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On the back cover: Fifty years after the Space Age began, the International Space Station orbits the Earth. It is the result of a cooperative effort of 16 nations led by the United States.



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REMEMBERING the SPACE AGE

Steven J. Dick
Editor



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Proceedings of the 50th Anniversary Conference



Steven J. Dick

Editor

There is no doubt that the last 50 years have witnessed numerous accomplishments in what has often been termed “the new ocean” of space, harkening back to a long tradition of exploration. Earth is now circled by thousands of satellites, looking both upward into space at distant galaxies and downward toward Earth for reconnaissance, weather, communications, navigation, and remote sensing. Robotic space probes have explored most of the solar system, returning astonishing images of alien worlds. Space telescopes have probed the depths of the universe at many wavelengths. In the dramatic arena of human spaceflight, 12 men have walked on the surface of the Moon, the Space Shuttle has had 119 flights, and the International Space Station—a cooperative effort of 16 nations—is almost “core complete.” In addition to Russia, which put the first human into space in April 1961, China has now joined the human spaceflight club with two Shenzhou flights, and Europe is readying for its entry into the field as well.

After 50 years of robotic and human spaceflight, and as serious plans are being implemented to return humans to the Moon and continue on to Mars, it is a good time to step back and ask questions that those in the heat of battle have had but little time to ask. What has the Space Age meant? What if the Space Age had never occurred? Has it been, and is it still, important for a creative society to explore space? How do we, and how should we, remember the Space Age?

On the cover: The Space Age begins. Top left: A technician puts the finishing touches on Sputnik I in the fall of 1957. Top middle and right: The Soviet Union launched Sputnik I—the first artificial Earth satellite—on October 4, 1957. Bottom: Explorer 1—America’s first Earth satellite—was launched January 31, 1958. Pictured left to right are William H. Pickering, director of the Jet Propulsion Laboratory that built and operated the satellite; James A. van Allen of the State University of Iowa who designed and built the instrument that discovered the Van Allen Radiation Belts; and Wernher von Braun, leader of the U.S. Army’s Redstone Arsenal team which built the first stage Redstone rocket that launched Explorer 1. The photo was taken at a press conference at the National Academy of Sciences building in the early hours of February 1, 1958.

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the **SPACE AGE**

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INTRODUCTION

Fifty years ago, with the launch of Sputnik I on October 4, 1957 and the flurry of activity that followed, events were building toward what some historians now recognize as a watershed in history—the beginning of the Space Age. Like all “Ages,” however, the Space Age is not a simple, straightforward, or even secure concept. It means different things to different people, and, space buffs notwithstanding, some would even argue that it has not been a defining characteristic of culture over the last 50 years and therefore does not deserve such a grandiose moniker. Others would find that to be an astonishing viewpoint, and argue that the Space Age was a saltation in history comparable to amphibians transitioning from ocean to land.¹

There is no doubt that the last 50 years have witnessed numerous accomplishments in what has often been termed “the new ocean” of space, harking back to a long tradition of exploration. Earth is now circled by thousands of satellites, looking both upward into space at distant galaxies and downward toward Earth for reconnaissance, weather, communications, navigation, and remote sensing. Robotic space probes have explored most of the solar system, returning astonishing images of alien worlds. Space telescopes have probed the depths of the universe at many wavelengths. In the dramatic arena of human spaceflight, 12 men have walked on the surface of the Moon, the Space Shuttle has had 119 flights, and the International Space Station (ISS), a cooperative effort of 16 nations, is almost “core complete.” In addition to Russia, which put the first human into space in April 1961, China has now joined the human spaceflight club with two Shenzhou flights, and Europe is contemplating its entry into the field.

1. Walter McDougall (see chapter 18 of this volume) opens his Pulitzer-Prize winning book . . . *the Heavens and the Earth* with such a scenario. See also Walter A. McDougall, “Technocracy and Statecraft in the Space Age: Toward the History of A Saltation,” *American Historical Review* 87(1982), 1025. By the 40th anniversary of Sputnik in 1997 McDougall had revised his thesis to say “I no longer think that *saltation* was the right label for the chain of events kicked off by Sputnik.” But he thought in the long term, when a new launch technology had replaced the “clumsy chemical rocket,” *saltation* might still prove an apt term. Walter A. McDougall, “Was Sputnik Really a Saltation?” in *Reconsidering Sputnik: Forty Years Since the Soviet Satellite*, ed. Roger D. Launius, John M. Logsdon, and Robert W. Smith (Harwood Academic Publishers, 2000), pp. xv-xx. In chapter 4 of this volume, Robert MacGregor also challenges the view of Sputnik as a technological saltation, arguing that technocratic ideas of the relation of science to the state were already well established by this time. In particular he points to the parallels between the Atomic Energy Commission and NASA, and further argues that “NASA’s rise in the 1960s as an engine of American international prestige was rooted in atomic diplomacy, and that certain debates in Congress about the new Agency were largely approached from within a framework of atomic energy, thereby limiting the range of discourse and influencing the shape of the new Agency.”

After 50 years of robotic and human spaceflight, and as serious plans are being implemented to return humans to the Moon and continue on to Mars, it is a good time to step back and ask questions that those in the heat of battle have had but little time to ask. What has the Space Age meant? What if the Space Age had never occurred? Has it been, and is it still, important for a creative society to explore space? How do we, and how should we, remember the Space Age?

It is with such questions in mind that the NASA History Division and the National Air and Space Museum Space History Division convened a conference on October 22–23, 2007, to contemplate some of the large questions associated with space exploration over the last half century. The conference was designed to discuss not so much the details of what has happened in space over the last 50 years, nor even so much the impact of what has happened, but rather its meaning in the broadest sense of the term.² In doing so, the organizers made a conscious attempt to draw in scholars outside the usual circle of space history. This was not an easy task; we found that, with few exceptions, historians had not contemplated the meaning of the Space Age in the context of world history, even though the Space Age has given rise to an embryonic movement known as “big history” encompassing the last 13.7 billion years since the Big Bang.³ We therefore turned to “big picture” historians, among whom is John R. McNeill, who had recently coauthored *The Human Web: A Bird’s-eye View of Human History* with his father, William H. McNeill, another big picture historian.⁴ With the idea that space is the ultimate “bird’s-eye view” and that it has enlarged and enhanced the human web, we invited the younger McNeill to deliver our opening keynote lecture. Readers will find his provocative thoughts in chapter 1.

The conference encompassed two main themes, reflected in the first two sections of this book. The first, “national and global dimensions of the Space Age,” was meant to examine the place of space exploration in human history. Here the guiding questions were as follows: Has the Space Age fostered a new global identity, or has it reinforced distinct national identities? How does space history connect with national histories and with the histories of transnational or global phenomena such as the Cold War, the rise of global markets, or global satellite communications? One might argue there is a fundamental

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2. On the question of societal impact, see Steven J. Dick and Roger D. Launius, eds., *Societal Impact of Spaceflight* (NASA SP-2007-4801: Washington, 2007).
 3. On “big history,” see David Christian’s “The Case for ‘Big History’” in *The Journal of World History*, 2, No. 2 (Fall 1991): 223–238 (<http://www.fss.uu.nl/wetfil/96-97/big.htm>); David Christian, *Maps of Time: An Introduction to ‘Big History’*, Berkeley, CA: University of California Press, 2004; as well as Fred Spier, *The Structure of Big History: From the Big Bang Until Today*, Amsterdam: Amsterdam University Press, 1996, and Marnie Hughes-Warrington, “Big History,” *Historically Speaking*, November, 2002, pp. 16–17, 20 (available at <http://www.bu.edu/historic/hs/november02.html#hughes-warrington>).
 4. J. R. McNeill and William H. McNeill, *The Human Web: A Bird’s-eye View of Human History* (W.W. Norton, New York, 2003).

tension between national goals of preeminence in space, and the global identity that the Space Age fosters in a variety of ways—through communications satellites, through the global awareness brought by photos of the whole Earth and Earthrise from the Moon, and through international cooperation in huge human spaceflight endeavors like the ISS. Scholars from several disciplines and backgrounds examined these questions from a variety of perspectives, and the debate spilled over into the entire conference. Speaking in his article of applications satellites such as the Global Positioning System (GPS) and Iridium, Martin Collins concludes that “Spaceflight—especially those near-Earth applications cited here—has been a major element in creating the incarnation of the global we have experienced over the last 40 years. It has provided images and practices that have made the category of the global natural and insistent, even when different actors give it different meanings. It has been a primary site in which prior categories of the modern—the nation state, the military, civil society, capitalism—have been refashioned and given new meanings.” Others in this volume differ with that interpretation.

The second theme, “remembrance and cultural representation of the Space Age,” posed questions about how the historical record of the Space Age has been collected, preserved, displayed, and interpreted around the world, especially in the United States, Russia, the European Union, Canada, and China. How do the “official” versions of events square with the document trail and with eyewitness accounts? How has the Space Age been represented in the arts, the media, the movies, in propaganda discourse, and so on? What does space exploration tell us about culture and the space endeavor’s relation to culture? Such questions are not confined to the realm of space. They permeate all of history, and especially global events affecting the masses. In the context of the 20th century out of which the Cold War and Sputnik emerged, for example, one thinks in the fictional realm of Herman Wouk’s novel *War and Remembrance*, or Emily Rosenberg’s non-fiction work *A Date Which Will Live: Pearl Harbor in American Memory*.

In Rosenberg’s piece and others in part II of this volume, one will find reflections on remembrance and history. “From the 1950s to the 1970s,” she writes, “space held many meanings: it was a symbol-laden arena in which people and nations staged Cold War competitions, a ‘star’ in the media firmament, an ultimate challenge for scientists and engineers, and an inspiration for artists and designers.” In this vein, both Roger Launius and Slava Gerovitch contemplate the “master narratives” of the Soviet Union, Russia, and the United States with regard to the Space Age, finding them inevitably grounded in culture. As Gerovitch concludes, “There can be no ‘true’ memory, as any act of recollection reconstitutes our memories. As different cultures remember the Space Age, it keeps changing, revealing new symbolic meanings and providing an inexhaustible source of study for historians. By shifting the focus from debunking myths to examining their origins and their constructive role

in culture, we can understand memory as a dynamic cultural force, not a static snapshot of the past.” Reflecting on the relation between reality, memory, and meaning, Launius offers a provocative premise: “Perhaps the reality of what happened does not matter all that much; the only thing that is truly important is the decision about its meaning. That may well be an intensely personal decision predicated on many idiosyncrasies and perspectives.”

Remembrance is not simply a pleasant pastime, something to be contemplated at life’s end. Nor is history a luxury, an irrelevance, or a straightforward activity as some people might think. Not without reason does there exist a National Archives in the United States with the words “What is Past is Prologue” scrolled along the top of its impressive façade, this building duplicated in function, if not in detail, in most countries of the world. Not without reason does the Smithsonian Institution strive to display thoughtful commentary in its exhibits, despite criticism from its wide variety of audiences, each with their own interpretations of history. And not without reason does every high school, college, and university teach history. As Wouk said in the context of his novel, “the beginning of the end of War lies in Remembrance.” Whether we learn the lessons of history is another matter.

Part III of this volume consists of reflections and commentary, where some of the major themes are once again engaged. Walter McDougall views the 50th anniversary of the Space Age as a melancholic affair, filled with disappointment and unfulfilled hopes, a secondary activity compared to the dominant trends of contemporary history, and in any case too embryonic to judge its significance. John Logsdon disagrees in part, arguing that both the modern nation-state and the global economy depend on space-based systems. The ability to operate in outer space, he contends, is an integral part of modern history. He agrees that the progress of the Space Age has been frustrating in many ways to those who lived through the Apollo era, a level of activity that was not sustainable. Sylvia Kraemer argues there are many competing events that may define the last 50 years more than space exploration, including the Cold War and digital and information technologies. She also argues that the contribution of space activity to globalization has been far greater than its contribution to nationalism. Linda Billings reflects on space exploration in the context of culture, concluding that it means many things to many people, quite aside from dominant official narratives. Nor is this an academic exercise, for she suggests that if space programs are to survive and thrive in the 21st century they need to involve citizens and be aware of the visions they have for a human future in space. On the global level, this resonates with John Krige’s statement that “when ‘Remembering the Space Age,’ we should not shy away from admitting the complexity and diversity of the space effort, nor pretend that the view of the world from Washington is the only view worth recording.”

Some in the audience at this 50th anniversary conference thought it should have been more celebratory and described the meeting itself as depressing. Others

felt it reflected both the frustrations and the realities of the Space Age. In the end, there seemed to be consensus that human spaceflight has been a disappointment in the aftermath of Apollo, and in that sense the Space Age, if indeed it ever existed, has been a disappointment as well. Such disappointment is no artificial construct of historians; the legendary Wernher von Braun, who thought humans would land on Mars by 1984, would undoubtedly have agreed. Nor is disappointment necessarily a bad attitude; it means vision has outstripped practical realities and that vision may yet drive individuals and nation-states toward new realities.

