfer centers in

[9] William C. Hannas and Huey-Meei Chang, "China Access to Foreign AI Technology," CSET, September, 2019, 6, https://cset.georgetown.edu/publication/chinas-access-to-foreign-ai-technology/.

China that commercialize or weaponize the take;[10] and a litany of statutory provisions enacted at the state level to facilitate formal *and informal* acquisition of foreign tech, including:[11]

- 1994: "*Ministry of Personnel Notice on 'Implementing Temporary Measures to Subsidize Overseas Chinese Scholars who Return to China for Short Periods to Work in Areas Outside the Educational System'*." Share with the motherland while remaining abroad.

- 2001: "*Circular on the Release of Opinions on Encouraging Overseas Chinese Scholars to Serve the Country by Multiple Means*." Endorsed by five ministries—basically a carte blanche to provide whatever is useful, wherever it is found.

- 2017: "*13th Five-year Plan for S&T Military and Civil Fusion*." Cross-pollination of military and civilian technology, e.g., quantum computing, neuroscience, brain-inspired research, will be supported by a range of foreign outreach initiatives.

We end this section by referring the Committee to a chapter in our 2023 book on China AI, where we offer a tongue-in-cheek apologia for China's behavior based on PRC rhetoric and a more plausible explanation, which ends as follows:

- "China's predatory [transfer] practices will not end when it achieves parity, because the causes of the behavior predate the problem… The upshot is a unique system that avoids blind alleys and allows China to 'leap ahead' on technologies important to China—while skirting liberalization."[12]

China's multiple paths to artificial general intelligence (AGI)

We segue now to this testimony's next focus—China's efforts to leverage advances in AI to promote state and Party goals, in particular, its declared intent to create AGI (通用人工智能) and gain what it calls a "first mover advantage" (先发优势) over competing nations.

"AGI," defined as broadly capable software that can replicate or exceed human functionality in all or most fields of endeavor, has been the holy grail of AI since its inception. Until recently most AI scientists considered the goal decades out, if attainable at all, although Chinese scientists were more optimistic, predicting AGI's arrival in 28 years (median figure) compared to 76 years for their U.S. counterparts.[13] Current thinking has narrowed the window to as few as 1-3 years from now, depending on one's definition of the target.[14]

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[10] Colleagues who continue to follow the issue have identified more than a thousand units functioning under various names and occupying simple storefronts to multi-storied, multi-acre mega-complexes.

[11] See Hannas and Chang, "Chinese technology transfer—an introduction" in Hannas and Tatlow, eds., *Beyond Espionage*, (Routledge, 2021), 9-11, for a sample of 18 such measures.

[12] Hannas and Chang, "Foreign support, alliances, and technology transfer," in Hannas and Chang, eds., *Chinese Power and Artificial Intelligence*, (Routledge, 2023), 36-38.

[13] Katja Grace, John Salvatier, Allan Dafoe, Baobao Zhang, Owain Evans, "Viewpoint: When Will AI Exceed Human Performance? Evidence from AI Experts," *Journal of Artificial Intelligence Research* 26, July 2018, 734.

[14] The Millennium Project, "International Governance Issues of the Transition from Artificial Narrow Intelligence to Artificial General Intelligence," Report of Phase 1, 2023, www.Millennium-Project.org. At the heart of the issue is the "goal post" problem, where increasingly capable AI begets increasingly stringent definitions.

Many Chinese researchers do not believe "AGI," as referenced in the dialog on generative large language models, is the only or even the best way of viewing AI's future.[15] Advanced AI can take—and has taken—many forms that exhibit amazing ability in certain fields while performing abysmally in areas that young children easily master. The concern should not be with software that mimics humans but with "super" forms of intelligence that run autonomously, ubiquitously, opaquely, and can bootstrap themselves to higher levels by rewriting their own source code.

These caveats aside, Chinese scientists recognize (a minimum of) three approaches to AGI:

- Machine learning (ML) approaches that rely on big data and massive computing power, as represented by today's highly successful large language models.

- Brain-inspired (类脑) artificial intelligence (BI-AI) based on accurate mathematical descriptions of physical brain processes run as algorithms on computers.

- Brain-computer interfaces (BCI) aimed at cognitive enhancement through direct links between human brains and AI resources, in a continuously improving synthesis.

