

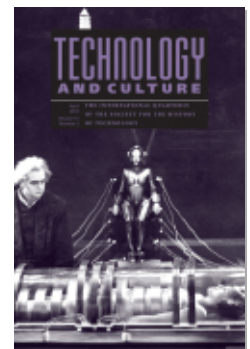


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Competing Technologies, National(ist) Narratives, and
Universal Claims: Toward a Global History of Space
Exploration

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Technology and Culture, Volume 51, Number 2, April 2010, pp. 425-443 (Article)



Published by Johns Hopkins University Press

DOI: <https://doi.org/10.1353/tech.0.0459>

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Competing Technologies, National(ist) Narratives, and Universal Claims

Toward a Global History of Space Exploration

ASIF A. SIDDIQI

David Nye has succinctly noted that “the meaning of a tool is inseparable from the stories that surround it.”¹ What are the meanings of space technology, particularly for historians? How do these meanings differ in disparate national contexts? Is it possible to conceive of a universal narrative of the history of space exploration? The fiftieth anniversary of the Society for the History of Technology—and the almost simultaneous fiftieth anniversary of Sputnik—provided an obvious occasion to revisit these questions.

In the fifty years since the launch of Sputnik on 4 October 1957, more than 6,000 functioning satellites have been launched into Earth orbit and beyond—some to the farthest reaches of our solar system. By its physical nature, space exploration has a resonance beyond national borders—at a fundamental level, it is a project that transcends national claims and appeals to the global, perhaps even to the universal. Yet our understanding of the half-century of space travel is still firmly rooted in the framework of the national imagination. Until now, barring very few exceptions, only nation-states have been able to mobilize the resources necessary for regular access to space. For most laypersons, the perceived apotheosis of space exploration remains the heady days after Sputnik, when the United States and the Soviet Union competed to trump the other in a series of progressively more complex feats in space. The cold-war space race retains its mystique, either

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0040-165X/10/5102-0008/425–43

1. David E. Nye, *Technology Matters: Questions to Live With* (Cambridge, Mass., 2006), 3.

as a benchmark that subsequent accomplishments could never equal, or as an anomaly whose particular conditions could never be repeated. It has, in fact, become impossible to think of space exploration without allusion to the halcyon days of the 1960s and equally inconceivable for historians to interpret the act of space travel without the space *race* hovering over the very language that we use.

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My goal in this essay is to offer some thoughts on the way in which the relationship between national identity and space exploration has affected our discipline's approach to the history of spaceflight—in fact, has been fundamental to it. This discussion is intended to be a starting point to revisit both the history and the historiography of space exploration and suggest some new avenues of investigation that move beyond formulations rooted in the cold-war space race. I will begin by illuminating the ways in which multiple and contradictory narratives—engendered by national claims—have been a staple of space history in both the United States and Russia, the two foremost spacefaring nations. The citizens of both nations remember space exploration quite differently, yet they appeal to the same kind of universal import. In addition, the maturation of other national space programs—those of China, Japan, and India, for example—will require us to approach space history with new lenses as more and more “new” narratives join the old cold-war-centered approach to space history. Second, by using the particular case of the burgeoning Indian space program and its postcolonial context, I will draw attention to avenues opened up by de-privileging borders in the history of space exploration, i.e., clearing the path to a potentially *global* history of space exploration. This line of thinking may raise a set of provocative questions concerning the motivations which lead nations to explore space, and why, in doing so, they take certain pathways that are not explicable by deterministic approaches.

National Narratives

Ask historians of technology from the United States to name the most important event in the history of space exploration, and they will cite the *Apollo* Moon landing in 1969. Pose the same question to their Russian counterparts and they will recall the flight of Yuri Gagarin in 1961. American historians of spaceflight (or indeed, historians of technology) would be surprised to learn that few beyond the United States remember or care about *Apollo*, while Russians find it startling that few Americans have even heard of Gagarin. Two nations that have engaged in essentially the same endeavor—to take leave of this planet—have fundamentally dissimilar perspectives on the same set of events. That history is told differently in different places by different people is hardly surprising. The same historical episode, seen from two different national cultures, can engender entirely different national claims, assertions that are contingent on a complex ma-

trix of deeply ingrained cultural assumptions. What is unique about the received history of spaceflight is that its claims—such as those for Gagarin or *Apollo*—have been imbued with a certain universal, even anthropological, significance. In each nation’s canon of space history, Gagarin’s flight and Neil Armstrong’s first step have been compared with the evolutionary movement of life from water to land. This simultaneous invocation of national aspirations and universal significance is what distinguishes the conflicting national narratives of space history from other more common *Rashomon*-like views of history.

Essential to this tension between the more specific narrative and the universal claim in the case of the space program is the perceived importance of technological prowess in the construction of a national identity. While the notion that scientific prowess is a constitutive element of national identity goes back to at least the seventeenth century, the Enlightenment strongly reinforced this relationship in the European context. By the late nineteenth century, with the fruits of the Industrial Revolution evident and the appearance of a distinct category of technology, many of the rationales used in favor of science were even more persistently applied to technology and its essential role in the enterprise of nation-building.² And, as the European colonial project reached its peak, the discussion over modern technology became inseparable from empire-building; technology, in effect, became a dominant metric of modernity—Michael Adas’s “measure of men.”³ By the early twentieth century, and especially in the light of experiences during World War I, technology assumed a fundamental role in the projection of national prowess, a role that was now further complicated by the specter of international competition for global dominance—through science, technology, war, and imperial holdings. In his study of the relationship between technology and modernity in early-twentieth-century Britain and Germany, Bernhard Rieger notes that “[t]echnological innovations not only underpinned the competitiveness of national economies as well as both countries’ military might; a large range of artifacts also became national symbols and prestige objects that signaled international leadership in a variety of engineering disciplines.”⁴

2. Carol E. Harrison and Ann Johnson, “Introduction: Science and National Identity,” in “National Identity: The Role of Science and Technology,” ed. Carol E. Harrison and Ann Johnson, special issue, *Osiris*, 2nd ser., 24, no. 1 (2009): 1–14. See also the thirteen essays on the topic in this same volume.