In common parlance, the title “Remembering the Space Age” carries with it a connotation that we are looking back on something that may have ended. Or maybe it never began; certainly launching Sputnik in and of itself did not constitute a Space Age, and the resulting reaction culminating in the manned lunar landings had ended within 15 years. Communications, navigation, weather, reconnaissance, and remote sensing satellites have been more sustained. But is such space activity, bounded by commercial and practical applications, enough to constitute a Space Age? Or, as several speakers opined, is space science the real core of the Space Age? As John McNeill concluded in his opening paper, it may well be too early to tell whether space activities over the last half century constitute a genuine “Age.” We may need more time for better perspective. One thing is certain: if indeed the Space Age exists and if it is to continue, it must be a conscious decision requiring public and political will. Like exploration, each culture must set its priorities, and there are no guarantees for the Space Age.

The reader will find this volume filled with many more provocative thoughts and themes, large and small. However one defines or explains away the Space Age, whether in terms of space science, human spaceflight, applications satellites, or a combination of all of them, it is clear that what we usually refer to as the Space Age has been remembered differently by individual scholars depending on their perspective, by scientists and engineers depending on their specific roles, and by the public depending on their priorities. Moreover, it has been remembered differently depending on when one contemplates these questions. Quite aside from references to “semiotics,” “tropes,” and other postmodern terms common in the first years of the 21st century, the record presented in this volume is quite different from the perspective 25 years ago, or even 10 years ago.⁵ And it will be different 25 years from now. Such is the nature of memory; such is the nature of history.

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May 2008

5. See, for example, *Reconsidering Sputnik: Forty Years Since the Soviet Satellite*, ed. Roger D. Launius, John M. Logsdon, and Robert W. Smith (Harwood Academic Publishers, 2000).

PART I.

NATIONAL AND GLOBAL
DIMENSIONS OF THE SPACE AGE



CHAPTER 1

GIGANTIC FOLLIES? HUMAN EXPLORATION AND THE SPACE AGE IN LONG-TERM HISTORICAL PERSPECTIVE

J. R. McNeill

In 1667, the poet John Milton, in the final quatrain of *Paradise Lost* reflected upon the exodus of Adam and Eve from the garden of eden. As a believing Christian, Milton understood the biblical story as truth, and thus as the original human voyage of exploration:

*The world was all before them, where to choose
Their place of rest, and Providence their guide:
They hand in hand, with wand'ring steps and slow,
Through Eden took their solitary way.*

Since the first humans trod this Earth, perhaps 10,000 generations ago, slow wandering steps have formed a characteristic part of the experience of most peoples at one time or another, and for some, migration and exploration has stood at the center of their experience of life. In recent years, wandering and exploration rarely involved literal human steps, but rather technologically sophisticated and organizationally complex efforts to take giant leaps.

My aim in this chapter is to place the whole endeavor of the Space Age into a global historical context. My friend and fellow historian, Felipe Fernandez-Armesto, in his recent book entitled *Pathfinders: A Global History of Exploration*, refers to space exploration as a “gigantic folly.”¹ He could be right, but it is too soon to be sure. Folly or not, we can be sure space exploration is consonant with the deepest traditions of our species.

In the pages that follow, I will try to show just how deeply rooted exploration is in human society and will speculate on why that should be so. I will also reflect on some of the global-scale changes since the dawn of the Space Age in 1957, and where space exploration fits in this contemporary history.

1. Felipe Fernandez-Armesto, *Pathfinders: A Global History of Exploration* (New York, NY: Norton, 2006), p. 399.

THE REAL GREAT AGE OF EXPLORATION

When I was a schoolboy in Chicago—early in the Space Age—I defied the odds by studying “The Explorers” five different times between third and tenth grade. Maybe it was the buzz surrounding the Apollo program that inspired my teachers year in and year out to include a unit on Marco Polo, Vasco da Gama, Columbus, Magellan and all the rest, usually ending with Lewis & Clark. I memorized the dates of voyages the way my grandfather as a school boy had memorized scripture. While it didn’t do me any harm, later in life I felt misled upon learning that da Gama hired a local pilot in Mombasa (today’s Kenya) to take him and his ship to India. He didn’t really explore anything: there were already people everywhere he went who gave him directions, as well as provided him and his men with supplies. The same was true of Marco Polo, Columbus, Magellan, and the rest. They were visiting lands unfamiliar to them, and certainly took great risks on the sea, but “explored” only in a generous sense of the word.

The real explorers in human history are almost all unknown, anonymous figures, people who explored unpeopled realms. And the real great age of exploration was long ago and lasted for tens of thousands of years.

Our species, *homo sapiens sapiens*, evolved from various hominid predecessors some time around 250,000 to 150,000 years ago, or so the scanty evidence suggests. This happened in Africa, somewhere between the Ethiopian highlands and the South African high veld. We evolved in ways that made us well-suited to the grassland and parkland ecosystems of East Africa. Among other things, we became excellent long-distance walkers.

After the burst of climate change that occurred at the onset of a glacial period and a period of technological advance in toolmaking, a few bands of humans walked out of Africa, probably around 100,000 years ago. They and their descendants probably skirted the shorelines of the Indian Ocean—now underwater because of deglaciation and sea level rise in the past 15,000 years—where food could be scooped up fairly easily in the intertidal zones. They arrived in India perhaps 70,000 years ago, and in China about 67,000 years ago. People first made it to Australia, which required a maritime voyage even in those days of lower sea level, perhaps 60,000 years ago. Others veered off into Europe about 40,000 years ago and into Siberia some 30,000 years ago. The final frontiers in this long saga of exploration were the Americas (15,000 years ago) and Polynesia (4,000 to 1,000 years ago). New Zealand was the last sizeable piece of habitable land to be discovered, around AD 1000 or maybe 1200.²

These peregrinations were real exploration. In some parts of the world, these footloose *Homo sapiens* encountered a few *Homo erectus*, whose ancestors had also walked out of Africa perhaps half a million years back. But those

2. These dates are rough estimates—the older the date the rougher the estimate—subject to revision by a single new archeological find.

Homo erectus did not have language, or at least not much of it, and could not tell *Homo sapiens* much of anything about the lands they were exploring. In any case, *Homo erectus* soon went extinct wherever our ancestors showed up, a disconcerting fact about our family tree. In Europe, the new arrivals encountered Neanderthals and swiftly swept them into the dustbin of prehistory. So for all intents and purposes, these wandering *Homo sapiens* were exploring unpeopled lands, unfamiliar not only to them, but to everyone alive. The trip to Australia must have been especially challenging—across open water and into a new and exotic biological kingdom with almost no familiar plants or animals. Similarly, exploring north into Siberia took much courage: few edible plants, trackless tundra, and bitter cold (the first humans arrived in the middle of the last Ice Age). They needed warm clothes and skill in very-big-game hunting, as well as a full supply of either optimism or desperation.

These Paleolithic pathfinders knew nothing at all about what lay over the horizon, and no one could tell them, yet they went. Had these individuals had the foresight to leave to posterity letters, diaries, journals, and handsome engravings instead of merely the odd flint or chunk of charcoal, their stories would be well-known and their status as historical icons assured.³

MOTIVATION AND EXPLORATION

Why did they do it? Why leave home at all, why walk out of Africa, why sail to Australia? We can't know, but we can make informed guesses. The last chapter of these great explorations was the Polynesian one, and we know more about that than any of the earlier ones. There are oral traditions, such as those maintained by New Zealand's Maori, as well as much more plentiful archeological remains. Linguistic and genetic evidence adds details to the general picture. The Polynesians clearly organized deliberate voyages of exploration, discovery, and colonization. Presumably, despite their legendary maritime skills, many Polynesian voyages ended badly because the Pacific is a big ocean with only a few specks of habitable land. These voyages were very risky undertakings. People accepted the risk presumably because staying at home seemed worse. In some cases, perhaps, island populations grew too large and starvation loomed, inspiring some to take to the sea in search of fertile land or fish-filled lagoons. Oral traditions suggest that, in other cases, conflicts arose, such as between two claimants to a chieftaincy, and one had to go: their island wasn't big enough for the two of them. If the loser was lucky, his followers

3. Clive Gamble, *Timewalkers* (Cambridge, MA: Harvard University Press, 1994) remains useful on prehistoric migration. See also Steven Mithen, *After the Ice* (Cambridge, MA: Harvard University Press, 2004).

would accompany him over the horizon, perhaps to find a good uninhabited island somewhere, perhaps to find only endless ocean and early death.⁴

The epic Paleolithic peregrinations probably arose more often from conflict than overpopulation. It is hard to imagine the exodus from Africa owing anything to overpopulation: there were probably well under a million people at the time, a number easily sustained on a continent as big as Africa. So why did they move on? Perhaps they were following game animals. Perhaps a wet phase in the Sahara was ending and they had to find a new home. Perhaps they were consistently curious. Perhaps each incremental movement of people arose from different motives. But quite likely conflict was often involved, as among the Polynesians, and the easiest resolution required some group to move away. In some cases, perhaps, cultural conservatives objected to some changes and, like the Puritans who settled in New England, hived off in order to be able to practice their old ways without harassment. Once they got there, they probably often quarreled, split, and the stronger or luckier drove off the unlucky schismatics, as among the Massachusetts Puritans. In other cases, perhaps, cultural radicals pursued new ways that others found distasteful, so, like the Mormons in the mid-19th century, they were driven over the horizon where they, too probably quarreled and split.

Space exploration also arose from conflict.⁵ Although the dynamics were very different from what I have claimed about the Puritans, Polynesians, and Paleolithic peoples, it is clear that the funds provided by the Soviet Union and the United States, beginning just over 50 years ago, would not have been allocated without the Cold War context (or some equivalent unprecedented peacetime mobilization of money and resources). The dog Laika, the first living thing to experience Earth orbit, blasted into space aboard Sputnik II just a year after the October 1956 Suez Crisis and the Soviet invasion of Hungary. Gagarin and Glenn were propelled into space by a climate of anxiety fed by the Berlin crisis and the Cuban missile crisis. Americans and Russians did not explore space because they lost a quarrel or feared hunger, but because they feared they might suffer in the Cold War if they allowed space to be dominated by their rival. President Lyndon Johnson feared the communists would drop bombs on America “like kids dropping rocks onto cars from freeway overpasses.”⁶ In a less colloquial moment, Johnson claimed that, “Failure to master space means

4. Within the sizeable literature on Polynesian history, a good starting point is Patrick Kirch, *On the Road of the Winds: An Archeological History of the Pacific Islands before European Contact* (Berkeley, CA: University of California Press, 2000).

5. Roger D. Launius, “Compelling Rationales for Spaceflight? History and the Search for Relevance.” In: Steven J. Dick and Roger D. Launius, eds., *Critical Issues in the History of Spaceflight* (Washington DC: NASA, 2006), pp. 37-70, reviews the American motives for space exploration, emphasizing the political ones.

6. *The Washington Post*, October 2, 2007: A1.

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.”⁷ Americans and Russians also found, as many had before them, that virtuoso displays of technological prowess and national resolve served useful propaganda purposes, which seemed especially important during the era of decolonization when the allegiance of billions of people around the world (and their geostrategic resources) was up for grabs. Laika, by the way, lasted four days in space before expiring from heat exhaustion on the 40th anniversary of the Bolshevik Revolution, November 7, 1957.⁸

Space exploration has proved to be a risky venture, although in statistical terms it is probably less so than Polynesian voyaging. Polynesians accepted high levels of risk because they felt they had to: at times, staying put carried unacceptable costs or perhaps even greater risks. Presumably, Paleolithic explorers sometimes arrived at the same calculus. Today, as for the last half century, one of the central questions surrounding space programs is that of risk. How much is prudent to accept when the returns are unmeasurable? Should human lives be risked for uncertain rewards? Although insurance companies and their customers explicitly put monetary values on human lives, and those responsible for air traffic and highway safety do so implicitly, when it comes to space exploration, this calculation is not mainly a matter of money and numbers, but of moral and political positions. For some, the ratio of risk to reward spells gigantic folly; for others, an irresistibly noble calling. Different people, different governments, different eras will hold sharply divergent views on this, and they are probably not easily reconciled or persuaded by mere reason.

In point of historical fact, no human being has ventured beyond low-Earth orbit since 1972.⁹ To those in control, the further rewards to distant space travel since then apparently did not justify the risks. Détente, perhaps, diminished the determination behind human space exploration, as did financial difficulties. By the late 1960s, the Soviet economy had begun to flag, and although high oil prices helped prop it up for more than a decade after 1973, the malaise associated with the Brezhnev years did not augur well for renewed commitment to lofty ambitions in space. The American economy (and government revenues) suffered a downturn in 1973 due in large part to high oil prices, raised higher in 1979. So with détente dampening the motives, and economic difficulty undermining the means, ambitions for projects in space waned since the heady early days (c. 1957-1969) when all seemed possible. But, as with Paleolithic and Polynesian

7. Walter A. McDougall, “Technocracy and Statecraft in the Space Age: Toward the History of A Saltation,” *American Historical Review* 87 (1982): 1025.

8. This is not the only ironic calendrical coincidence of Cold War space history: the day Sputnik I was launched, October 4, 1957, was the day American TV stations launched that paean to normalcy, “Leave It to Beaver.”