My team went to some length to identify and describe China's "mainstream" approaches to advanced AI as practiced by ten leading organizations[16] in part because it is important, in part as a counter to the misguided notion that China's relative lag behind leading US and UK companies in ML techniques is a perpetual given. Significant work is being done, which we ignore at our peril, at the same time China leverages close links with the world's AI giants.

Meanwhile, what is overlooked in the fuss over LLMs are China's prodigious efforts to achieve AGI through a brain-inspired approach. BI-AI, while harder to do than "next token prediction" on which today's computational approaches are based, promises to overcome many bottleneck problems that have eluded traditional ML research, such as intuition, creativity, sense making, imagination and planning—all easily done by the three-pound biomass inside our skulls using 25 watts of power. China recognizes this and has invested in some 30 BI-AI labs and centers.[17]

This counter-trend to realize "big tasks with small data" (小数据，大任务) is exemplified in the rise of two major AGI research empires in Shanghai and Beijing, along with significant albeit less well-known efforts in the "provinces." The former is managed by returned Chinese scholar Pu Muming (蒲慕明), whose enterprises include factory-scale primate farms (macaque monkeys) for in vivo experimentation.

The Beijing complex, more recent of the two, is an amalgam of resources from China's top universities (Tsinghua and Beijing), CAS's Institute of Automation, the AI department of CAS University, and a wholly new entity stood up in 2020 whose name—Beijing Institute of General

[15] See "Survey of Chinese scientists and project managers" in Hannas, Chang, Wang, Aiken and Chou, "China AI-Brain Research," CSET, September 2020, 41-45, https://cset.georgetown.edu/publication/china-ai-brain-research/.
[16] Hannas, Chang, Chou and Fleeger, "China's Advanced AI Research," CSET, July 2022, 7-11, https://cset.georgetown.edu/publication/chinas-advanced-ai-research/.
[17] Hannas, Chang, Wang, Aiken and Chou, "China AI-Brain Research," CSET, September 2020, 29-34.

Artificial Intelligence (北京通用人工智能研究院)—belies its mission. BIGAI is run by returned UCLA professor and DARPA funds recipient Zhu Songchun (朱松纯), who regards the program to achieve AGI as on a par with China's historic development of "nuclear weapons, ballistic missiles, and earth satellites."[18]

BIGAI has a targeted staff of 1,000, drawn "from China and abroad."[19] A sense of its scale is given by the following photo:

Source: Beijing Institute of General Artificial Intelligence[20]

The third approach, BCI research, is the topic of a current CSET study focused on China's non-therapeutic use of these interfaces to achieve multiple objectives associated with AGI, including "twin brains" and, at one extreme, digital immortality. The project is summarized by Wu Zhaohui (吴朝晖), former dean of Zhejiang University, Chinese Academy of Science and IEEE member, and vice-director of China's Science ministry:[21]

> "We believe the fusion of brain and machine intelligence represents a new form of future AI, compatible with biological intelligence's perception of environment, cognitive mechanism, and ability to learn how to reason, and with machine intelligence's capability for information integration, storage, and compute.
>
> The basic intent is to start from the brain, use human information processing methods to build a virtual brain, and use brain-computer interaction to realize the fusion and integration of a biological brain, virtual brain, and human-computer intelligence.

[18] Irene Zhang, "AI Proposals at 'Two Sessions'." China Talk, March 8 2023, https://www.chinatalk.media/p/ai-proposals-at-two-sessions-agi.
[19] Chang and Hannas, "Spotlight on Beijing Institute of General Artificial Intelligence," CSET, May 2003, https://cset.georgetown.edu/publication/spotlight-on-beijing-institute-for-general-artificial-intelligence/.
[20] https://www.bigai.ai/about/.
[21] Wu Zhaohui, "From AI to CI—the development of brain-machine intelligence." Global Artificial Intelligence Technology Conference, Hangzhou, China June 5-6, 2021, https://dl.caai.cn/home/Literature/details.html?id=266.

China's academics and practitioners agree overall with this demarcation of tasks. The 'hybrid enhanced intelligence' in the [2017] New Generation Artificial Intelligence Plan originated from this understanding."