3. Useful surveys on technologies of empire include Daniel Headrick, *The Tools of Empire: Technology and European Imperialism in the Nineteenth Century* (Oxford, 1981), and Michael Adas, *Machines as the Measure of Men: Science, Technology, and Ideologies of Western Dominance* (Ithaca, N.Y., 1989). For a survey of the literature, see David Arnold, “Europe, Technology, and Colonialism in the 20th Century,” *History and Technology* 21 (2005): 85–106.

4. Bernhard Rieger, *Technology and the Culture of Modernity in Britain and Germany, 1890–1945* (Cambridge, 2005), 224. In a similar vein, see Guillaume de Syon, *Zeppelin!*

The competition between Britain and Germany in fin-de-siècle Europe suggests some striking antecedents to the space race of the late 1950s and 1960s, particularly the collective national rumination in the United States following the shock of Sputnik. In the earlier case, the British were surprised and then alarmed by the rise of German technological innovation. Rieger notes that “[a]fter decades of unchallenged economic leadership, competition from [Germany] came as a shock to the world’s foremost imperial power and immediately conjured up the specter of ‘decline.’”⁵ World War I fighter pilots (much like later astronauts) assumed a key role in Germany’s projection of technological acumen, augmenting the value of technological artifacts as formidable national symbols: both pilots and artifacts were physical expressions of the notion that technology was indispensable to “national self-assertion in competitive environments,” created in this case by the British-German rivalry.⁶

The launch of Sputnik starkly accentuated the relationship between national identity and technology. Soviet and American commentators actively encouraged this link, using many of the same rationales advanced previously for technological prowess, albeit in entirely different conditions. Sputnik, launched on the same night that *Leave It to Beaver* premiered on U.S. television, awoke a nation now seen as far too complacent. Walter McDougall notes that “no [single] event since Pearl Harbor set off such repercussions in public life.”⁷ A crisis of confidence washed over most of American society, an anxiety that depended on an intrinsic equation between modern America and science and technology. The political response unfolded with the legislation to create several new agencies focused on science, technology, and innovation, including the National Aeronautics and Space Administration (NASA). On the basis of the belief that better education in Soviet Russia contributed to Sputnik, federal money poured into the American higher education system, making it a key component in the battles of the cold war. These policies—the creation of new government agencies, further increases in state-sponsored R&D, and expansion and restructuring of higher education—had enormous influence on America’s political, social, and cultural trajectory during the cold war.⁸

Germany and the Airship, 1900–1939 (Baltimore, 2002); Peter Fritzsche, *A Nation of Fliers: German Aviation and the Popular Imagination* (Cambridge, Mass., 1994); and Gabrielle Hecht, *The Radiance of France: Nuclear Power and National Identity after World War II* (Cambridge, Mass., 1998).

5. Rieger, 227.

6. Quote from *ibid.*

7. Walter McDougall, . . . *the Heavens and the Earth: A Political History of the Space Age* (New York, 1985), 142.

8. For only a small sampling of the literature on the domestic political repercussions of Sputnik, see McDougall; Roger D. Launius, John M. Logsdon, and Robert W. Smith, eds., *Reconsidering Sputnik: Forty Years since the Soviet Satellite* (Amsterdam, 2000); Paul Dickson, *Sputnik: Shock of the Century* (New York, 2001); Robert A. Divine, *The Sputnik*

In the years after Sputnik, space exploration assumed a critical role in the projection of American identity both at home and abroad. More than anything, human spaceflight, in the form of the Mercury, Gemini, and Apollo programs, solidified this link. The rhetoric of politicians, media commentators, and NASA spokespersons helped to mobilize support for one of the most expensive civilian endeavors in the history of the nation, the *Apollo* Moon landing. Rieger's comment about Britain and Germany in the early twentieth century, that "playing up technology's national significance . . . engendered understandings that overcame public resistance to new artifacts and instead highlighted their promise and led . . . laypersons to embrace advances" anticipates the rhetoric surrounding *Apollo*.⁹ Mark E. Byrnes, in his *Politics and Space: Image Making by NASA*, has traced the effects of NASA's image-building policy on popular perceptions of the organization as well as broader support for the cause of space travel.¹⁰ He argues that NASA primarily used three images—nationalism, romanticism, and pragmatism—to create and consolidate political support across the nation for its major endeavors in space. During the early years of NASA, no one infused these arguments with more passion than then-vice president Lyndon B. Johnson, who characteristically noted that "Failure to master space means being second best in every aspect, in the crucial area of our Cold War world. In the eyes of the world, first in space means first, period; second in space is second in everything."¹¹ In a well-received 2002 book on *Apollo*, popular science writer David West Reynolds distills his belief in the connection between national identity and *Apollo* succinctly and emotionally:

[The Moon race] was a Cold War battle to demonstrate the superior ability of the superior system, capitalism versus communism. . . . And the battle did prove out the more capable system. . . . The reasons are many, but among them the power of free enterprise ranks high. . . . Free competition motivated American workers whose livelihoods were related to the quality and brilliance of their work, and we saw extraordinary, impossible things accomplished by ordinary Americans. The American flag on the Moon is such a powerful symbol because it is

Challenge: Eisenhower's Response to the Soviet Satellite (New York, 1993); Stuart W. Leslie, *The Cold War and American Science: The Military-Industrial-Academic Complex at MIT and Stanford* (New York, 1993); Rip Bulkeley, *The Sputniks Crisis and Early United States Policy: A Critique of the Historiography of Space* (Bloomington, Ind., 1991); Andrew Hartman, *Education and the Cold War: The Battle for the American School* (New York, 2008); and Zuoyue Wang, *In Sputnik's Shadow: The President's Science Advisory Committee and Cold War America* (New Brunswick, N.J., 2008).