9. Launius, “Compelling Rationales,” p. 69.

explorers, such reluctance is always provisional. Conditions will change, political resources will ebb and flow, the premium on human safety will evolve. Sooner or later, someone in power somewhere will consider, once again, that the game is worth the candle. Perception of acceptable risk is not merely a calculation of probabilities costs, and benefits; it is also a cultural choice and always subject to reconsideration.

CHALLENGE AND LIBERATION IN EXPLORATION

When humans first left East Africa for the wider world, they experienced both a challenge and a liberation. Their new environments were unlike the ones to which they had been slowly attuned by biological evolution. A lot of their accumulated wisdom presumably applied less well to the shores of the Indian Ocean and its hinterlands than it had to the savannas of East Africa or the Nile valley. However, over time they developed new wisdom appropriate to their new surroundings. They adapted biologically in small ways in accordance with the novel pressures of their new environments, such as gradual variations in skin color to harvest more vitamin D in higher, sun-starved latitudes. In cultural and in biological ways, they met the challenges of migrating into unpeopled realms.

The liberation consisted, in the first part, of escaping the pathogenic load that had evolved among their ancestors. Countless pathogens had had plenty of time to adapt to life within and among hominids in the long haul of evolution in East Africa. Not all of these pathogens, however, made the trip out of Africa. Some could not handle the cooler temperatures of Eurasia. Others, by sheer chance, had not been along for the ride when the migrants left and could not catch up. Thus humans, upon arrival in Asia, entered into a golden age of health that would last some 90,000 years until the transition to agriculture—farming was a great leap backward as far as health was concerned. To judge from skeletal evidence, the first Eurasians suffered much less from infectious diseases than either their ancestors in Africa or their farming descendants. They did not, it seems, live much longer lives: accidents, violence, and abandonment of infants and toddlers kept life expectancy at birth around 30 years. One had to be healthy enough to walk in those days.

The liberation had a second aspect to it. In East Africa, while the foraging and gathering was probably good, the hunting was probably bad. All the big game there had had plenty of time to develop appropriate suspicion of upright, fire-wielding, projectile-throwing creatures, thus limiting the success of hunters. But in Eurasia, and later in Australia, the Americas, and New Zealand, people arrived amid populations of naïve wildlife. Hunting was comparatively easy when the prey took no notice of hunters until they were well within spear-throwing range. The world outside of Africa was a happy hunting ground until selection weeded out the unsuspecting or until the choicest prey grew scarce.

If humans are to leave Earth behind and settle elsewhere in the universe, they will experience something of the same challenges and perhaps the same liberation. They will need to adjust their culture to their new environments, jettisoning all that which was applicable only on Earth and devising new formats appropriate to the far corners of the universe. They will evolve biologically according to the pressures of their new surroundings, whatever those might be. For example, gravity of different strengths from what we have known on Earth would presumably encourage different sorts of bodies. Since migration around the globe led to numerous small biological adaptations in humans over the past 100,000 years (and among other animals as well), it stands to reason that space colonization would transform our bodies, too. Indeed, in short order humans elsewhere in space might cease to be humans. Given the vast distances involved, space colonists would cease to interbreed with Earthbound populations. Only if space colonies were to consist of glorified versions of Biosphere II, hovering in near space, could the biological oneness of humankind be preserved for long.

The biological evolution of space colonists, as with those of us here on Earth, might in time become a matter of conscious design through genetic manipulation more than of natural selection of the sort characteristic of us since time immemorial. The genetic and biological diversification of the creatures formerly known as humans would, it seems likely, grow rapidly in the event of exploration outside our solar system. Should that happen, then even after people colonize space, further space exploration would still be into unpeopled realms, strictly speaking, once people ceased to be people.

Their social and cultural evolution would, of course, also be affected by their distant new environments. The migrants out of Africa kept their basic social organization, the small band of 30 to 80 people who were mostly kinfolk, wherever they went. It seems to have adequately served the purposes of nomadic foragers and hunters, whether in Africa, Australia, or Siberia. Only when people settled down and domesticated plants and animals did they find new social formats (villages, chiefdoms, states) more appropriate. Space settlers, once free of the umbilical cord of Earth, would likewise presumably experiment with new social formats, finding alternatives to those we have known here on Earth.

Thus, in social and cultural terms, one could anticipate a liberation from earthly patterns in the event of space colonization. Whether this would also include counterparts to the epidemiological liberation and the happy hunting ground effect seems much less likely, depending a great deal on what exists out there in the colonized environments. Since hunting provides only the tiniest proportion of the food supply among peoples technologically capable of pursuing space exploration, and because our digestive capabilities are calibrated to the things we eat here on Earth, it seems most unlikely that space colonization would involve an analogue to the happy hunting the first Eurasians, Australians, and Americans enjoyed—even if there is something out there to hunt. Epidemiological liberation is another matter.

At first glance it seems reasonable to suppose that leaving earthly ecosystems behind might allow space travelers and settlers to shed much, if not all, of their pathogenic load. The early emigrants from Africa apparently did so, as did the wandering bands that left Siberia for the Americas around 14,000 years ago, founding the indigenous American populations that were for millennia unusually free from infectious disease.¹⁰ However, it is implausible to suppose that all microbes can be left behind, and once in space microbes may behave differently. A new National Academy of Sciences study claims that certain pathogens, salmonella in particular, prosper better in space than on Earth.¹¹ Moreover, in all likelihood, the human immune system, like our digestive system calibrated for conditions here on Earth, would prove far less useful elsewhere in the universe. For this reason, if for no other, the health liberation that eased emigration from Africa and assisted settlement of the Americas, would probably not help us make our way in space.

WHAT MATTERED IN HISTORY DURING THE SPACE AGE

This speculation about space, evolution, and who will remain really human threatens to get out of control and become its own gigantic folly. Let me return to a historian's *terra firma* and reflect upon the changes here on Earth since Laika's orbital flight.

In terms of health and demography, this last half century has been the most revolutionary in the human career. In 1957, the average life expectancy was about 47. Today it is close to 67.¹² While we have not been able to "close the book on infectious diseases," as the Surgeon General forecasted in the 1960s,¹³ we have intervened dramatically in the relations between pathogens and our bodies. Sanitation, vaccines, antibiotics, and other measures have made a huge difference in human health. Some pathogens, such as the smallpox virus, have been ushered into extinction or near extinction. Many of the crucial developments in this story—the germ theory of disease, sewage treatment, penicillin—date to well before 1957. But their application, their spread around the world, their full effect came mainly after that date. Even though this health revolution remains unevenly distributed around the world, indeed unevenly distributed within many of the world's cities, it probably amounts to the single

10. See Alfred Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900-1900* (New York, NY: Cambridge University Press, 1987), pp. 197-198.

11. See for example Gillian Young, "Bacterial Virulence: Return of the Spacebugs," *Nature Reviews Microbiology*, 5, no. 11 (November 2007): 833-834.

12. United Nations data appearing in James C. Riley, *Rising Life Expectancy: A Global History* (New York, NY: Cambridge University Press), pp. 37-38.

13. This quotation is variously dated as 1967 or 1969. See J. R. McNeill, *Something New Under the Sun* (New York, Norton, 2000), p. 201.

greatest social change of the last half century. Whether it can be maintained indefinitely is an interesting question that depends chiefly on the ongoing arms race between pathogenic evolution and human efforts at disease control.

One result of the health revolution since 1957 is the global population explosion. The world had about 3 billion people in 1957; today it has more than twice that number. Put another way, it took hundreds of thousands of years for human population to add its first 3 billion, but only 50 years (more like 47 actually) to add the second 3 billion. Whereas for most of human history the annual population growth rate remained well below 0.01 percent, in the 1960s and early 1970s, it briefly attained 2.1 percent per annum. Now it is close to 1.3 percent annually. The last 50 years has been one great spike in population growth rates, unprecedented in our history and destined to end soon.¹⁴ No other primate, perhaps no other mammal, has ever done anything like this in the history of life on Earth. Consider this: roughly 10–15 percent of the years lived by people and their hominid ancestors going back four million years have been lived after 1957.¹⁵ A memorable way to visualize it comes from the Italian historian Carlo Cipolla: if post-1957 population growth rates had obtained from the dawn of agriculture 10,000 years ago to the present, Earth would now be encased in a ball of squiggling human flesh expanding outwards into space with a radial velocity greater than the speed of light, gobbling up planets and stars in its path.¹⁶ (Just as well that didn't happen I suppose, even if it might have saved us the trouble of space exploration.) What did happen was remarkable enough.

Connected to this stunning growth of population is the sudden urbanization of our species. For our first few hundred thousand years on Earth, our characteristic habitat was savanna grasslands and parklands, riverbanks, and shorelines. For a brief span, maybe 7000 or 5000 B.C. to A.D. 2000, the farming village formed the standard human habitat. But now, for the first time, the typical human animal has become a city dweller. In 1800, about 3 percent of the world's population lived in cities, and only one city, Beijing, topped one million. By 1957, about 30 percent of us lived in cities, close to a billion people in all. And today, more than half of us, over three billion souls, are urbanites, and the world has some 468 cities with more than a million people.¹⁷ In 1957, only one urban area, New York, housed upward of 10 million people. Now there are about 25 such megacities, the largest of which—Tokyo/Yokohama—

14. United Nations data appearing in Angus Maddison, *The World Economy: Historical Statistics* (Paris: OECD, 2003), pp. 255–256.

15. This figure is adapted from calculations made by J. N. Biraben, "Essai sur l'évolution de nombre des homes," *Population*, 34 (1979): 13–24; and J. Bourgeois-Pichat in, "Du XXe au XXIe siècle: Europe et sa population après l'an 2000," *Population* 43 (1988): 9–42.

16. Carlo Cipolla, *An Economic History of World Population* (Harmondsworth, UK: Penguin, 1978), p. 89.

17. According to Thomas Brinkmann's Web site at <http://www.citypopulation.de/World.html> (accessed September 4, 2007).

is home to some 33 million people, roughly the population of the entire United States at the time of the Civil War. Cities everywhere used to serve as a check on population growth because their infectious diseases killed people faster than others were born. But in the last few decades this has changed and cities are no longer demographic black holes, but instead hothouses of further growth.

This is, to put it mildly, a bizarre transformation. It is less conspicuous in the United States, where half the population was urban by about 1920, than in Asia and Latin America, where things happened later and faster. In national terms, the fastest large-scale urbanizations in world history were those of the Soviet Union in the 1930s (while building socialism) and China since 1980 (while dismantling it). The urbanization of our species surely carries tremendous significance in ways not yet fully apparent. We have built new environments and new habitats while simultaneously populating them and leaving behind the milieux that formed us and our institutions.

One of the reasons that cities could grow as they did and do is the radical changes in energy use witnessed in our times. Before the era of fossil fuels, cities in temperate latitudes, say North China or Europe, needed to command an area of forest some 50 to 200 times their own spatial size to meet their fuel wood needs.¹⁸ This, together with limits to agricultural efficiency, constrained urban growth. Fossil fuels broke this constraint, and helped break the ones on agricultural efficiency. Since 1957, global energy use has almost tripled, largely as a result of the globalization of oil use. Oil was a small part of the energy mix outside of North America until the 1950s. What China and India are doing now in terms of deepening energy and oil appetites, was done by Western Europe and Japan on a smaller scale from the mid-1950s to the 1970s.¹⁹

Again, as with urbanization, the significance of fossil fuels since the 1950s is less conspicuous in the American context than elsewhere because they became important in the United States earlier. But in global terms, it is only after the 1950s, with the opening of the so-called elephant fields in Saudi Arabia, and then those in Western Siberia, that cheap energy became routine. With cheap oil, automobiles became the normal accoutrements of middle-class and, in richer countries, working-class life. Furthermore, transportation of goods around the world became far more practical, leading to ever more complex divisions of labor and levels of specialization that enabled larger and larger numbers of people to live lives of ease instead of near-universal grim and grinding toil.²⁰

18. Vaclav Smil, *Energies*, (Cambridge MA: MIT Press, 1999), p. 118.

19. Useful histories of energy include Vaclav Smil, *Energy in World History* (Boulder, CO: Westview Press, 1994); Alfred Crosby, *Children of the Sun: A History of Humankind's Unappeasable Appetite for Energy* (New York, NY: Cambridge University Press, 2006).

20. This is explained for Europe in Christian Pfister, *Das 1950er Syndrom: Das Weg in die Konsumgesellschaft* (Bern, Switzerland: Paul Haupt Verlag, 1995).

Cheap energy is probably the single most important factor behind the spectacular economic growth of the last half century. For most of human history, the global economy grew at a snail's pace and, indeed, often shrank. The period since the middle 1950s, however, has chalked up by far the fastest growth rates ever posted. In the last five decades, the global economy has grown by about four percent per annum, twice as fast as during the second quickest era of expansion, which was 1870–1913. In per capita terms, the global economy has nearly tripled since 1957.²¹ Of course, this is a very uneven achievement as some populations—in Central Africa for example—have scarcely benefited from this trend, while others, such as those in East Asia or southern Europe, have experienced far higher than average per capita income growth. For its overall growth, and for its wild geographic unevenness, the economic history of the last half century is far and away the most eccentric in the human record. This would be obvious to all if we did not naturally assume that what we have known from our own experience and observation is normal.