Technology transfer as a tool for AI progress

However one views China's AGI programs—and we consider them highly credible—a decisive factor invariably left out of these East-West comparisons is China's ability to "leap ahead" (超越) in AI development by doing what it has always done when pressed with the need to compete—access foreign know-how.

We considered this phenomenon important enough to have dedicated our Center's inaugural report in 2019 to "China's Access to Foreign AI Technology."[22] We addressed it again in a standalone chapter on "Foreign support, alliances, and technology transfer" in our edited book on China AI,[23] to which we refer the Committee for an in-depth treatment. The main takeaways are (1) China is using, to good effect, the same tried-and-true venues and techniques elaborated over the course of decades for S&T in general to transfer foreign AI, and (2) the efforts are facilitated by the eagerness of U.S. academics and technology companies to bolster China's AI prowess.

Here is an abbreviated list of transfer venues China has used to support its AI agenda:

Venues of foreign support to China AI

Chinese academic institutions	Official PRC policy support
Chinese AI companies	Online and physical exchange forums
Chinese research and investment abroad	Overseas study and research
Co-authorship of academic articles	Sino-foreign AI conferences
Foreign research and investment in China	Sino-foreign cooperation associations
Government outreach facilities	Talent recruitment programs
Government-sponsored labs	Technology transfer centers
Innovation and returnee parks	Think tanks and professional groups.

Evidence from open sources attests to the use of each of these enablers for China's AI development. Research I conducted in 2020 elicited information on more than one hundred "Thousand Talents Plan" (千人计划) co-optees supporting China's AI programs, chiefly from the United States and Europe, despite efforts by the sponsor to obscure their identities.[24] In 2021, we widened the search to include other talent plans listed in CSET's "Chinese Talent Program Tracker."[25] Each program without exception included dozens to thousands of unique references to "artificial intelligence."

[22] Hannas and Chang, CSET, September 2019.
[23] Hannas and Chang, eds., *Chinese Power and Artificial Intelligence*, 2023, 36-53.
[24] Hannas and Chang, "China's artificial intelligence," in Hannas and Tatlow, eds, 2021, 193.
[25] Emily Weinstein, "Chinese Talent Program Tracker," CSET, 2021, https://chinatalenttracker.cset.tech/.

Looking only at the academic dimension, we found examples of Sino-foreign AI transactions spread over ten categories, including training by "international" scientists, multinational alliances, bilateral associations, school-to-school partnerships, foreign-based alumni groups, academic forums, academic sponsorship of commercial ventures, co-authorship of academic papers, "using foreigners to draw in foreigners" and Chinese AI students abroad.[26]

In terms of corporate involvement, we found multiple examples of ongoing support to China AI and information technologies through in-country research facilities established by Amazon, Dell, IBM, Intel, Microsoft, and dozens of others, some of which began in the mid-1980s.

As is true of technology transfer in general, it is disingenuous to attribute these academic and corporate link-ups to a quest for knowledge and profit alone, as the Chinese government's hand can be seen in most of it. For example, China's 2017 "New Generation AI Development Plan"—the gold standard for national AI development—has a Section 4 that reads like a recitation of the transfer techniques described in this testimony's first section.[27] Subsequently, three ministries each issued programs for AI development calling for:

- Full use of international cooperation mechanisms and attracting high-level talent through the "Thousand" and "Ten Thousand Talents" Plans (MIIT); [28]

- "Foreign intellect recruitment innovation bases" (创新引智基地, "Program 111"), joint AI laboratories, importing top scholars, and organizing international AI forums (MOE);[29]

- Use of foreign scientists employed concurrently by foreign and Chinese employers as AI project leaders (MOST).[30]

I conclude this section with an excerpt from a Chinese Ministry of Education notice released in 2020, that deserves to be quoted at length:

> "Aiming at the international cutting edge of AI and at weaknesses in domestic development, increase support for joint training of doctoral students in AI-related fields at home and abroad. Actively encourage high-level talent to carry out international exchanges and expand the depth and breadth of cooperation. Hold internationally influential AI academic conferences and forums and create high-level academic journals. Build a number of AI international cooperative scientific research platforms and bases and strengthen the development and training of international high-end talent. Encourage universities to initiate and organize AI international big science projects (大科学计划) and create international academic organizations and university cooperation alliances. Promote