9. Rieger, 224.

10. Mark E. Barnes, *Politics and Space: Image-making by NASA* (Westport, Conn., 1994). See also James L. Kauffman, *Selling Outer Space: Kennedy, the Media, and Funding for Project Apollo, 1961–1963* (Tuscaloosa, Ala., 1994); Harlen Makemson, *Media, NASA, and America's Quest for the Moon* (New York, 2009).

11. Lyndon B. Johnson, quoted in McDougall, 320.

not a vain one. America, like no other nation, was capable of the Moon.¹²

Such self-congratulatory and nationalistic sentiments, rooted in broader notions of American exceptionalism, are common in much of the popular literature on *Apollo*.

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For the Soviet Union, the flight of Yuri Gagarin only reaffirmed what was a given: that the Soviet state's existence and future depended on the development and use of modern science and technology. The early architects of the Bolshevik state were explicit on this point, their stance fortified by the perception (and reality) of Russian "backwardness" in comparison to its Western neighbors. Lenin's fascination with the rapid electrification of Russia, Taylorism, and the construction of modernized railroads in Russia were certainly all practical, but they also carried with them an underlying idea that technology itself was a national panacea.¹³ Beyond his oft-quoted phrase "communism equals Soviet power plus the electrification of the entire country," Lenin had an almost evangelical view of the role of electricity, and technology in general, as if it had the power to transform nation and culture. Aviation—and eventually space exploration—represented a powerful marker of modernity that proved irresistible to the Communist Party. In the aftermath of Gagarin and at the height of the space race in the 1960s, the discourse of cosmic flight was ubiquitous in Soviet popular culture and polity—cosmonauts became heroes of the space age, their iconic status infused with a heady mixture of nationalism and worship of technology.¹⁴ The Soviet space program was a potent projection of Soviet national aspirations, which is probably why—when it failed to keep up with American advances in the late 1960s—the damage done to public perceptions of Soviet technological prowess was doubly injurious.

Universal Claims

Space exploration's link with national identity partly overlapped with its claims to a larger idea that appealed to a global, even universal, vision of humanity. Counterintuitively, these ideas emerged from ideas deeply em-

12. David West Reynolds, *Apollo: The Epic Journey to the Moon* (New York, 2002), 257.

13. Jonathan Coopersmith, *The Electrification of Russia, 1880–1926* (Ithaca, N.Y., 1992); Anthony Heywood, *Modernising Lenin's Russia: Economic Reconstruction, Foreign Trade and the Railway* (Cambridge, 1999); Kendall E. Bailes, "Alexei Gastev and the Soviet Controversy over Taylorism, 1918–24," *Soviet Studies* 29 (1977): 373–94; Mark R. Beissinger, *Scientific Management, Socialist Discipline, and Soviet Power* (Cambridge, Mass., 1988).

14. Slava Gerovitch, "New Soviet Man' Inside Machine: Human Engineering, Spacecraft Design, and the Construction of Communism," in "The Self as Project: Politics and the Human Sciences," ed. Greg Eghigian, Andreas Killen, and Christine Leuenberger, special issue, *Osiris*, 2nd ser., 22, no. 1 (2007): 135–57.

bedded in national contexts. Roger Launius has noted that nations have historically justified space exploration by appealing to one (or a combination) of five different rationales: human destiny, geopolitics, national security, economic competitiveness, and scientific discovery.¹⁵ The latter four stem from national and nationalist requirements; the first, human destiny, appeals to the idea of survival of the species. In the American context, this universal rationale of human destiny combines older traditions of technological utopianism and an updated version of “manifest destiny.” Technological utopianism, i.e., a notion that conflates “progress” (qualified technologically) with “progress” (unqualified), has been an essential part of popular discourse since the late nineteenth century, and if the crisis of modernity and the Great War made Western Europeans less enamored of the panacea promised by technology, Americans continued to embrace more fully the idea of technological utopianism than most other societies.¹⁶

As Launius has shown, influential space activists of the past fifty years deployed rhetoric and rationale to support space exploration that simultaneously invoked romanticized notions of the American frontier—Frederick Jackson Turner’s “frontier thesis” was ubiquitous—with emphatic language that underscored that what was at stake with space exploration was not about Americans but the entire human race. Commentators as varied as Wernher von Braun, Gerard K. O’Neill, and Robert Zubrin all couched their arguments with a distinctly American spin—ingenuity, frontier, freedom—in their search to create the opportunity for global survival in the form of human colonization of the cosmos.¹⁷ Here, the American becomes the normative for space travel for the species.

The situation was and is eerily similar in the Russian (and former Soviet) case. As with the United States, there is a deep strand of technological utopianism in Russian society, a cultural trait that was undeniably heightened by the Bolshevik Revolution. What was once a vision of the future for Russian intelligentsia at the turn of the century took on millenarian overtones after 1917.

Beginning in the 1920s, space exploration became a powerful avatar of utopian dreaming in post-revolution Russia. The most powerful symbol of this appeal was the patriarch of Soviet cosmonautics Konstantin Tsiolkovskii, the half-deaf village schoolteacher who, before any other in the world, articulated the practical possibility of space travel in an obscure journal article in 1903. Tsiolkovskii was driven not only by a fervent belief in the

15. Roger D. Launius, “Compelling Rationales for Spaceflight? History and the Search for Relevance,” in *Critical Issues in the History of Spaceflight*, ed. Steven J. Dick and Roger D. Launius (Washington, D.C., 2006), 37–70.