The extraordinary histories of population, urbanization, energy use, and economic growth over the past half century have combined to produce the most turbulent times yet in the history of human relations with the biosphere. Since at least the harnessing of fire, humans have had an outsized impact on Earth. That impact grew more widespread and profound in the 19th century when population growth and energy use began to climb at hitherto unprecedented rates. But the impact entered a new, tumultuous phase in the 1950s, so distinctive that the Nobel laureate chemist Paul Crutzen labeled it the “Anthropocene,”²² the geological epoch dominated by human influence.

Since the dawn of the Space Age, the carbon dioxide concentration in the atmosphere has risen by a fifth, and global climate has begun to warm. Global forest area has declined by about 11 percent and grasslands by 19 percent. Freshwater use has tripled, and global irrigated area is up by 240 percent. Sulfur dioxide emissions have at least doubled (and that counts their decline in the United States and Europe since 1980). Same with methane emissions. Livestock numbers—mixing sheep, goats, pigs, and cattle together, no doubt an Old Testament, as well as methodological, abomination—are up about 170 percent. Cement production is up eight-fold.²³ You get the picture. Despite some improved technologies and

21. Maddison, *The World Economy*, pp. 260–262. See also Eric Lambin, *The Middle Path: Avoiding Environmental Catastrophe* (Chicago, IL: University of Chicago Press, 2007), pp. 26–28.

22. See Will Steffen, Paul Crutzen, and John R. McNeill, “The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature?” *Ambio* 36, no. 8 (2007): 614–621.

23. Data from the database maintained by Kees Klein Goldewijk at www.mnp.nl/hyde/bdf (consulted on September 4, 2007).

greater efficiencies in resource use, the economic miracle of the last half century has put unprecedented pressures on the biosphere that sustains all life.²⁴

In the fullness of time, this environmental turbulence may come to appear the most important thing in the history of our times, more so than the Cold War; decolonization and the end of the British, French, Soviet and other empires; the growing emancipation of women; the rise of terrorism; the rise of China; the resurgence of political religion; the splitting of the atom; the decipherment of the human genome; or globalization. That remains to be seen: what is important about a given era depends entirely on what happens next. Should the stresses and strains upon the biosphere turn out one day to have been a mere tempest in a teacup, then this suggestion will have proved wrong. But if they build over time and prove disruptive in human affairs, then they will seem more meaningful, in time, than what preoccupied those alive in the second half of the 20th century.

THE PLACE OF SPACE EXPLORATION IN THE SPACE AGE

Given all these developments of the last 50 years that I claim are unprecedented, remarkable, revolutionary, and so forth, where do space exploration and space programs fit in? I am tempted to take refuge in the wisdom of Zhou Enlai (1898–1976), Mao Zedong’s urbane foreign minister. French journalists in the 1960s asked Zhou what he thought was the significance of the French Revolution of 1789. Zhou paused thoughtfully and said that “it is too soon to tell.”²⁵

It is in fact too soon to tell what the real significance of the Space Age may be. At the moment, space exploration, space flight, and space research, all seem, at most, secondary next to the dominant trends of contemporary history. Moreover, nothing to do with space seems central in the sense that, had there been no Space Age, no Gagarin or Glenn, no Moonshot, no Hubble Telescope, no Laika, everything else probably would have unfolded much the way that it did. Some things would have been a bit different without spy satellites, communications satellites, weather satellites, Earth-observation satellites, and so forth. Hurricane Katrina (2005) and other weather disasters could have been even worse had we not known in advance what was coming. Figuring out the ozone hole over Antarctica would have taken longer.²⁶ But I am skeptical of the

24. An excellent study that shows the interplay of economic expansion and increased efficiencies in the Spanish national economy is Oscar Carpintero, *El metabolismo de la economía española: Recursos naturales y huella ecológica (1955-2000)* (Madrid: Fundación César Manrique, 2005).

25. This phrase is variously reported, for example, as “too early to tell” in Wikiquote (en.wikiquote.org/wiki/Zhou_Enlai). In any case, Zhou spoke with French journalists in French as he had studied in France for three years in his youth.

26. See Ray A. Williamson and Henry R. Hertzfeld, “The Social and Economic Impact of Earth Observing Satellites.” In: Steven J. Dick and Roger D. Launius, eds., *Societal Impact of Spaceflight* (Washington DC: NASA, 2007), pp. 237–266.

view that, for example, spy satellites prevented the Cold War from turning into World War III. The big things would *probably* be much the same, for better or for worse. I write “probably” in italics as a way to convey uncertainty because I am conscious that there are many things about space programs that I do not know. Furthermore, questions of causation in counterfactual scenarios are inherently unknowable, even for the best informed.²⁷ Had hundreds of billions of dollars and trillions of roubles not been spent on space, what might they have been used for? We can’t know, but my guess is nothing out of the ordinary, that is, a little more of both guns and butter.

Perhaps space programs indirectly affected the big trends, even if spy satellites cannot be credited with preventing World War III. Could, for example, the current surge of globalization have derived some of its momentum from an enhanced awareness that we are all in the same boat, all stuck on the same small blue dot spinning through the darkness? Or could it owe something to instantaneous communications via satellites?²⁸ My view is the best answer is: yes, but not much. If no one had ever seen photos of Earth from space, and if information from India and Indonesia still arrived by telegraph and took a day or two to reach other continents instead of a second or two, would globalization be substantially different?

Space programs, of course, had spinoffs that affected contemporary history. The two most consequential so far are communications satellites and (very indirectly) the Internet. Nearly two-thirds of all satellites are used for communications,²⁹ and they have dramatically lowered the time and cost required for long-distance communications. The Internet arose from the Defense Advanced Research Projects Agency (more familiarly known as DARPA), which itself was created in response to the successful launch of Sputnik. These are both developments of consequence in today’s world. But the Internet would likely have evolved, in somewhat different ways no doubt, even without DARPA. And in the absence of communication satellites, what they now transmit would likely go via the Internet (as, increasingly, long-distance phone calls do now). These musings reinforce the conclusion that space programs changed the history of our times, but not (yet) in any fundamental ways. Contemporary history, however, will inevitably look different to those no longer in the middle of it.

Space exploration, as opposed to the totality of space programs, could well be relegated to the status of historical footnote if, in the years ahead, exploratory probes are shut down. Satellites in near orbit are surely here to stay for a while,

27. For a more favorable assessment of the significance of space programs, see Erik M. Conway, “Overview: Satellites and Security: Space in Service to Humanity.” *Societal Impact of Spaceflight*, pp. 267–288.

28. James A. Vedda, “The Role of Space Development in Globalization.” *Societal Impact of Space Flight*, pp. 193–206.

29. *The Washington Post*, October 2, 2007: A1, A6.

as they serve several useful purposes, and some of them at least are profitable. But exploration programs are another matter: they are especially expensive and, since they probably won't cure cancer or defeat terrorism, they are at high risk of being phased out by Congress and its equivalents in other lands when money gets tight. If so, in time space exploration will be forgotten, a dead end, a historical cul-de-sac. On the other hand, it could be that space exploration will thrive, find new budgetary champions in the corridors of power, perhaps in China if not elsewhere. The likely endurance of geopolitical rivalry means space exploration programs will probably have some appeal, partly practical, and partly for propaganda value. It could well be, given the appreciation of the risks involved, that robotic space exploration will have a long future but human space flight will not. This, I imagine, is more likely to be the case if the sponsors are aiming at practical benefits rather than rewards in terms of prestige and propaganda, for which heroic humans still, and perhaps always will, carry outsized value.

One way to look at the experience of space exploration, and one justification for its endless continuation, is to see it as a species of expeditionary science. Past rulers have often sent out scouts, spies, and scientists to take inventory of the resources and peculiarities of other lands. In the 18th century, Britain and France competed for geopolitical dominance in several parts of the world, and in that context sponsored scientists and scientific expeditions to gather useful information, whether about medicinal plants, trees suitable for naval timber, or a thousand other things that might come in useful one day. When Napoleon conquered Egypt in 1798, he loosed a team of scholars and scientists upon the country to ransack it for information (and art) of all sorts. From Russia to Spain, all European states with overseas interests sponsored expeditionary science on some scale, as in time did the United States. When Jefferson purchased half a continent from Napoleon in 1803, he bankrolled Lewis and Clark to take a preliminary inventory of what he had bought. During the Cold War, the United States and the U.S.S.R. sponsored scientific expeditions on a much more lavish scale to the polar regions and deep beneath the seas. Their space programs were, among other things, part of this tradition.

Space exploration may survive on one or another basis, but it still will not loom large in terms of human history unless something really new and interesting happens, the sort of thing people in the space business probably dream about—finding intelligent and agreeable (or at least neutral) life out there or colonizing new corners of the universe—or probably have nightmares about—developing effective space-based weapons suitable for use against earthly enemies or finding intelligent but hostile life out there. If any of these things happen, then the first 50 years of space exploration will look like the beginning of something of epic significance. If they don't, it will look like a small step for mankind that led nowhere, and did not amount to much in the balance before being consigned to the dustbin of history. It is indeed too soon to judge whether the whole enterprise is a gigantic folly diverting money and talent from more urgent applications, a noble calling consonant with our deepest nature, or something else altogether.

CHAPTER 2

SPACEFLIGHT IN THE NATIONAL IMAGINATION

Asif A. Siddiqi

INTRODUCTION

Few would recount the history of spaceflight without alluding to national aspirations. This connection between space exploration and the nation has endured both in reality and in perception. With few exceptions, only nations (or groups of nations) have had the resources to develop reliable and effective space transportation systems; nations, not individuals, corporations, or international agencies, were the first actors to lay claim to the cosmos. The historical record, in turn, feeds and reinforces a broader public (and academic) consensus that privileges the nation as a heuristic unit for discussions about space exploration. Historians, for example, organize and set the parameters of their investigations along national contours—the American space program, the Russian space program, the Chinese space program, and so on. We evaluate space activities through the fundamental markers of national identity—governments, borders, populations, and cultures.

As we pass an important milestone, moving from the first 50 years of spaceflight to the second, nations—and governments—retain a very strong position as the primary enablers of spaceflight. And, in spite of increased international cooperation, as well as the flutter of ambition involving private spaceflight, there is a formidable, and I would argue rising, chorus of voices that privilege the primacy of national and *nationalistic* space exploration. The American and Russian space programs remain, both in rhetoric and practice, highly nationalist projects that reinforce the notion that space exploration is a powerful vehicle for expressing a nation's broader aspirations. Similarly, second tier space powers such as China, Japan, and India, which have long been spacefaring nations, have more recently strengthened the link between nationalism and competence in space activities. The evidence from the past 50 years of spaceflight convincingly counters utopian notions—expressed in television, film, fiction, and journalism—that as spaceflight becomes mature, national space programs will disappear, and all spacefaring countries will come together to work towards a shared set of objectives that have global resonance.

Despite the fundamental and enduring nature of the relationship between space exploration and the nation, we know very little about the manner in which

nations articulate their engagement in space activities. My goal in this essay is to offer some preliminary thoughts on the broad patterns that characterize the public rhetoric surrounding national space programs, patterns that are common across different national contexts. Here, I define “public rhetoric” to include the discourse generated by governmental agencies, journalists, historians, and public commentators, i.e., those that elucidate and establish the contours of public debate over space exploration in particular national contexts. I do not claim that this discourse reflects or approximates the “real” relationship of spaceflight to national aspirations, i.e., that space exploration can only be understood in terms of the nation. On the contrary, I strongly believe that the immutable association in the public eye of spaceflight with the nation has helped to *obscure* important non-state processes, an understanding of which might offer valuable insights in analyzing the history of space exploration.¹ I do, however, believe that the language describing space exploration has certain semiotic characteristics that communicate persistent ideas about the history of spaceflight that repeat across entirely different cultures and contexts. These ideas are important to discern since they serve as a filter for the public understanding of spaceflight and consequently contribute to the public enthusiasm (or lack of) for space exploration in general.

The evidence suggests that through the first 50 years of the Space Age, all spacefaring nations have used four different tropes—linguistic constructs dependent on symbols—to articulate their space programs to the broader public. These four tropes, which take the form of particular rhetorical strategies, continue to be fundamental to the way that the project of space exploration has been articulated in both official and unofficial discourses; governmental agencies, journalists, historians, public commentators and the lay public in spacefaring nations have consistently invoked these archetypes to construct a master narrative of the history of space exploration. They are: the myth of the founding father, the claim of indigenous creation, the connection between spaceflight and national identity, and the essential need to justify space activities. In elaborating these tropes, I use as examples the five nations which have achieved the domestic capability to launch objects into Earth orbit and still retain that capability—the Soviet Union (achieved orbit in 1957), the United States (1958), Japan (1970), China (1970), India (1980), and Israel (1988). Two European nations which once had that capability—France (1965) and Great Britain (1971)—have relinquished it. The former folded their efforts into the European Space Agency (ESA) while the latter saw no value in having such a

1. I make this point in my “Competing Technologies, National(ist) Narratives, and Universal Claims: Revisiting the Space Race,” paper presented at the NSF-sponsored workshop of the Society for the History of Technology, October 18, 2007, Washington, DC. The paper can be accessed at http://jfftieth.shotnews.net/?page_id=23. (accessed February 29, 2008).

capability. ESA still remains the only multinational organization to develop its own satellite launch capability, having achieved that ability in 1979.²

FOUNDING FATHERS

The first trope of a national space history is that of the “founding father.”³ Each space program arrives in the historical record with a singular figure whose determinations mirror and telescope the spacefaring ambitions of the nation in question. For the Soviet Union, there was Sergei Korolev (1906–1966), for the United States, Wernher von Braun (1911–1977), for Japan, Hideo Itokawa (1912–1999), for China, Qian Xuesen (1911–), for India, Vikram Sarabhai (1919–1971), and for Israel, Yuval Ne’eman (1925–2006).⁴ In some cases, their claims as founding fathers are contested—especially in the case of von Braun—but the commonalities between them are striking. Each of these individuals embodies a unique combination of dualities: they are always both capable and visionary, brilliant engineers and unequalled managers, and comfortable with the topmost levels of power and yet accessible to the rank-and-file technician. There are early traumas typically associated with each, ordeals that were physical, moral, or professional. For example, Korolev served a sentence in the Gulag, von Braun never fully escaped the moral quandaries of being associated with the Dora labor camp in Nazi Germany, and Qian’s life and career were disrupted by the Red Scare in the 1950s when he was deported to China on charges of being a communist sympathizer. In all cases, these men were seen as overcoming these adversities to achieve prominence later in their lives. For those reconstructing narratives of national space programs, these traumas become metaphors for the uphill battles faced by the space programs themselves.

