Pursuing the Paradoxical Phase of Science Diplomacy

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Science diplomacy is entering a paradoxical phase: the very knowledge systems that connect nations are becoming instruments through which nations compete. The future of science diplomacy may depend less on resolving this contradiction than on learning how to govern it.

For decades, science was valued in international relations partly because it could operate beyond the immediate turbulence of geopolitics. Scientists collaborated across borders even when governments disagreed. Universities and laboratories created enduring people-to-people connections. Shared research on climate, health, oceans and space demonstrated that some challenges were simply too consequential to be contained within national boundaries.

The premise was powerful: science could build bridges where politics built walls. That premise still holds. But it increasingly coexists with another reality: science and technology are becoming instruments of strategic statecraft.

AI, semiconductors, quantum technologies, biotechnology, critical minerals, space systems and data infrastructure are no longer viewed only as domains of scientific and economic progress. They are increasingly associated with national security and technological sovereignty, with varying degrees of geopolitical influence. International research collaboration is consequently being evaluated not only for its scientific value but also for questions of intellectual property (IP) ownership, technology leakage, technology dumping, supply chain resilience and strategic dependence.

The result is an unusual paradox: the global scientific system is simultaneously being asked to become more open for discovery and more guarded for security.

The shift is visible across major scientific powers. The United States, for instance, has articulated a doctrine of both "promotion and protection"—advancing technological leadership while strengthening research security, protecting IP and controlling access to sensitive technologies. Its 2026 National Security Science and Technology Strategy explicitly treats science and technology leadership as a national security objective.

But this is not simply an American story. Research security frameworks, export controls, trusted technology partnerships, and strategic industrial policies are emerging across global jurisdictions. Science itself is becoming part of the vocabulary of strategic autonomy.

And therein lies the deeper question: can strategic autonomy coexist with the fundamental interdependence upon which modern science depends?

No country possesses all the capabilities required to lead across every technological frontier. Scientific progress depends on international talent, data, supply chains, specialised infrastructure and

complementary expertise. Even technologically advanced states remain deeply interconnected. Perhaps, therefore, strategic autonomy in the twenty-first century will not mean autonomy *from* interdependence, but the ability to exercise strategic choice *within* interdependence. This is already reshaping science diplomacy.

The India-US TRUST Initiative, for example, combines collaboration in AI, semiconductors, quantum, biotechnology, energy, and space with an emphasis on verified technology vendors, sensitive technology protection, and resilient supply chains. The India-UK Technology Security Initiative similarly places technologies such as AI, quantum, biotechnology, semiconductors, advanced materials and critical minerals within a framework that explicitly combines technological collaboration with security considerations.

These developments point towards a new model of international scientific cooperation: trusted interdependence. But trusted by whom? This is where the paradox becomes consequential.

If international collaboration increasingly depends upon being part of a "trusted" ecosystem, could science diplomacy unintentionally contribute to the fragmentation of the global scientific commons? Could research networks become increasingly organised around geopolitical alignment rather than scientific merit? And if access to advanced computing, datasets, fabrication facilities, biotech infrastructure, or critical materials becomes increasingly restricted, what happens to countries that remain outside these technology networks? The concern is particularly important for emerging nations with techno-economic ambitions to address their developmental needs.

The world cannot simultaneously argue for a more distributed global innovation system and construct barriers that make participation in frontier science increasingly conditional. Excessive restrictions could constrain precisely the scientific mobility, knowledge exchange and capacity building that developing research ecosystems need. Yet the opposite extreme is equally problematic. The assumption that all knowledge should remain unrestricted is increasingly difficult to sustain when fundamental research can rapidly acquire commercial or military applications. The boundary between basic science and strategic technology is becoming porous.

The challenge, therefore, is not to choose between open science and research security. It is to determine how much openness is appropriate, where safeguards are necessary, who defines those boundaries, and how often they should be reconsidered. This calls for a more nuanced architecture of graduated openness.

Fundamental research should remain as open as possible. Sensitive dual-use research may require proportionate safeguards. Commercially strategic technologies may warrant targeted protection. Truly security-critical capabilities may require tighter controls.

But "security" cannot become an elastic justification for permanently closing scientific borders. This raises several pressing questions for contemporary science diplomacy.

- Where should the boundary between scientific openness and strategic vulnerability be drawn?
- Who decides what constitutes sensitive science: the state, the scientist, the university or industry?
- Can research security protect scientific ecosystems without creating a culture of suspicion that undermines international collaboration?
- Can strategic autonomy be achieved without technological isolation?
- And perhaps most importantly, can frameworks of 'trusted technology partnerships' remain genuinely inclusive, or will they gradually produce competing scientific and technological blocs?

These are not abstract questions. They will shape who participates in the next generation of scientific discovery, who controls critical technologies and who benefits from them. They also demand a rethinking of the purpose of science diplomacy itself.

Traditionally, science diplomacy has been understood largely as using science to build diplomatic bridges. Its emerging role may be more complex: diplomacy will increasingly have to help determine where those bridges remain open, where they need safeguards, and how they can remain accessible without ignoring legitimate security concerns.

This is particularly important for countries such as India. The objective should extend beyond joining existing technology blocs to helping shape the rules of emerging technological cooperation through co-development, research mobility, shared infrastructure, standards, capability-building and inclusive innovation.

The future of science diplomacy should therefore not be defined by the choice between openness and sovereignty. It should seek sovereignty without isolation, and openness without naivety.

The paradox is unlikely to disappear. Indeed, it may become the defining condition of twenty-first-century science diplomacy. Science will continue to be one of humanity's most powerful bridges. But those bridges now carry strategic traffic. The real task is to manage strategic competition while preserving the openness that makes science capable of connecting us in the first place.

Perhaps the ultimate test of contemporary science diplomacy is therefore not whether science can remain outside geopolitics. It cannot. It is whether we can build a global scientific order that is strategic yet open, secure yet inclusive, and competitive yet collaborative.

That is the paradox we must learn not to eliminate but to govern.