16. Howard P. Segal, *Technological Utopianism in American Culture* (Chicago, 1983).

17. Howard E. McCurdy, *Space and the American Imagination* (Washington, D.C., 1997); Roger D. Launius, “Perfect Worlds, Perfect Societies: The Persistent Goal of Utopia in Human Spaceflight,” *Journal of the British Interplanetary Society* 56 (2003): 338–49.

power of science and technology to save the world but also by ideas deeply rooted in Russian culture, particularly the philosophy of Cosmism. Cosmism's intellectual foundations comprised a hodgepodge of Eastern and Western philosophical traditions, theosophy, Pan-Slavism, and Russian Orthodox thinking. The outcome was a nationalist and often reactionary philosophy that, in spite of its reactionary tenets (or perhaps because of them), continues to attract the attention of many Russian nationalist intellectuals in the post-Communist era.¹⁸ The cause of Cosmism was "liberation from death," a goal that would be achieved by human migration into space which would allow humans to reanimate the atom-like particles of all those who had already "died" in the previous hundreds of thousands of years. The eccentric late-nineteenth-century Russian philosopher Nikolai Fedorov, who articulated much of this philosophy before anyone, wrote: "[The] conquest of the Path to Space is an absolute imperative, imposed on us as a duty in preparation for the Resurrection. We must take possession of new regions of Space because there is not enough space on Earth to allow the co-existence of all the resurrected generations."¹⁹ In present-day Russia, the philosophy of Cosmism holds deep sway among many commentators, especially those who meditate on the meaning of Russian space exploration.²⁰

For those Russians not partial to occult ramblings about reanimation of the dead, the launch of Sputnik and the astonishing series of successes in its aftermath—the first animal in space (1957), the first lunar impact (1959), the first pictures of the far side of the Moon (1959), the first human in space (1961), the first woman in space (1963), the first "walk" in space (1965), the first lunar soft landing (1966), and many others—seem to confirm that the Soviet Union's natural destiny was as the leading spacefaring nation. The successes that the Soviets accumulated under the legendary "chief designer" Sergei Korolev in the late 1950s and 1960s were never matched after his death in 1966; as such they remain markers of the golden era of Soviet space travel.²¹

18. Asif A. Siddiqi, "Imagining the Cosmos: Utopians, Mystics, and the Popular Culture of Spaceflight in Revolutionary Russia," in "Intelligentsia Science: The Russian Century, 1860–1960," ed. Michael D. Gordin, Karl Hall, and Alexei Kojevnikov, special issue, *Osiris*, 2nd ser., 23, no. 1 (2008): 260–88. For links between modern Russian Cosmism and post-Soviet Russian nationalism, see James P. Scanlan, ed., *Russian Thought after Communism: The Recovery of Philosophical Heritage* (Armonk, N.Y., 1994), 26–28.

19. Jean Clair, "From Humboldt to Hubble," in *Cosmos: From Romanticism to the Avant Garde*, ed. Jean Clair (Montreal, 1999), 25. For a detailed exploration on the role of Cosmism in Soviet space exploration, see Asif A. Siddiqi, *The Red Rockets' Glare: Spaceflight and the Soviet Imagination, 1857–1957* (New York, 2010).

20. For a small sampling of works on Russian Cosmism since the early 1990s, see L. V. Fesenkova, ed., *Russkii kosmizm i sovremennost'* (Moscow, 1990); S. G. Semenova and A. G. Gacheva, eds., *Russkii kosmizm: Antologiiia filosofskoi mysli* (Moscow, 1993); O. D. Kurakina, *Russkii kosmizm kak sotsiokul'turnyi fenomenon* (Moscow, 1993); and O. Ia. Gelikh, ed., *Kosmizm i novoe myshlenie na Zapade i Vostoke* (Saint Petersburg, 1999).

21. For the most comprehensive biography of Korolev, see Yaroslav Golovanov,

Like *Apollo* in the United States, that period, with its cosmonauts, spaceships, and memorabilia, has remained the archetype of the Russian space program in the public eye. Cosmonauts and commentators flooded the official Soviet media with ruminations emphasizing the link between nation and space exploration not only for the Soviet case but also for the American one. Thus, highlighting Soviet successes and American failures in space were implicit critiques of the national worth of the United States. Additionally, as in the United States, there was a vibrant public culture of space enthusiasm in the Soviet Union that was rooted back in the pre-Sputnik years of the 1950s. This discourse helped to reinforce the notion that the Soviet way to space was the universal, the only way to space. To give one example: In a recent article, a prominent Russian philosopher argued that Konstantin Tsiolkovskii's ideas on space travel provide the foundation for a "Russian national idea," an alternative to a "Europeanized" Russia that is part of the global system of capitalism and dependency. Tsiolkovskii, the author argued, had shown that the true destiny of Russians, like no other nationals on this Earth, was in space, a place that transcends borders and nations.²²

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Both the United States and the Soviet Union, then, the two earliest spacefaring nations, produced narratives on space exploration that were deeply grounded in domestic cultural discourses that simultaneously couched their achievements as if they had universal import. This dichotomy runs through most of the historiography on both the Soviet and American space programs. The grand narratives of each nation—frequently utopian in nature—rely on the assumption that each is the normative history of space exploration. This is not a trivial issue, since how we remember and write history bequeaths to future generations how *they* will remember and memorialize human efforts to explore space. But who will write a history that reflects a global consensus? Is it even possible to propose such a thing? In *Cosmodolphins: Feminist Cultural Studies of Technology, Animals and the Sacred*, Mette Bryld and Nina Lykke argue that:

The early space race was, amongst other things, a discursive battle over entitlement to represent Universal Man in the biggest story told in modern times. Who was going to be the script writer and the protagonist of the master narrative of mankind's cosmic exodus? This was and is a question that matters a great deal when the official story of spaceflight is retold.²³

Korolev: *Fakty i mify* (Moscow, 1994). For an English-language treatment, see James J. Harford, *Korolev: How One Man Masterminded the Soviet Drive to Beat America to the Moon* (New York, 1997).

22. L. V. Leskov, "K. E. Tsiolkovskii i rossiiskaia natsional'naia ideia," *Zemlia i vselennaia* 4 (1998).

23. Mette Marle Bryld and Nina Lykke, *Cosmodolphins: Feminist Cultural Studies of Technology, Animals and the Sacred* (London, 2000), 8.