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2. Although I do not focus on them, the same patterns also apply to those countries that are close to achieving a domestic capability to launch satellites into orbit but have not yet done so: Brazil, North Korea, Iran, and South Korea. In addition, I do not explore the strategies of those dozens of nations that have developed or purchased satellites but lack the expertise or resources to launch them themselves and, therefore, pay other nations or agencies to do so.
 3. It goes without saying that there were no women founders of space programs; the history of space exploration has been dominated by men in all nations, partly because of the substantive obstacles faced by women in pursuing higher education in the applied sciences or engineering. On the other hand, women in large numbers did contribute to space programs globally at mid- and lower-levels of management (e.g., as computer operators, medical personnel, draftspersons, administrative staff, custodial laborers, and daycare workers). Because social history has not been a concern for space historians, these women and their contributions remain largely invisible in most space history narratives.
 4. For useful biographies of some of these individuals, see Iaroslav Golovanov, *Korolev: fakty i mify* (Moscow: Nauka, 1994); Michael J. Neufeld, *Von Braun: Dreamer of Space, Engineer of War* (New York: Alfred A. Knopf, 2007); Iris Chang, *The Thread of the Silkworm* (New York: Basic Books, 1995); Amrita Shah, *Vikram Sarabhai: A Life* (New Delhi: Penguin Viking, 2007).

What purpose does the founding father trope serve? There is hardly a historian who would agree that Korolev single-handedly founded the Soviet space program, yet his epic biography completely overshadows the mention of many other individuals who made critical contributions to the emergence of the Soviet space program. Here it is important to distinguish between formal academic history and the popular notion of history that becomes part of the collective memory of a nation. With the former, historians are drawn to complexities and the messiness of yesterday; with the latter, our predilection is to distill complexities down to broad themes, personalities, and events that are often deterministic and teleological in nature. Thus, one purpose of the founding father archetype is to reinforce deterministic explanations for space history (e.g., “Korolev did X, therefore the Russian space program is like Y”).

The founding father archetypes did not arrive out of a vacuum but rather drew upon a longer tradition of similar archetypes. Most European nations, for example, reinforce narratives that they have founding fathers for particular scientific and applied scientific fields such as physics, chemistry, biology, mathematics, computer science, etc. These narratives center around an individual who is not only a deep thinker but also a builder of institutions, as well as an individual who bequeathed a substantial system (of research, education, etc.) for the good of the nation. In that sense, the founding father narratives of space exploration also parallel and mirror narratives about the founding of the nation itself, which are often tied to singular individuals who embodied some of the same kinds of qualities. Thus, these founding fathers represent not only the space program but also become key figures in nation building. By association, our conceptions of the founding father archetypes attach national space programs to imperatives, challenges, and triumphs associated with the founding of the nation. As a result, to many, the space program acquires a level of gravitas typically associated with concerns about the future of the nation.

INDIGENITY

All national space program narratives depend on the claim that its achievements were native in origin. In other words, the space history of each country assumes that nations are airtight constructs where immutable borders overshadow transnational flows and fixed delineations trump the fluid nature of both identities and knowledge. There are obvious reasons why the appeal of a particular space program depends on the notion of home-grown expertise: such accounts bolster national claims of competence, both to domestic and international audiences. Indigenous technologies—or at least those that are represented as indigenous—serve as surrogates for the projection of national prowess, a phenomenon that dates back at least to the late 19th century when

both Great Britain and Germany began to assert their standing on a global stage through accomplishments in science and technology.⁵

In the case of the space powers, each of their achievements served to place them on a global stage. Much like the acquisition of nuclear capability—more prosaically termed “going nuclear”—the domestic capability to deliver objects into Earth orbit secures a powerful and symbolic status that is also discrete since it divides “before” and “after” as being completely different. The symbolic power of such moments derives from the way a single launch can represent a convergence of many national aspirations—pride in history, a consensus that the present is a moment to be celebrated, and a confidence in a bright tomorrow. In 1980, when India launched its first satellite into orbit, Prime Minister Indira Gandhi noted in a speech to the Indian parliament that “This is a great day for India and for Indian science.” Mass media response in the West was predictably reductive but couched the event as a landmark: the *Washington Post* reported, for example, that it was “a remarkable achievement for a country that still uses bullock carts as a prime mode of transportation.”⁶

From the Indian perspective, it was important to emphatically underscore the value of indigenuity and the issue of ownership: the Indian space program was, above all else, Indian. Participants of the Indian space program continue to emphasize this aspect of the development of their first satellite launch vehicle, the SLV-3, attributing the mastery of this capability both to the high level of existing Indian expertise and the circumstances generated by draconian technology proliferation controls which forced Indian engineers to “go it alone.”⁷ Even though the development of the SLV-3 actually predated the enforcement of the Missile Technology Control Regime (MTCR) that limited international flows of “sensitive” missile technology to selected countries, the current existence of such controls serves to embolden ahistorical and disingenuous lines of argument and, in fact, obscures the significant international collaboration that led to the SLV-3 rocket.⁸

Claims of indigenuity are not monolithic across nations. In the more mature space powers, the tone of these assertions communicate unquestioned celebrations of national character, while in the “newer” space powers, they come across as preemptive responses to accusations of clandestine (or otherwise) appropriation

5. Bernhard Rieger, *Technology and the Culture of Modernity in Britain and Germany, 1890–1945* (Cambridge, UK: Cambridge University Press, 2005).

6. “India Becomes 6th [sic] Country to Put Satellite into Orbit,” *Washington Post*, July 19, 1980. India was actually the seventh nation to put a satellite into orbit using its own rocket, and the eighth if one includes the European Space Agency.

7. See for example, B. N. Suresh, “History of Indian Launchers,” IAC-07-D2.2.01, paper presented at the 58th International Astronautical Congress, Hyderabad, India, September 24–28, 2007.

8. The history of international contribution to the SLV-3 has been all but forgotten from the “official” record of its development. For a still-valuable historical work that explores the development of Indian launch vehicles, see Gopal Raj, *Reach for the Stars: The Evolution of India’s Rocket Programme* (New Delhi: Viking, 2000).

of technology from other nations. An example of the former is the United States, where the achievements of the American space program—particularly the Apollo lunar landings—represent the achievements of Americans, and not, for example, Germans or Canadians.⁹ As the author of a very popular book on Apollo recently noted:

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 not a vain one. America, like no other nation, *was* capable of the Moon.¹⁰

Soviet and Russian commentators, including veterans, have long made similar pronouncements in relation to the achievements of Sputnik and Gagarin, albeit, in the backdrop of latent suspicions (especially in Europe and the United States) that the help of German engineers kidnapped after World War II was critical to the spectacular early successes of the Soviet space program.¹¹

Claims of fully indigenous space technology are often motivated by accusations from abroad that this technology was “borrowed”; such allegations themselves focus mostly on non-Western nations. In other words, while the mature Western programs are largely insulated from charges of benefiting from foreign technological expertise, both new and mature non-Western programs are continually dogged by such accusations—usually emanating from the West—prompting a generally defensive posture that requires repeated assertions about domestic expertise. Through the entire period of the Cold War, for example, Soviet space achievements were continually marred by Western claims that the Soviets benefited from the “other Germans” or that they used

9. Both Germans and Canadians, naturalized as U.S. citizens by the early 1960s, made significant contributions to the Apollo program. For the Canadian contribution, see Chris Gainor, *Arrows to the Moon: Arvo's Engineers and the Space Race* (Burlington, Ontario: Apogee Books, 2001). There are a vast number of books on the German contribution. For a representative example, see Frederick I. Ordway, III and Mitchell R. Sharpe, *The Rocket Team* (New York, NY: Cromwell, 1979).

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

11. Soviet rocketry veteran Boris Chertok, who represents a “mainstream” voice within the Soviet space history community, concedes that German help was important in the immediate postwar years but dismisses any notion that this help was essential to the early successes of the Soviet space program. See Boris Chertok, *Rockets and People*, ed. Asif A. Siddiqi (Washington, DC: NASA, 2004). On the other hand, a number of German writers, without much convincing evidence, have recently attributed most of the early Soviet successes in rocket design to Germans. See for example, the three-part article by Olaf Przybilski, “Die Deutschen und die Raketentriebwerksentwicklung in der UdSSSR,” *Luft- und Raumfahrt* no. 2 (1999): 30–33; no. 3 (1999): 28–33; and no. 4 (1999): 33–40.

technology stolen from the U.S. space program through skillful spying.¹² Similarly, Western commentators, both official and independent, continue to express concern about possible Chinese use of sensitive American technology for use in the development of their ballistic missiles and launch vehicles.¹³ While such expressions are linked to concerns about the global proliferation of potentially harmful technology, they also communicate an implicit message about the inability of certain nations to innovate without outside help. Not surprisingly, such a stance tends to embolden and fortify the opinions of the scientific elite in non-Western nations who reject the notion that they are not capable enough to master the technology of space exploration. Affirmations of domestic competence emanating from Chinese or Indian scientists and engineers challenge the unquestioned assumption that there is an arbitrary line in history that divides those who are innovators (i.e., Western nations) and those who are proliferators (i.e., non-Western nations).¹⁴ As such, in the non-Western world, claims of indigenuity serve not only to boost national pride but are also vehicles for affirming a kind of revisionist and non-Orientalist historical thinking that decenters and deprives the West as the de facto basis for all discussions of spaceflight.

SPACE AS AN EXPRESSION OF NATIONAL IDENTITY

Each national space program is also articulated both in contemporaneous times and in retrospect as an expression of a nation's identity. In other words, discussions about space exploration across extremely different national

12. The most famous example of Soviet "copying" was the case of the Buran space shuttle. See John Noble Wilford, "Soviet Design Appears in Debt to U.S. Shuttle," *New York Times*, November 16, 1988. For a careful and recent analysis of the possibility of Soviet appropriation of U.S. technology in relation to the Buran, see Bart Hendrickx and Bert Vis, *Energiya-Buran: The Soviet Space Shuttle* (Springer: Chichester, UK, 2007), pp. 82-85.

13. For the controversial and error-ridden report issued by the U.S. House of Representatives on China's alleged efforts to obtain technological information covertly from the United States (including those related to space technology), see the *Report of the Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China* (more commonly known as the "Cox Report") at <http://www.house.gov/coxreport/> (accessed February 29, 2008).

14. Itty Abraham makes this argument about the arbitrary nature of the definition of nuclear proliferation in "The Ambivalence of Nuclear Histories," *Osiris* 21 (2006): 49-65. Hugh Gusterson similarly describes a moral distinction made by Westerners in terms of the acquisition of nuclear weapons. He writes: "There has long been a widespread perception among U.S. defense intellectuals, politicians, and pundits—leaders of opinion on nuclear weapons—that, while we can live with nuclear weapons of the five official nuclear nations for the indefinite future, the proliferation of nuclear weapons to nuclear-threshold states in the Third World, especially the Islamic world, would be enormously dangerous. This orthodoxy is so much a part of our collective common sense that, like all common sense, it can be usually stated as simple fact without fear of contradiction." See Hugh Gusterson, "Nuclear Weapons and the Other in the Western Imagination," *Cultural Anthropology* 14 (1999): 111-143.

contexts almost always include the notion, implicitly or explicitly, that there is something fundamental in the national character that gives force to the urge to explore space. Such expressions use three different rhetorical strategies that are not necessarily mutually exclusive: first, they involve a suggestion that space exploration represents a logical and further expression of deep-rooted cultural traits; second, they underscore national space achievements as a natural outcome of historical events; and third, they couch the space program as a vehicle for communicating a nation's prowess in science and technology.