[26] Hannas and Chang, "Foreign support," in Hannas and Chang, eds., 2023, 45-47.
[27] Hannas and Chang, "China's artificial intelligence," in Hannas and Tatlow, eds., 2021, 189.
[28] 促进新一代人工智能产业发展三年行动计划 (Three-year Action Plan to Promote the Development of New-Generation AI Industry), MIIT 315, 2017. Section 4, "Accelerate the cultivation of talent."
[29] 高等学校人工智能创新行动计划 (AI Innovation Action Plan for Institutes of Higher Education), MOE 3, 2018.
[30] 科技部关于发布科技创新 2030—"新一代人工智能"重大项目 2018 年度项目申报指南的通知 (Project Application Guidelines for S&T Innovation 2030-'New Generation Artificial Intelligence' 2018 Major Projects), MOST 208, 2018.

> the formation of relevant international standards and ethical norms in the field of AI. Vigorously cultivate internationalized talent to participate in its global governance."[31]

What's to be done?

My colleagues and I deeply respect the United States Intelligence Community (USIC), in which we were privileged to serve. Indeed, some of us were responsible for managing issues this testimony addresses. Hence it is with some authority that I testify, in good faith, that the USIC is ill-suited to perform many of the collection and analysis tasks needed to interdict these threats.

The problem is two-fold. Title-50 organizations are chartered—budgeted—to do classified collection through specific venues: HUMINT, SIGINT, IMINT, MASINT, etc. Although each acknowledges the value of open source (OSINT) in principle, in practice it is seen—even referred to—as an "enabler" of the house specialty, not as an -INT worth exploiting in its own right. Secondly, the USIC, in the post-Cold War era especially, has relegated S&T intelligence (STI) to last place behind terrorism, economics, political leadership, and military intentions. These biases have been known since at least 2013, when pointed out by a congressionally established commission charged with reviewing USIC R&D programs,[32] and have led my team to conclude, in exasperation, that:

> "In the United States, STI has the same standing within the USIC's open source community that OSINT has in the broader intelligence community, namely, last at the budgetary trough."[33]

This posture, where open source is the -INT of last resort, is the exact opposite of China's long-standing commitment to exploit OSINT. I detailed China's STI organization and practices in a separate paper but lack space to repeat those findings here, other than to affirm that China beats the U.S. by two or more orders of magnitude in size, quality, automation, professionalism, level of commitment and, importantly—access to state policymakers.[34]

Accordingly, I join my CSET colleagues in recommending in the strongest terms that the USG stand up a dedicated STI organization, outside the USIC or, if necessary, as an office under DNI auspices, provisionally called the "National Science and Technology Analysis Center" to identify, monitor, and alert policymakers of important foreign S&T developments early enough to matter.

While its details are beyond the scope of this testimony, we have considered the matter in depth and would be happy to share our thoughts. Underlying this recommendation is a maxim almost too banal to repeat, namely, <u>good policy depends on good information</u>, which the USG currently lacks. While I have nothing useful to say about what the USG should do to counter the emerging

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[31] 关于"双一流"建设高校促进学科融合, 加快人工智能领域研究生培养的若干意见 (Notice on the Publication of "Certain Opinions on Promoting Curricula Merging at 'Double World-Class' Institutes of Higher Education and on Accelerating the Cultivation of Graduate Students in the AI Field"), MOE 4, NDRC, MOF, 2020.

[32] "Report of the National Commission for the Review of the Research and Development Programs of the United States Intelligence Community (unclassified version)," 2013.

[33] Hannas and Chang, "China's STI Operations," CSET, January 2021, 7.

[34] Ibid.

China AI threat, I can say with confidence that we are not at present equipped to understand it, let alone discuss ways to deal with it.

My second recommendation pertains to Chinese technology transfer, outlined in an appendix to this testimony (below). Effective measures depend on timely data, which we lack. The problem mirrors the former conundrum: one cannot interdict unwanted transfers without knowing China's needs, just as one cannot grasp the S&T challenge without knowing what China can steal.

Thank you for this opportunity to testify.