Who writes the history of space exploration and how do you account for multiple and contradictory national narratives? Mikael Hård and Andrew Jamison describe the process of “cultural appropriation” of science and technology as “the discursive, institutional, and daily practices through which technology and science are given human meaning.”²⁴ How do you account for cultural appropriations of the same technological events—say, cold-war space history—that are wildly different? And finally, how do these particular cultural appropriations which are essentially nation-specific narratives make claims as global narratives, or the “global normative”?

From the Postcolonial to the Global

These questions are relevant and perhaps even urgent, not only for those of us who cross the divide between Russian and American space history and the communities they involve, but also in light of the “newer” space powers such as China, Japan, and India, who are now defining and writing their own narratives about their roles in the project of space exploration. Like their Western predecessors, Indian and Chinese commentators locate their own narratives about space travel in indigenous scientific and technological achievements that have both national and global import. Many Chinese writers are eager to emphasize the importance of China as the birthplace of rocketry in the premodern era, while Indian writers similarly stress the importance of heliocentric ideas to Vedic Sanskrit texts that long predate Copernicus.²⁵ In their narratives, Sputnik, Gagarin, *Apollo*—these all are peripheral.

The case of the Indian space program specifically—but postcolonial studies in general—points to fruitful avenues of research for historians of technology grappling with the conundrums posted by multiple and conflicting narratives that make claims for the universal. A growing body of scholarship on the history, sociology, and anthropology of postcolonial science has rendered problematic such essentialist identifiers as “Western” and “colonial” when describing the development of science and technology

24. Mikael Hård and Andrew Jamison, *Hubris and Hybrids: A Cultural History of Technology and Science* (New York, 2005), xiv.

25. In an article reporting on the launch of the first Chinese astronaut into space, the official Chinese press agency, Xinhua, announced that “[b]ack in the 14th century, a Chinese named Wan Hu attempted to send himself into sky [*sic*] by lighting 47 gunpowder-packed bamboo tubes tied to his chair. Although he got killed in his bold attempt, Wan has been widely regarded as the world’s first person using rockets as a flight vehicle.” See “Astronaut Yang Liwei in space,” *China View*, 15 October 2003, available online at http://news.xinhuanet.com/english/2003-10/15/content_1124317.htm (accessed 30 November 2009). See also M. R. Ananthasayanam, “A Relook [*sic*] into the Historical Progress and Philosophy of Indian Space Exploration,” paper presented at the International Astronautical Congress, Hyderabad, India, 24–28 September 2007, available online at <http://www.iafastro.org/iac/archive/browse/IAC-07/E4./3./6719/> (accessed 30 November 2009).

outside of Europe and the United States. This body of postcolonial theory questions the authority of Western knowledge systems as being objective and universally valid. Warwick Anderson recently underscored that “post-colonial studies have enabled [a] sort of decentered, diasporic, or ‘global’ rewriting of earlier nation-centered imperial grand narratives.” In other words, the field has rephrased “modernity within the framework of ‘globalisation.’”²⁶ As such, postcolonial theory prompts us to reconsider received wisdom about existing power relations and to avoid distinct markers such as “colonial” and “indigenous” and instead focus on cultural and historical spaces where various types of interaction and exchange can occur. One way to begin such a project would be—in the words of postcolonial theorist Dipesh Chakrabarty—to “provincialize” Europe, i.e., to question the received structures that make it impossible for us to conceive of modernity (and by extension, one might argue, modernization) without reference to Europe. Chakrabarty argued that there is an “asymmetric ignorance” whereby historians within postcolonial locales must inevitably refer to Europe as a point of orientation without any expectation of the reverse.²⁷

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Postcolonial thought makes possible a provocative rethinking of both the Indian space program and the history of space exploration in general. Western evaluations of the Indian space program have reflexively been grounded in assumptions about the marriage of poverty and high technology, i.e., a rhetorical question mark about why a nation so poor should have a space program at all. Because the project of space exploration has been a normatively Western idea, non-Western space programs such as the Indian one are understood in relation to aspirations for a Western modernity. But the Indian space program, as manifested in its technology, its goals, and its architects, represents a kind of modernity that is neither completely Western nor fully postcolonial—it is a vision of modernity that is decentered, constantly mutating, often contradictory, and globalized.²⁸ We see these processes in India in the 1960s as an influential domestic constituency invested in space exploration “sold” their goals of self-reliance and social benefit to consecutive governments. This was not easy, given the significant amounts of international collaboration as well as domestic opposition from local advocacy groups who believed that India had more pressing concerns.²⁹ By rhetorically linking the “modern” space program with the

26. Warwick Anderson, “Introduction: Postcolonial Technoscience,” *Social Studies of Science* 32 (2002): 643–58.

27. Dipesh Chakrabarty, *Provincializing Europe: Postcolonial Thought and Historical Difference* (Princeton, N.J., 2000).

28. For more on postcolonial modernities, see Arjun Appadurai, *Modernity at Large: Cultural Dimensions of Globalization* (Minneapolis, 1996). For the Indian context, see Gyan Prakash, *Another Reason: Science and the Imagination of Modern India* (Princeton, N.J., 1999), and Itty Abraham, *The Making of the Indian Atomic Bomb: Science, Secrecy, and the Postcolonial State* (London, 1998).

29. Asif Siddiqi, “‘There is no ambiguity of purpose’: Creating the Indian Rocket and Space Programs,” paper presented at annual meeting of the Society for the History of

alleviation of poverty, the architects of the space program not only overcame local opposition but created a new vision of space exploration that could exist in the postcolonial context. If previously the question had been “*Why should India have a space program when it is so poor?*” the answer was now “*India should have a space program precisely because it is poor.*”

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Here, on the one hand, the space program with its advanced technologies allows India to be modern, a Western metric of modernity that harks back to the European “machines as the measure of men.” On the other hand, the Indian space program fundamentally depends on the existence of those markers that Vikram Sarabhai, the founder of the effort, identified as less than modern—poverty, illiteracy, and economic underdevelopment. This built-in tension is complicated by other factors, including migration (both of people and knowledge) across borders, evolving aspirations, contingent metrics of “how to be modern,” and military and strategic questions. In a sense, what is modern about the Indian space program betrays complexities, contradictions, and considerations that are not easily parsed into conventional Western ideals of modernity.