Both the United States and the Soviet Union had deep-rooted traditions that suggest antecedents for their respective 20th century space programs. In the former case, there are any number of archetypes that justify and underlie the spacefaring activities of the United States. These are dominated by the notion of exploring the Western frontier and its attendant links to the idea of freedom: the freedom to explore, the freedom to settle, and the freedom to move again into the unknown. The "frontier thesis," as first cogently articulated by historian Frederick Jackson Turner in the late 19th century was a powerful statement of American exceptionalism, and as an analogy, it has proved remarkably resilient for many different American endeavors, including, of course, the space program.¹⁵ In American space exploration, many commentators saw not only how engagement with the frontier shaped American society and culture but also how American society and culture shaped the frontier itself. American exploration—from Lewis and Clark to the Apollo program—was acting both on a generic human impulse to seek knowledge and a deep-rooted American urge for inquiry, exploration, and the freedom of wide open spaces.¹⁶ Commentators as varied as rocket engineer Wernher von Braun, space visionary Gerard K. O'Neill, and space advocate Robert Zubrin all have couched their arguments with a distinctly American spin—ingenuity, frontier, freedom—in their search to advance the cause of human survival in the form of human colonization of the cosmos.¹⁷

As with Americans, many Russians also argue for deep-seated autochthonous urges for space exploration. In a recent article, a prominent Russian philosopher argued that the ideas of Konstantin Tsiolkovskii—the founding theorist of Soviet space exploration—provides the basis for a "Russian

15. For Turner's original works, see John Mack Faragher, ed., *Rereading Frederick Jackson Turner: The Significance of the Frontier in American History and Other Essays* (New Haven, CT: Yale University Press, 1994); George Rogers Taylor, *The Turner Thesis: Concerning the Role of the Frontier in American History*, 3rd ed. (Lexington, MA: Heath, 1972). For a more contemporary critique, see Richard Slotkin, *Gunfighter Nation: The Myth of the Frontier in Twentieth Century America* (New York, NY: Atheneum, 1992).

16. For an excellent summary of these themes as they relate to American space exploration, see Roger D. Launius, "Perfect Worlds, Perfect Societies: The Persistent Goal of Utopia in Human Spaceflight," *Journal of the British Interplanetary Society* 56 (2003): 338–349.

17. Howard E. McCurdy, *Space and the American Imagination* (Washington, DC: Smithsonian Institution Press, 1997).

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, resided in space, a place that transcends borders and nations.¹⁸ While some would argue that this line of thinking is rooted in the Marxist-Leninist utopian thinking unleashed by the Russian Revolution of 1917, such ideas of technological utopianism can actually be traced further back to the mystical and occult pre-Revolutionary philosophy known as Cosmism, a tradition that was made up of a hodgepodge of Eastern and Western philosophical traditions, theosophy, panslavism, and Russian Orthodox thinking. The outcome was a nationalist and often reactionary philosophy that, in spite of its reactionary tenets (or perhaps because of it), continues to attract the attention of many Russian nationalist intellectuals in the post-Communist era.¹⁹ The cause of Cosmism was “liberation from death,” a goal that would be achieved by human migration into space that 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 19th century Russian philosopher Nikolai Fedorov, who articulated much of this philosophy before anyone, wrote in 1905 that “[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 coexistence of all the resurrected generations. . . .”²⁰ In present-day Russia, the philosophy of Cosmism holds a deep sway among many commentators, especially those who meditate on the meaning of Russian space exploration.²¹

Spaceflight is also linked to national identity through history. Most spacefaring countries, for example, claim pre-modern historical events as part of their narrative of space exploration. Such arguments rooted in history lay claim to the idea that the nation’s path to space was preordained and inevitable, and that the modern space program is but a continuation of activities stretching

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18. L.V. Leskov, “K. E. Tsiolkovskii i rossiiskaia natsional’naia ideia,” *Zemlia i vseleennaia* no. 4 (1998).
19. For links between modern Russian Cosmism and post-Soviet Russian nationalism, see James P. Scanlan, ed., *Russian Thought After Communism: The Recovery of A Philosophical Heritage* (Armonk, NY: M. E. Sharpe, 1994), pp. 26-28. See also Michael Hagemester, “Russian Cosmism in the 1920s and Today” *The Occult in Russian and Soviet Culture*, ed. Bernice Rosenthal (Ithaca, NY: Cornell University Press, 1997), pp. 185-202.
20. S. G. Semenova and A. G. Gacheva, eds., *N. F. Fedorov: Sobranie sochinenii v chetyrekh tomakh*, 4 vols. (Moscow: Progress, 1995-2000). For a detailed exposition on the role of Cosmism in the origins of Soviet space exploration, see Asif A. Siddiqi, *The Red Rockets’ Glare: Soviet Imaginations and the Birth of Sputnik* (Cambridge, UK: Cambridge University Press, forthcoming).
21. For a small sampling of works on Russian Cosmism since the early 1990s, see L.V. Fesenkova, ed., *Russkii kosmizm i sovremennost’* (Moscow: IFAN, 1990); S. G. Semenova and A. G. Gacheva, eds., *Russkii kosmizm: antologiiia filosofskoi mysli* (Moscow: Pedagogika-Press, 1993); O. D. Kurakina, *Russkii kosmizm kak sotsiokul’turnyi fenomenon* (Moscow: MFTI, 1993); O. Ia. Gelikh, ed., *Kosmizm i novoe myshlenie na Zapade i Vostoke* (St. Petersburg: Nestor, 1999).

back centuries that embody similar sensibilities. In non-Western nations, there is also a specific pattern of linking contemporary space programs with events that predate Western modernity. Chinese writers, for example, are eager to emphasize the importance of China as the birthplace of rocketry in the 13th century, while Indian writers similarly stress the importance of Tipu Sultan's rockets from the late 18th century as a harbinger of the future.²² In these narratives, Tsiolkovskii, Goddard, and Oberth are all peripheral.

Finally, national identity is linked to spaceflight as an expression of national technological competence. Since the very first satellites, space exploration has served as a reminder to both domestic and international audiences of a nation's mastery of science and technology, not too dissimilar from other technological metrics of late 20th century modernity such as nuclear power, computing, and biotechnology. Already by the late 19th century, and especially in the light of experiences during the Great War, technology had assumed a fundamental role in the projection of national prowess, contributing to and joining the other measures of global dominance such as imperial adventurism, military assets, and industrial growth. In his study of the role of technology in the creation of modernity in early 20th 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.²³

A half a century later, especially after the launch of Sputnik in 1957, the connections between technology and national prowess became fully established. And just as Sputnik marked a particular historical moment that attached the notion of technological competence to the Soviet Union, Apollo did the same for the United States. I would argue that the most enduring aspect of the iconography of Apollo has been to set a benchmark for technological competence in American

22. For the Chinese references, see Brian Harvey, *China's Space Program: From Conception to Manned Spaceflight* (Berlin: Springer, 2004). For India, see A. P. J. Abdul Kalam, *Wings of Fire: An Autobiography* (Hyderabad: Univ. Press, 1999); S. Krishnamurthy and B. R. Guruprasad, "On the Nature and Significance of Tipu Sultan's Rockets from a Historical Perspective," IAC-07-E4.4, paper presented at the 58th International Astronautical Congress, Hyderabad, India, September 24-28, 2007.

23. Rieger, *Technology and the Culture of Modernity in Britain and Germany, 1890-1945*, p. 224. In a similar vein, see Guillaume de Syon, *Zeppelin!: Germany and the Airship, 1900-1939* (Baltimore, MD: Johns Hopkins University Press, 2002); Peter Fritzsche, *A Nation of Fliers: German Aviation and the Popular Imagination* (Cambridge, MA: Harvard University Press, 1994); Gabrielle Hecht, *The Radiance of France: Nuclear Power and National Identity after World War II* (Cambridge, MA: MIT Press, 1998).

culture, as underscored in the oft-repeated lament that begins, “If we could send a man to the Moon, there’s no reason we can’t. . . .” The later second-tier space powers have deployed this fundamental link between national prowess and space technology in similar ways. For emerging global players such as China and India, space exploration represents one of a constellation of important ways with which to announce their “arrival” as global powers: upon the launch of their first lunar probe, for example, Chinese space scientist Ouyang Ziyang noted that, “[a]s lunar exploration embodies our overall national strength, it is very significant for raising our international prestige and our national unity.”²⁴ The media hype over a possible Asian space race among China, Japan, and India in recent times is one symptom of this belief in “raising” prestige on a global level; the overtly nationalist rhetoric about the meaning of space exploration for the youth of the nation—as was seen with the domestic coverage of cosmonaut missions from Malaysia and South Korea—was another.²⁵

JUSTIFICATIONS

The fourth dimension of the public articulation of national space programs are best described as justifications. Space exploration—especially the kind that involves developing a domestic space transportation system—requires enormous investments in resources. As such, articulation of any particular space event, whether in real time or in retrospect, demands a variety of rationalizations not only to justify but also to explain the event. Historically, most other major and mature technological systems of the 19th and 20th centuries, especially ones that have developed over a period of a half a century (such as urban electrical systems, air travel, high speed rail, telephone networks, and television systems) have not required the kind of concomitant justifications that are *de rigueur* in discussions about space travel. While the benefits of these other systems—in the form of social welfare or profit or both—have been seen self-evident, in the case of space travel, social benefits and material gain continue to be issues of debate

24. Jim Yardley, “China Sends Its First Probe for the Moon Into Space,” *New York Times*, October 25, 2007.

25. Both Malaysia and South Korea paid the Russian Space Agency to launch individuals from their respective nations into orbit on board a Soyuz spacecraft for short visits to the International Space Station. See Azura Abas and Nisha Sabanayagam, “First Malaysian in Space: Angkasawan to Inspire Schoolkids,” *New Straits Times Online*, October 11, 2007, http://www.nst.com.my/Current_News/NST/Thursday/Frontpage/2057731/Article/index_html (accessed February 29, 2008); “Malaysians over the Moon as Their Astronaut Blasts into Space,” *Space Travel: Exploration and Tourism*, October 10, 2007, http://www.space-travel.com/reports/Malaysians_over_the_moon_as_their_astronaut_blasts_into_space_999.html (accessed February 29, 2008); Cho Jin-Seo, “Sputnik and Arirang: 50 Years of Space Exploration and Korea,” *Korea Times*, October 8, 2007, http://www.koreatimes.co.kr/www/news/tech/2007/10/129_11545.html (accessed February 29, 2008).

rather than unquestioned axioms. As a result, discussions surrounding national space programs have remained inseparable from invocations of justifications.

Historian Roger Launius has described the various rationales put forth justifying the cause of space exploration: survival of the species, national pride, national security, economic competitiveness, and scientific discovery.²⁶ To these five, I would add “benefits to the populace” as a sixth set of justifications. These justifications are central to space narratives because they preemptively try to insulate discussions about space travel from critiques both internal (i.e., domestic and institutional) and external (i.e., international and public). Without dispensing judgment on the validity of these justifications, it is clear that they play a critical role in the discourse about space exploration, one that is so deeply ingrained that we hardly even think it odd that there should be any suggestion that we not have to justify spaceflight.

Justifications for spaceflight have been historically contingent; different historical periods required different justifications to be accentuated. Moments of perceived crisis, for example tend to privilege some justifications over others. In the initial collective national anxiety following Sputnik, the *raison d'être* of the American space program was framed in discourses of national pride and national security. These justifications were particularly effective in the 1960s, the former for Apollo and the latter for various military and intelligence space projects. The other three justifications—economic competitiveness, survival of the species, and scientific discovery—were at the forefront in the post-Apollo years when the American space program was more mature but also more directionless in the inevitable letdown after the Moon landings.

The crisis of the post-Apollo years—in the aftermath of a costly foreign war, an energy crisis, and a space program without a vision matching Apollo—generated enormous discussion about the practical costs and benefits of the space program.²⁷ As indifference to the space program mounted in the 1970s, NASA sought to attract positive attention to its cause by emphasizing the rewards of space exploration, benefits beyond the clichés of Tang, Teflon, and Velcro—none of which were developed by NASA but which had become comedic counterpoints to the perceived majesty of Apollo. The Agency also devoted significant resources to advertising its efforts to transfer the benefits of space travel to taxpayers; in 1962, it created the Technology Utilization Program, and, since 1976, it has published the annual *Spinoff* volume. What is the purpose of preparing this publication? According to NASA:

26. Roger D. Launius, “Compelling Rationales for Spaceflight: History and the Search for Relevance” in *Critical Issues in the History of Spaceflight*, eds., Steven J. Dick and Roger D. Launius (Washington, DC: NASA, 2006), pp. 37–70.