Wm. C. Hannas

Appendix

Proposed legislative and institutional remedies to mitigate unwanted foreign transfers of U.S. technology

Amid their work on technology policy and risk mitigation, CSET analysts are often asked about technology transfer—the licit, illicit and grey-zone provisioning of intellectual capital from one nation to another. The matter intersects with "normal" technology development on multiple levels since nations, often as a matter of state policy, rely on the ingenuity of one another to fashion their futures. While we believe collaboration should be encouraged, the transfer of national security relevant technology—to peer competitors especially—is a well-documented problem and must be balanced with the benefits of free exchange. The following propositions covering six facets of the transfer issue reflect CSET's current recommendations on the matter.

Laws and guidelines

Define what transactions and types of transactions are problematic from a national security standpoint. Publicly identify platforms, proxies, venues and techniques judged to be inimical to U.S. technological and economic security and the relative risks they pose.

Create consistent, transparent laws and guidelines governing the transfer of U.S. research and technology to "at risk" countries with a view toward eliminating ambiguity, while balancing the benefits the United States accrues from foreign scientific exchange.

Establish disclosure rules for U.S. government (USG) grant recipients researching technical areas. Disallow USG funding to projects linked directly or through performer affiliations to the military establishments and "United Front" organizations of designated threat countries.

Data collection and monitoring

Create a National Science and Technology Analysis Center to establish a contextual framework for answering key emerging technology-related questions, including those concerning technology transfer, using publicly available information from all scientific technical domains.

Mandate the U.S. intelligence community to monitor key indicators and provide warnings of potential illegal and extralegal transfers through mission-specific classified venues, redirecting resources as needed to respond to this traditionally undervalued threat.

Establish online databases of all overseas funding received by U.S. public universities and their employees, and of foreign entities with a history of improper transfers or intellectual property theft, especially those linked to China's military and that of other designated countries.

Institutional remedies and reform

Establish within the White House a high, preferably Cabinet-level position to recommend and oversee national technology policy aimed at securing American leadership in critical “new and emerging” fields using expanded information and monitoring resources as identified above.

Create as an adjunct to the above office dedicated policymaking infrastructure to protect the United States from disadvantageous transfers of technologies created on U.S. soil, and by multinational companies (MNCs) headquartered on U.S. soil, to agents of “at risk” countries.

Ensure law enforcement agencies are resourced and able to investigate and prosecute cases of IP theft, fraud, economic espionage, and other forms of legally-defined illicit tech transfer, and that funding agencies have mechanisms to monitor compliance with grant agreements.

Repairing our national S&T base

Build up America’s S&T base to avoid a zero-sum struggle. Develop national strategies to promote commercialization of research and to build talent. Appreciate that mitigation is no substitute for positive efforts to create and operationalize wholly new indigenous technologies.

Encourage foreign students and researchers to remain in the United States, become citizens, and help their new country prosper, especially in areas where we face critical shortages. Facilitate the transition by offering a clear path from temporary status to permanent residence and citizenship.

Encourage MNC’s to consider the interests of their home country in their technology sharing and stewardship. Corporate advantage should also be interpreted in a national security context, while hedging against the negative impact of overly restrictive measures on free exchange.

Outreach and cooperation

Institute a USG-sponsored outreach program to alert businesses, universities, research labs, foreign governments, foreign students entering the United States, and foreign advocacy groups in the United States to the risks and penalties of illicit transfers.

Acquaint universities and other research institutions with the talent recruitment programs of designated threat countries and pertinent USG policies. Develop recommendations for these institutions to mitigate talent recruitment activity. Fund measures for compliance.

Establish with allied country cooperation a consortium of common cause democratic states chartered to combat hostile appropriation of sensitive and proprietary research, and empowered to share and act on information of general concern.

Foreign talent programs and support guilds

Prohibit all persons, regardless of position or nationality, who are receiving USG research grants from being members of foreign talent recruitment programs and technology support groups identified with designated threat countries.

Broaden the Foreign Agents Registration Act to cover talent program co-optees and technology transfer intermediaries serving foreign states, including technology support groups identified by charter with designated threat countries.

Encourage research organizations to familiarize staff with policies pertaining to designated threat countries' recruitment programs and to update their policies on IP, research integrity, conflicts of interest, and external appointments as necessary.

William C. Hannas
Huey-Meei Chang