This new postcolonial vision of space exploration is as much part of the fabric of space history as the more well-known American and Soviet models grounded in the cold war.³⁰ These multiple perspectives on space travel suggest that our view of the long history of spaceflight may benefit from a standpoint that no longer privileges borders—demarcations that create rigid analytical categories such as ownership, indigeneity, and proliferation. The Indian space program was at the intersection of multiple flows of knowledge from a variety of sources, including, of course, local expertise. Likewise, the history of spaceflight has been part of a consistent flow of knowledge and technology across (geographical) space and time—among Germans, Soviets, Americans, British, French, Chinese, Japanese, Indians, Israelis, Brazilians, and so on. By rethinking the relationship between modernity and the postcolonial state, postcolonial thought challenges us to rethink the connection between modernity and spaceflight, and, ultimately, to replace the “national” with the “global” when thinking of space exploration, an exercise that has become doubly important as dozens of developing countries in Asia, Africa, and the Middle East are now spending money on space exploration.

Writing on the history of nuclear power, Itty Abraham has noted that “practically no state travelled alone.”³¹ Further, Abraham adds:

Technology, 10–14 October 2008, Lisbon. For general histories of the Indian space program, see A. P. J. Abdul Kalam, *Wings of Fire: An Autobiography* (Hyderabad, 1999), and Gopal Raj, *Reach for the Stars: The Evolution of India's Rocket Programme* (New Delhi, 2000).

30. For a recent perspective on the intersection between European conceptions of space exploration and the colonial context, see Peter Redfield, *Space in the Tropics: From Convicts to Rockets in French Guiana* (Berkeley, Calif., 2000).

31. Abraham, *The Making of the Indian Atomic Bomb*, 9.

One of the most enduring tropes of nuclear histories is the idea that atomic energy programs are always national programs. The close relation between nuclear power and national power has led to the assumption that, for reasons of security especially, nuclear programs must be uniquely identified with particular countries. Official histories and scientists encourage this belief, for obvious parochial reasons, but it is rarely true. No atomic program anywhere in the world has ever been purely indigenous.³²

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Abraham's argument in favor of moving toward a global history of nuclear energy has much to offer to the case of rocketry and space exploration. The available evidence points strongly to similar processes of knowledge flows in the evolution of ballistic missiles and space technology.³³ Every nation engaged in this technology has been a proliferator and has benefited from proliferation; this process of proliferation began in the 1920s when an informal and international network of spaceflight enthusiasts in Europe—particularly in Germany, Austria, France, Poland, Great Britain, and the Soviet Union—and in the United States generated the first substantive exchange on topics related to rocketry and space exploration.³⁴ The development of sophisticated German ballistic missiles in the 1930s benefited from this discourse, as did parallel but less ambitious Soviet efforts to build rockets. In the aftermath of World War II, the remainder of the German missile program—the most developed effort at that point—then fed into several different postwar missile programs, including, of course, those of the United States, the Soviet Union, France, and Great Britain. The Soviet Union in turn passed both German and “indigenous” technology to the Chinese while the Americans did the same for the Japanese. By the mid-1970s, the “space club” included all of these countries, joined in the 1980s by India and Israel, both of which depended on flows from the United States, Western Europe, and the Soviet Union. Europe itself—in the form of international agreements—had many cooperative efforts that blurred distinctions of ownership, even as it gained the “indigenous” capacity for space activity in 1979.³⁵

I am not suggesting that we should ignore nations, national identity, or vital indigenous innovation. But I believe that nation-centered approaches, useful and instructive as they were, occlude from view important phenom-

32. Itty Abraham, “The Ambivalence of Nuclear Histories,” in “Global Power Knowledge,” ed. John Krige and Kai-Henrik Barth, special issue, *Osiris*, 2nd ser., 21, no. 1 (2006): 49–65. See also Abraham’s “Notes toward a Global Nuclear History,” *Economic and Political Weekly* 39, nos. 46–47 (20 November 2004): 4997–5005.

33. For a recent analysis of the relationship between national culture and space technology transfer, see Mike Ryan, “The Role of National Culture in the Space-Based Technology Transfer Process,” *Comparative Technology Transfer and Society* 2 (2004): 31–66.

34. Siddiqi, *The Red Rockets’ Glare* (n. 19 above).

35. J. Krige and A. Russo, *A History of the European Space Agency*, 2 vols. (Noordwijk, Netherlands, 2000).

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ena in the history of space exploration. My hope is that by deemphasizing ownership and national borders, the invisible connections and transitions of technology transfer and knowledge production will become clear in an abundantly new way. Such an approach would inform a project encompassing the entire history of modern rocketry and space exploration, from the late nineteenth century to the present, focusing on Europe, America, Russia, and Asia. Most important, a global history of rocketry and space exploration would avoid the pitfalls of the “discursive battles” between nation-centered histories and open up the possibility to revisit older debates in the historiography of space exploration in entirely new ways.

Taking a global history approach, one that favors decentering the conventional narrative, would allow historians to redirect their attentions in three ways: we can shift our gaze from nations to *communities*, from “identification” to *identities*, and from moments to *processes*. These three strategies, in one way or another, are inspired by the problems posed by historicizing the ambitions and achievements of emerging space powers, which operate in a postcolonial context where categories such as indigenous, modern, and national are problematic. I offer some brief examples of each below.

In the space imagination, nations typically represent airtight constituencies despite evidence to the contrary that *communities* cutting across borders and cultures—national, institutional, and disciplinary—represent important actors and actions. The most obvious example here, of course, is the German engineers who formed the core of the Army Ballistic Missile Agency in the United States in the 1950s and who later directed the development of the Saturn V rocket that put Americans on the surface of the Moon. Wernher von Braun’s team represented a unique mix of Germans and Americans who worked together with several different communities, from Boeing, North American Aviation (including its separate Space and Rocketdyne divisions), Douglas Aircraft Company, and International Business Machines. These communities represented scientists and engineers, the government and private industry, and customers and contractors. In the rush to draw up airtight national narratives, we inevitably tend to gloss over the ambiguities and flows among each of these communities.