27. For a lengthy discussion of how the writing of American space history was also affected by the rise and fall of Apollo, see Siddiqi, “American Space History: Legacies, Questions, and Opportunities for Further Research” in *Critical Issues in Space History*, pp. 433–480.

it is a convincing justification for the continued expenditure of NASA funds. It serves as a tool to educate the media and the general public by informing them about the benefits and dispelling the myth of wasted taxpayer dollars. It reinforces interest in space exploration. It demonstrates the possibility to apply aerospace technology in different environments. It highlights the ingenuity of American inventors, entrepreneurs, and application engineers, and the willingness of a government agency to assist them. And finally, it continues to ensure global competitiveness and technological leadership by the United States.²⁸

One striking aspect of these justification narratives is that they have been deployed in support of space programs regardless of the nature of the political system in question: nations that are vibrant democracies use the same kind of justifications as those nations where large portions of the popular are politically disenfranchised. For example, while the Chinese space program has no immediate counterpart to NASA's Commercial Technology Program, it does frequently articulate very similar justifications about its own growing space program. In a white paper on the Chinese space program prepared in 2000, the foremost rationale of the Chinese space program was laid out as such:

The Chinese government attaches great importance to the significant role of space activities in implementing the strategy of revitalizing the country with science and education and that of sustainable development, as well as in economic construction, national security, science and technology development and social progress. The development of space activities is encouraged and supported by the government as an integral part of the state's comprehensive development strategy.²⁹

China's democratic neighbor, Japan, has communicated similar rationales, albeit ones that have changed over the decades with the evolution of the Japanese economy and industry. If in the 1970s and 1980s the space program was rationalized by the need to keep the Japanese economy competitive and its industry robust, by the early 2000s the justifications for space exploration incorporated a new motive: the security of the Japanese people from natural disasters and global environmental degradations. Perhaps responding to the perception that the Japanese public "is becoming increasingly skeptical of

28. "History of Spinoff," <http://www.sti.nasa.gov/tto/spinhist.html> (accessed February 29, 2008).

29. Information Office of the State Council, "White Paper on China's Space Activities," <http://english.peopledaily.com.cn/features/spacepaper/spacepaper5.html> (accessed February 29, 2008).

claims that the space program will produce major economic benefits,” the Japan Aerospace Exploration Agency (JAXA) issued a 20-year vision statement in 2005.³⁰ In it, the Agency emphasized goals that were reiterated by JAXA President Keiji Tachikawa in an annual message:

I feel that Japan’s space program can contribute more to the safety and security of the Japanese people. I hope that JAXA will actively bear responsibility to follow this lofty goal and space development leads to greater safety and security for all mankind, from our daily lives to emergency situations.³¹

Tachikawa’s message is emblematic of a general shift in justifications characteristic of all the major global space programs, one that equates a concern for the welfare of the environment with important social benefits. All national space programs—both major and minor—now pay lip service to critical environmental issues such as global warming, deforestation, land erosion, earthquake prediction, and disaster warning. Such rationales have begun to augment and replace Cold War-centered justifications that centered largely around prestige and national security.

The justification tropes, then—whether arguing for survival of the species, national pride, national security, economic competitiveness, scientific discovery, or benefits to the populace—serve to provide a foundation for which to discuss the very possibility of space exploration. Because of its extremely high costs and attendant high risks, nations have had to frequently and insistently justify the existence of space programs; thus, justifications are not simply extraneous rhetoric but have become intrinsic to our future visions of space exploration.

CONTESTED VISIONS

Each of these four elements that form the core of space exploration narratives—the founding fathers, the notion of indigeneity, connecting spaceflight with national identity, and the need for justifications—are contested and mutable. In each case, there are actors who seek to displace or destabilize the master narratives.

Perhaps the most rancorous disagreements have been over the founding father archetypes and the claims of indigeneity. In the former case, the U.S. space program is somewhat of an anomaly. A plausible candidate for a founding father is the rocketry pioneer Robert Goddard who designed, built, and

30. The quote is from Steven Berner, *Japan’s Space Program: A Fork in the Road?* (Santa Monica, CA: RAND Technical Report TR-184, 2005), p. 30.

31. “Message from President of JAXA,” http://www.jaxa.jp/about/president/index_e.html (accessed February 29, 2008).

launched America's first liquid propellant rocket in 1926.³² Despite Goddard's quite significant technical achievements in rocket development in the interwar years, however, he had little or no influence on the birth of the American space program, having passed away in 1945. And although his place in the pantheon of original space visionaries is secure, his contributions to spaceflight in the American context have been overshadowed by those of Wernher von Braun.

For many reasons, von Braun does not fit the typical mold of the founding father: he was originally German, he did not "found" the American space program, and he had little or no influence on the development of U.S. spacecraft. Yet he and his biographers, based upon his undeniably significant achievements, have positioned him—some would say very successfully—as one of the most iconic, if not *the* most iconic non-astronaut figure in the history of the American space program.³³ The fact that rockets designed under von Braun's direction launched the *first* U.S. satellite, the *first* American into space, and the *first* American to the Moon are important touchstones in his legacy; arguably, all of these achievements are overshadowed by von Braun's charisma and larger-than-life charms as a public figure in the 1950s and 1960s. Besides the astronauts, no individual in the public eye during that time personified the ingenuity, daring, and resourcefulness required to send humans to the Moon than Wernher von Braun.

Von Braun's legacy has been a contested one. Within the historical community, disagreements have raged over his alleged complicity with the forced labor at Dora during World War II.³⁴ Another debate has centered on his proper place in the history of the U.S. space program: for many years, von Braun's "rocket team" was square and center in the American space narrative that began with the capture of V-2 rockets at the end of World War II and ended with Apollo 11. A group of influential historians invested in maintaining von Braun's legacy have ensured the continuing prominence of this narrative (often called the "Huntsville School" of historiography), one that traces the roots of the American space program, particularly the Apollo project, to the V-2 rocket and its brilliant designers in Germany during the interwar years. In this narrative, which has had a near-impervious hold on the public perception of the American space program, the so-called German rocket team who were

32. David A. Clary, *Rocket Man: Robert H. Goddard and the Birth of the Space Age* (New York, NY: Hyperion, 2003).

33. For the many sympathetic and often hagiographic biographies of von Braun, see Erik Bergaust, *Wernher von Braun: The Authoritative and Definitive Biographical Profile of the Father of the Modern Space Age* (Washington, DC: National Space Institute, 1976); Ernst Stuhlinger and Frederick I. Ordway, III, *Wernher von Braun, Crusader for Space* (Malabar, FL: Krieger, 1994); Bob Ward, *Dr. Space: The Life of Wernher von Braun* (Annapolis, MD: Naval Institute Press, 2005).

34. Michael J. Neufeld, "Wernher von Braun, the SS and Concentration Camp Labor: Questions of Moral, Political, and Criminal Responsibility," *German Studies Review* 25, no. 1 (February 2002): 57-78.

brought to the United States in the aftermath of World War II played a singular and critical role in taking America to space and eventually to the Moon.³⁵ Although there has been a stream of recent scholarship highlighting more indigenous sources of innovation in the American context—such as the Jet Propulsion Laboratory and Reaction Motors—there continues to be a large divide between historians’ understanding of the role of von Braun in the early U.S. space program and laypeople’s perception of the same topic.³⁶

Perhaps the most contested aspect of national space history narratives is the issue of indigeneity. Every single space power has made a claim for indigenous origins of expertise, technology, and competence, and for every one of these claims, there exist counter-claims. In the American case, there are competing schools centered on German and more homegrown contributions. Similar arguments over German help have raged over the birth of the Soviet space program. The “second-rank” space powers all have comparable disputes over their stories of origin. We find obvious parallels in claims made for the development of atomic energy by various nations. At least one recent scholar of the history of atomic energy has begun to question the hermetically sealed nature of these nation-centered narratives. Writing on the history of nuclear power, historian Itty Abraham has noted that “practically no state travelled alone.”³⁷ He adds:

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 . . .³⁸

35. For an erudite analysis of the Huntsville School, see Roger D. Launius, “The historical dimension of space exploration: reflections and possibilities,” *Space Policy* 16 (2000): 23–38.

36. For von Braun-centered works embodying the Huntsville School, see, for example, Willy Ley, *Rockets, Missiles, and Men in Space* (New York: Viking Press, 1968); Ordway, III and Sharpe, *The Rocket Team*; Wernher von Braun, Frederick I. Ordway, III, and Dave Dooling, *History of Rocketry and Space Travel* (New York: Thomas Y. Cromwell, 1986); Ernst Stuhlinger, Frederick I. Ordway, III, and Wernher von Braun, *Crusader for Space*, 2 vols. (Malabar, FL: Robert E. Krieger, 1994). For syntheses that take a more balanced approach to U.S. space history, see T. A. Heppenheimer, *Countdown: A History of Space Flight* (New York: John Wiley & Sons, 1997); William E. Burrows, *This New Ocean: The Story of the First Space Age* (New York: Random House, 1998).

37. Itty Abraham, *Making of the Indian Atomic Bomb: Science, Secrecy, and the Postcolonial State* (London: Zed Books, 1998), p. 9.

38. Abraham, “The Ambivalence of Nuclear Histories.” See also his “Notes Toward a Global Nuclear History,” *Economic and Political Weekly* 39 nos. 46–7 (November 20, 2004): 4,997–5,005.

The available evidence points strongly to similar processes of knowledge flows in the evolution of ballistic missiles and space technology.³⁹ Every nation engaged in this technology has been a proliferator and has benefited from proliferation; this process of proliferation already 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 the United States, generated the first substantive exchange on topics related to rocketry and space exploration.⁴⁰ 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 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 to the Japanese. By the mid-1970s, the “space club” included all of the countries, joined in the 1980s by India and Israel who depended on flows from the United States and France respectively. 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.

CONCLUSIONS

The public awareness of spaceflight as an endeavor fundamentally associated with nations will remain unchanged for the foreseeable future. This relationship depends on a number of factors that are unlikely to alter soon; these include the perception of a powerful relationship between science and technology and nationalism; and an understanding of the high costs of space exploration that have impeded non-state actors in investing in such activities. In the latter case, the promise of private spaceflight remains only a promise; even if the sector develops into a vibrant industry in the next decade or so, private spaceflight will represent a very small portion of the overall space projects of any given nation. In perception at least, the major space projects such as human spaceflight and deep space exploration—executed by federal agencies such as NASA—will dominate. And while the creation, maintenance, and expansion of the ISS represents a striking case of international cooperation on a global scale, it is too early to say whether the ISS will serve as a harbinger of future international cooperation; it might well be remembered as a historical anomaly

39. For an ahistorical but useful and recent take on space technology transfers, see Mike H. Ryan, “The Role of National Culture in the Space-Based Technology Transfer Process,” *Comparative Technology Transfer* 2 no. 1 (2003): 31–66.

40. Siddiqi, *Red Rockets’ Glare*.

rather than as a precedent for future international cooperation. President George W. Bush's announcement of a new Vision for Space Exploration (VSE) that mandates a termination of American activities involving the ISS sometime around 2016 suggests that, on a tangible level, the most powerful and capable spacefaring nation on the globe is rejecting a global cooperative vision of human spaceflight in favor of a unitary national imperative.⁴¹ There are many complex geopolitical, technological, and cultural reasons for taking this path, but from the perspective of public rhetoric and public understanding of the future of spaceflight, the VSE has unambiguously reinforced the link between the nation and spaceflight.

I have argued that there are four elements ubiquitous in the public conception of any national space program: the iconography of a founding father, the claim of indigency, the link with national identity, and the necessity of justifications. It is doubtful that any of these four rhetorical archetypes will recede in importance in the near future. Barring a fundamental change in the link between the projection of national prowess and science and technology, there is little chance that we will see the founding father trope disappear or claims of indigency recede. And unless space exploration becomes cheap or immensely profitable—a distant possibility—we may not soon see any need to reduce or eliminate the need for justifications in considering the topic of national space travel. On the other hand, there is a probability that public discussions about national space programs will accrue other characteristics, including, paradoxically, an appeal to a global imagination. There are already a few singular achievements in the history of spaceflight that could be described in terms of universal import, i.e., achievements of a national space program that have relevance to the people of the Earth itself. These undertakings would include the launch of Sputnik (the first human-made object in orbit), the mission of Yuri Gagarin (the first human in space), and the landing of men on the Moon (the first humans on another planetary body). One might also include the flotilla of robotic spacecraft sent out to deep space, to the inner and outer planets, and ultimately out of the solar system. On some level, these spacecraft represent artifacts that transcend national ownership.

I believe that significant global firsts and the capability to exit near-Earth space can be construed as benchmarks for a national space program to rise to a new level and claim global significance. Until now, only two nations have achieved that capacity: the former Soviet Union and the United States. The

41. "President Bush Announces New Vision for Space Exploration Program," <http://www.whitehouse.gov/news/releases/2004/01/20040114-3.html> (accessed February 29, 2008); Marcia S. Smith, *Space Exploration: Issues Concerning the "Vision for Space Exploration,"* CRS Report for Congress RS 21720, revised June 9, 2005, <http://openers.com/getfile.php?rid=51025> (accessed February 29, 2008); Carl E. Behrens, *The International Space Station and the Space Shuttle*, CRS Report for Congress RL33568, revised November 9, 2007, <http://openers.com/getfile.php?rid=59204>.

language of global significance has been deployed frequently by commentators to characterize a few singular achievements—Sputnik, Gagarin, and Apollo being the most obvious ones—since the beginning of the space era in 1957. Arguably, some other nations or international agencies, including the European Space Agency (ESA) and Japan, can make a claim to have performed acts with comparable significance, particularly in the area of planetary exploration.⁴² And although China has a vibrant and diversified space program, until now it has only repeated actions done by others. But as more nations begin to become vibrant space powers capable of achieving critical “firsts” in the history of space exploration and equally capable of sending their handiwork out into deep space, we will probably see a rise in the kind of rhetoric we saw during the times of Apollo. In that sense, we may be soon witness to an interesting rhetorical clash between the national and the global—and at this point, it remains to be seen how that tension will play out.