By highlighting communities, we can also avoid the reductive problems of essentialization (another way of talking about “national styles” of science and technology) that aspire to explain everything but fail to elucidate much at all.³⁶ Instead, one might think in terms of fluid *identities* of scientists and engineers engaged in particular projects, identities which are not only tied to national identification but also regional, professional, cultural, religious, and educational markers, to name only a few categories. Using the perspective of mutable identity—different in different circumstances—we might be

36. For “national styles,” see Jonathan Harwood, *Styles of Scientific Thought: The German Genetics Community 1900–1933* (Chicago, 1993).

able to understand more clearly the ways in which space exploration has not only been a project of national consideration but also the result of communities (or individuals) who identify with a whole host of other markers that are not connected to national claims. In other words, it is a way to problematize the notion that space exploration represents national aspirations.

Finally, space historians have tended to focus on moments in history that define the story. For example, we use the notion of “achieving a capability” (the space equivalent of “going nuclear”) as shorthand for encompassing a variety of complex *processes*. Whether it be the first indigenous launch of a satellite or the first test of a liquid hydrogen rocket engine, these moments become historical signposts, turning points, bereft of the messiness inherent in the process of innovation. As a result, space history slips into the comfort mode of “what and when” instead of the more illuminating path of “how and why.” The focus on process would highlight the ambiguities instead of the binary poles (success, failure) inherent in isolated moments, thus encompassing both the material event and how the event becomes constructed as a historical moment.

All of these approaches also reinforce and foster the kind of social history that has become fundamental to most histories of technology but is largely absent in the literature on spaceflight, a lacuna explicable by the fetish for nation-centered cold-war geopolitics as the central organizing framework for most histories of space exploration. Barring a few notable examples, space historians have avoided in-depth inquiries into the lived experiences of large demographics such as engineers, servicemen and -women, military and intelligence personnel, launch crews, staff workers, and spouses and families of engineers. Likewise, little work has been done on public enthusiasm for the space program, mass campaigns in support of space exploration, and popular participation in programs usually identified with state-centered institutions.³⁷

Finally, using analytical categories such as communities, identities, and processes would direct our attention to the problem of “consumption” in the history of space technology. Despite a recent surge of scholarship on the role of consumers in shaping technology and technological systems, we have traditionally focused on production rather than consumption in chronicling the history of spaceflight.³⁸ Who has “consumed” the space

37. For exceptions, see Patrick McCray, *Keep Watching the Skies! The Story of Operation Moonwatch and the Dawn of the Space Age* (Princeton, N.J., 2008), and Michael A. G. Michaud, *Reaching for the High Frontier: The American Pro-Space Movement, 1972–84* (New York, 1986). See also Glen Asner, “Space History from the Bottom Up: Using Social History to Interpret the Societal Impact of Spaceflight,” in *Societal Impact of Spaceflight*, ed. Steven J. Dick and Roger D. Launius (Washington, D.C., 2007), 387–406.

38. For works on consumption in the history of technology, see Rosalind H. Williams, *Dream Worlds: Mass Consumption in Late Nineteenth-Century France* (Berkeley, Calif., 1982); David Nye, *Consuming Power: A Social History of American Energies* (Cambridge, Mass., 1998); and Nelly Oudshoorn and Trevor Pinch, eds., *How Users Matter:*

program? How do we ascribe identities to them as “consumers”? How and where do producers and consumers of the space program interact? Exploring these questions would open up new areas of investigation and enrich our understanding of the cold-war space race.

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The Space Race and Technological Determinism

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I will end this essay by revisiting the period of space exploration that most resonates both with historians of technology and with laypersons in general, the era commonly known as “the space race” spanning the late 1950s to the late 1960s. My hope is to extend some thoughts on how a decentered approach to space history might open up new ways of thinking about the early history of space exploration. The actions of the two superpowers during the space race, and the way in which historians and laypeople have accessed that memory, has cast a long shadow over humanity’s attempts to explore space *after* the era was over. In other words, Soviet and American achievements in space over a period of roughly a decade, spanning Sputnik, Gagarin, and the Apollo lunar missions, have assumed a kind of normative historical function in the broader fifty-year history of space exploration. We have been unable to move beyond the use of methodological tools and analytical tropes dependent on our fascination with the early years of spaceflight. Historians have long argued that the space race was an anomaly, with a set of peculiar and given conditions which have never been repeated, but we have been less eager to interrogate the legacy of this anomaly for scholarship on spaceflight.³⁹

No interpretive strategy has been more ubiquitous and dominant in the narrative of space history than technological determinism. Although it has lost much if not all its resonance in many other subfields of the history of technology, it still retains a strong appeal as a powerful and plausible explanatory model for the space race.⁴⁰ Determinism has played out in two

The Co-Construction of Users and Technology (Cambridge, Mass., 2005). See also the large body of work on gender and technology centered around consumption, for example, Roger Horowitz and Arwen Mohun, eds., *His and Hers: Gender, Consumption, and Technology* (Charlottesville, Va., 1998).

39. For comprehensive and recent surveys of space historiography, see Roger D. Launius, “The Historical Dimension of Space Exploration: Reflections and Possibilities,” *Space Policy* 16 (2000): 23–38, and Asif A. Siddiqi, “American Space History: Legacies, Questions, and Opportunities for Future Research,” in *Critical Issues in the History of Spaceflight* (n. 15 above), 433–80. The notion of the Moon race (and particularly the Apollo Program) as an anomaly was first put forward in Roger D. Launius and Howard E. McCurdy, eds., *Spaceflight and the Myth of Presidential Leadership* (Urbana, Ill., 1997).

40. For the standard arguments against technological determinism, see Wiebe J. Bijker et al., eds., *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge, Mass., 1987), and Merritt Roe Smith and Leo Marx, eds., *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge, Mass., 1994).

ways in the literature: first, as a tool to explain the unique trajectory of the space programs of the Soviet Union and the United States, particularly their reactive relationship to each other during the cold war; and second, as a framework to suggest that space achievements such as Sputnik and *Apollo* profoundly “affected” society in a unidirectional manner. For space historians, “the dilemma of technological determinism” has not been about its explanatory power but rather about the degree to which some events were more deterministic than others. Newly available evidence in the post-cold-war era from opened archives on both sides would seem to reinforce older claims about a “race” that depended on an appreciation of parallel actions by each side, which were often erroneous in nature—a kind of “determinism of perception.” There are any number of examples on both sides of the equation, especially events from 1957 to 1969, that suggest at least a weak form of this connection between the two space programs. One side developed a certain capability in spaceflight, often in reaction to the other which had developed a similar ability—a dynamic that was especially true for military and human spaceflight, the two most dominant directions of space activity of that period.⁴¹

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The notion that external events affected the actions of Soviet and American policymakers and led them to adopt specific decisions explains processes at a very broad level but fails as a tool to fully understand innovation at mid-levels—such as why space program managers adopted particular technologies and why scientists and engineers focused on specific paths of development. Indeed, few managerial, technological, and institutional changes on both sides follow parallel and proportional paths of development as one would expect if the space race were truly deterministic. For example, neither the “late” Soviet decision to adopt liquid hydrogen as propellant nor its selection of the lunar orbit rendezvous option for a Moon landing follow the expected pattern of response to American imperatives (or even perceptions of American imperatives). These paths were taken principally because of a mix of other factors: local industrial capacity, competition among Soviet designers, and perceived tradeoffs between payload weight and mission requirements. Here, American efforts to develop a liquid hydrogen engine (in the form of the Centaur upper stage) becomes one of many forces that affected Soviet decision making.⁴² Strictly deterministic approaches also fail to explain events in the later era of the space age—for example, the development of a vibrant Indian space pro-

41. Well-known syntheses that take such an approach include William E. Burrows, *This New Ocean: The Story of the First Space Age* (New York, 1998), and T. A. Heppenheimer, *Countdown: A History of Space Flight* (New York, 1997). I would also include my first book in this category; see *Challenge to Apollo: The Soviet Union and the Space Race, 1945–1974* (Washington, D.C., 2000).

42. Asif A. Siddiqi, “The Other Side of the Space Race: Perception and Decision-Making in the Soviet Space Program,” paper presented at the annual meeting of the Organization of American Historians, 30 March–2 April 2000, Saint Louis, Missouri.

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gram and the lack of any such program in Pakistan. Both nations had substantive intellectual and industrial foundations to embark on space research and engaged in comparable investments in sounding rocket developments in the 1960s, but only India opted to develop a domestic satellite launch capability. Pakistan never responded to the Indian space challenge.

Frameworks where the relationship between space and broader society is couched in terms that are unidirectional and/or deterministic have endured for two principal reasons: the heightened importance of nationalist narratives in the history of space exploration, and the general reluctance among historians to see space technologies as part of broader social and cultural concerns. A decentered perspective—focusing on flows rather than borders—would lead historians to avoid both these pitfalls. For example, the Soviet decision to develop liquid hydrogen can be explained more fully by integrating a number of different concerns: cold-war action-reaction determinisms, the social and cultural construction of technologies, and flows of knowledge across borders and time. The latter can be traced through genealogies of knowledge going back decades, discerned in Soviet scientists' perception of Western media accounts of NASA's liquid hydrogen development, and seen in exchanges between indigenous but different Soviet communities that had a vested interest in either supporting or opposing this new technology. A problem previously seen as a relatively simple action-reaction dynamic is now seen as a much more complex and contested process. In other words, interpretive approaches derived from the idea of a global history of spaceflight may have much utility also for those periods which we tend to assume had no global(ized) component, the era of the cold-war space race.

Conclusions

My goal in this essay has been to explore the relationship between nationalism and spaceflight, problematize it, and, using insights from that process, suggest some possible new avenues in the practice of space history. Although nationalist narratives (and nationalism) have been essential to the project of space exploration and its retelling, barring a few exceptions, space historians have not critically explored the relationship between spaceflight and national identity.⁴³ Deconstructing this relationship has become more urgent as a flotilla of non-Western nations are becoming more visible in the endeavor of space exploration, rendering the old cold-war

43. For useful and excellent exceptions, see McCurdy (n. 17 above), and Launius, "Perfect Worlds, Perfect Societies" (n. 17 above). See also Asif A. Siddiqi, "National Aspirations on a Global Stage: Fifty Years of Spaceflight," in *Remembering the Space Age*, ed. Steven Dick (Washington, D.C., 2008), 17–35, and James R. Hansen's essay, "The Great Leap Upward: China's Human Spaceflight Program and Chinese National Identity," in this same volume (pp. 107–18).

dynamic—both in reality and in memorialization—less effective as an explanatory tool for understanding the process of space exploration. Deterministic explanations from the cold war often rely on simplistic binary and oppositional divisions; although not trivial, these display their limitations as tools to fully explain the complexities of space exploration both during and after the cold war. Without disposing of technological determinism, I would urge historians to incorporate a broader matrix of approaches, including, particularly, the highlighting of global flows of actors and knowledge across borders, communities, and identities. Ultimately, this approach might lend itself to constructing for the first time a global and transnational history of rocketry and space travel. Since a global history would theoretically be decentered and a nation's space program rendered as a more nebulous transnational process, one might expect a multitude of smaller, local, and ambiguous processes and meanings to become visible. With a new approach grounded in a global history of spaceflight, we might learn much more about how individuals, communities, and nations perceive space travel, how they imbue space exploration with meaning, and especially how those meanings are contested and repeatedly reinvented as more and more nations articulate the urge to explore space.

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