42. ESA has directed and participated in a number of ambitious and path-breaking deep space exploration projects, including missions to Halley’s Comet (Giotto, launched in 1985), Mars (Mars Express, 2003), the Moon (SMART 1, 2003), minor planets (Rosetta, 2004) and to Saturn’s moon Titan (Huygens, 1997). Similarly, Japan has implemented a modest series of deep space missions since the 1980s including missions to Halley’s Comet (Sakigake and Suisei, both 1985), the Moon (Hiten in 1990, Kaguya in 2007), the minor planets (Hayabusa, 2003), and Mars (Nozomi, 1998). See Asif A. Siddiqi, *Deep Space Chronicle: A Chronology of Deep Space and Planetary Probes, 1958-2000* (Washington, DC: NASA, 2002).

CHAPTER 3

BUILDING SPACE CAPABILITY THROUGH EUROPEAN REGIONAL COLLABORATION

John Krige

On September 26, 2007, the widely distributed daily *USA Today* published a special feature on the dawn of the Space Age. It devoted more than a full page to the launch of Sputnik and to the conquest of space, more than a week before the 50th anniversary of the Soviet achievement. *USA Today*, obviously trying to steal a march on its competitors, also wanted to intervene in current debates on American space policy, as the title of the feature, “Lost in Space,” made clear. *USA Today*’s approach was dominated by two themes: the U.S. vs. Soviet competition in the space race, of which the newspaper gave a blow-by-blow chronological summary, and which ended victoriously when Neil Armstrong stepped onto the Moon; and the frustration of “those who were involved at the beginning and others who are key to future explorations”—pioneers and visionaries who were concerned that the United States had no long-term and sustainable space policy. The feature in *USA Today* thus provided both an historical and a policy-oriented intervention, an attempt to define a past and to use that representation of the past to shape the future.

I do not draw attention to this article because I deem it to be representative; indeed, a thorough, comparative analysis of how the launch of Sputnik and its aftermath were depicted in the world’s press 50 years later awaits scholarly attention and will, I am sure, be most illuminating. It interests me because it embodies some of the typical traps that lie in wait for those of us who set out to “Remember the Space Age.” Three of these are particularly striking.

Firstly, *USA Today* shrunk the content: the Space Age is reduced to human space flight and the competition for space firsts between two superpowers. While this focus is understandable in a popular daily newspaper, it is also regrettable. It is understandable since human spaceflight is a feature of the conquest of space that continues to inspire the public’s imagination. It is regrettable because people are not becoming educated about the other dimensions of space (i.e., space for science, space for applications both civil and military, and space as a means for building high-tech industry and national competitiveness in the aerospace sector). Public support for human space exploration may be, according to Roger Launius in the same edition of *USA Today*, “a mile wide

and an inch deep.” But it is surely our task as scholars to criticize this obsession with human spaceflight—however important it may be to maintaining NASA’s momentum—and draw the public’s attention to the many other reasons for a major technological nation to have a space program. In remembering the Space Age, we must uncouple the conquest of space from the always-contested domain of human space exploration in order to recognize that that conquest has multiple dimensions that range from stimulating basic science and engineering to national security applications.

Secondly, in the article in *USA Today*, the history of the Space Age shrinks geographically: the commemorative article is entirely Americo-centric. Even though Soviet feats are mentioned, their context is how they impacted the United States and provided the challenge that stimulated the U.S. response. Such an approach is misleading in many ways. For one thing, it completely overlooks the fact that human spaceflight is no longer at the core of superpower rivalry and the associated ideologies of leadership and “domination” that went along with this competition. On the contrary, human spaceflight is increasingly seen as an international, collaborative venture in which America’s partners—including its previous Cold war rival—play a critical role. This narrow Americo-centrism also ignores the fact that some major space efforts, such as that typically occurring in Western Europe—my concern here—have never included their own transport system for human spaceflight, nor attempts to compete with the two superpowers in this domain. (The project to develop the space plane Hermes was a brief but quickly abandoned effort to do just this: its rejection reinforces my point.) If we remember the Space Age through the prism of countries other than the United States, human spaceflight assumes an entirely different and far less central significance. The conquest of space is also seen to be driven by concerns other than the competition for “leadership” between two Cold War rivals. It is time that the American public understand that America’s ongoing activity in human spaceflight requires genuine partnership in ways that were inconceivable 20 years ago. The article in *USA Today* gives no indication of this context.

Thirdly, in the feature in *USA Today*, the history of the Space Age shrinks in time: it is confined to the first decade or so from the launch of Sputnik in 1957 to the first steps on the Moon in 1969. This narrowing of temporal context is obviously related to the two previous points. Such an approach is acceptable as long as one realizes that the events in that period were driven by an historically specific agenda that was not respected in other domains of space or, indeed, even in the domain of human spaceflight in the U.S. beginning in the 1970s. While this may seem trivial on first blush, it is not so when we consider that serious policy prescriptions may be based on the assumption that the way to redynamize the space program is to reconstruct in the present day the situation that prevailed in the late 1950s and 1960s. These arguments conclude, in effect, that only competition with a rival superpower (and China is

the prime candidate looming over the horizon) can imbue the American space program with new vitality. The point I want to stress is simply a variant of the one I made earlier: the visionaries and pundits who complain that the United States is “lost in space” need to start thinking about how to find useful ways of collaborating with other nations who have developed important space programs instead of remaining frozen in an obsolete mental framework dominated by the paradigm of Cold War rivalry.

Perhaps I have devoted too much time to one newspaper article that was never intended to be comprehensive or analytically rich. However, it is a useful and accessible source for making a more general point: all historical analysis is necessarily partial and selective. Efforts to imbue historical accounts with universality are not simply methodologically flawed. They also stifle our critical capacities while dominating our perception of the past and our definition of what the future should look like. When remembering the Space Age, we should not shy away from admitting the complexity and diversity of the space effort nor pretend that the view of the world from Washington is the only view worth recording. Our watchwords should be disaggregation and contextualization. We should emphasize the heterogeneity of space programs and explore the diversity of space policies as they evolved at the national, regional, and global levels. Over the past 50 years the conquest of space has followed different rhythms, been driven by different motives, and had a different physiognomy inside each spacefaring nation and region, as well as between them. That may make for a messy story, from which it is difficult to draw general policy implications. So be it. Surely one of the most important lessons of history is that we must grasp the past in its specificity in order to understand the present and think intelligently about the future.

THREE DISTINGUISHING FEATURES OF THE EUROPEAN COLLABORATIVE SPACE PROGRAM

It is time for me to turn away from these warnings and to focus on the European space program, which is the subject of this paper. My central claims are three. Firstly, Western European space projects have contributed to building a regional capability and identity. That identity is embedded in institutions and practices that brought together (mostly) men from separate European nation states and had them work in partnership around scientific and technological projects that their governments were willing to pursue at a collaborative level. The kind of project that was suitable, and the form of collaboration embarked upon, usually did not have immediate strategic significance for these national governments. European identity was not forged around space *tout court*, but around certain space projects that, it was believed, preserved or even advanced the ability both to build Europe and to secure key national interests.

My second main point is that this construction of regional identity was possible because of a combination of shared political, technological, and industrial objectives that were defined in the 1960s and 1970s. At that time, European integration was an important component of foreign policy, the European space science and engineering community was small and inexperienced, and European firms were novices in space technology and, above all, in systems engineering and project management. Space served as a scientific and technological platform around which to build Europe because of the cost, complexity, and industrial challenges it engaged. Integration was a solution to structural weaknesses that many, though not all, European nation states believed they could not overcome by “going it alone.”

My third point is that the United States played a key role in constructing and consolidating regional capability and identity. This may seem counterintuitive. It is obvious that many people in Europe, particularly today, regard the United States as an overbearing hegemon that unilaterally tries to impose its political, technological, commercial, and cultural values on friend and foe alike, resorting to force if needed to achieve its objectives. Many in the European space sector share that view, or some variant of it, in regard to the current situation. However those same people are the first to recognize the crucial role played by NASA and the United States in helping Europe get on its feet in the space sector in the first couple of decades following Sputnik. Some put this down to American generosity and to a sense of shared historical and cultural ties. The United States, President Eisenhower once said, “was related by culture and blood to (the) countries (of) Western Europe and in this sense is a product of Western Europe.” Similarly, for McGeorge Bundy, a National Security Adviser to President Kennedy, the European peoples were “our cousins by history and culture, by language and religion.” If here the personal and the cultural are stressed, on other occasions the political is the focus. For example, when Bundy was asked why he favored the postwar reconstruction of a united and “independent” Europe—since, after all, “great states do not usually rejoice in the emergence of other great powers”—his response was unequivocal: “The immediate answer is in the current contest with the Soviet Union.”¹ For Washington, a strong united Europe built on a solid scientific and technological base would bring with it the economic prosperity and political stability essential to maintaining democracy among America’s allies. European integration would act as a bulwark against communist expansion on the continent and, through NATO, help take the burden of the defense of the region off the back of the United States. In pursuit of these and related policies, NASA acted as an arm of American diplomacy in the 1960s and 1970s, and, along with the State Department, played a crucial role in fostering a collaborative European space

1. Cited in John Krige, *American Hegemony and the Postwar Reconstruction of Science in Europe* (Cambridge, MA: MIT Press, 2006), pp. 254, 255.

program and, in so doing, contributed to the building of a regional European identity.

In the remainder of this paper, I want to flesh out these claims in more detail and lay bare the poles around which the European space program has been built. In addition, I want to emphasize the very different shape the program has assumed as compared to the American program. The Space Age, as I insisted earlier, is not all of a piece, and is certainly not to be collapsed into those highly visible and exotic features that so often dominate the public debate and the public face of the American space program.

THE RELATION OF THE CIVIL AND THE MILITARY

Walter McDougall has claimed that, when NASA was launched, the separation of military and civilian activities was increasingly artificial in the age of scientific warfare and total Cold War. Even scientific programs, under a civilian agency, were tools of competition in so far as an image of technical dynamism was as important as actual weapons. The space program was a paramilitary operation in the Cold War, no matter who ran it. All aspects of national activity were becoming increasingly politicized, if not militarized.²

McDougall was of course deeply aware of the technological, political, industrial, and cultural dimensions of superpower rivalry. In addition, he was disturbed by what he saw as the corresponding militarization of every facet of American life in an age of what Eisenhower called “total cold war.”³ But even if we insist on drawing the distinction between the civilian and the military more finely than he did, there is no doubt that space was and is fundamental to national security, notably during the Cold War. As Paul Stares pointed out in 1985, about two-thirds of all satellites launched in the first 25-odd years after Sputnik by the United States and the Soviet Union were for military purposes. The fiscal year (FY) 1984 U.S. military space budget alone was about \$10.5 billion in current dollars—about half of the total American space budget.⁴ The apparatus of the national security state will ensure the future of spaceflight in the United States for multiple forms of reconnaissance whether or not there is a moonbase or a mission to Mars. In fact, one may go so far as to say that all major space programs are, to some extent or another, parasitic on governments recognizing the military potential of space. Without that military dimension, they would never be willing to invest the billions of dollars of taxpayers’ money

2. Walter A. McDougall, . . . *the Heavens and the Earth. A Political History of the Space Age* (Baltimore, MD: Johns Hopkins University Press, 1985), p.174.

3. Kenneth Osgood’s *Total Cold War. Eisenhower’s Secret Propaganda Battle at Home and Abroad* (Lawrence, KS: University Press of Kansas, 2006) described the many dimensions of this phrase.

4. Paul B. Stares, *The Militarization of Space. U.S. Policy, 1945-1984* (Ithaca, NY: Cornell University Press, 1985), p. 14.

needed to establish and to maintain a major presence in space and, above all, to acquire independent access to space.

That said, the situation has to be nuanced. Certainly Britain and France embarked on space programs in the 1950s and 1960s that owed much to their military ambitions (and, in the case of France, to a considerable influx of technical personnel from ex-Nazi rocket programs).⁵ Both countries were medium-sized, technologically dynamic powers that sought to maintain their global influence as their empires withered. Both sought independent nuclear deterrents and their appropriate delivery systems, and both were in a position to deploy engineering skills, hardware, and production techniques acquired in laboratories, design shops, testing grounds, and industries for both civilian and military purposes. It is also true that the earliest experiments in the upper atmosphere with sounding rockets were only possible due to the military infrastructure, be it at Woomera in South Australia for the British, at Hammaguir in the Sahara for the French, or in Sardinia for the Italians.⁶

All the same, as the collaborative European space program began to take shape, a distinct effort was made to distance it from the military. One of the reasons for this was the personalities and priorities of the main protagonists of a joint European effort.⁷ These were not government officials but cosmic ray physicists turned scientific statesmen, one Italian (Edoardo Amaldi), the other French (Pierre Auger). Amaldi and Auger were among the founders of the European Organization for Nuclear Research (CERN), a particle physics laboratory established in Geneva in 1954. Both firmly believed that the only way that European “big” science and technology could compete with the United States was if governments pooled their resources (financial, industrial, and skilled) in collaborative efforts. Both men had strong support in the highest level of national administrations where senior bureaucrats saw promising careers in joint European scientific and technological activities. Both deplored the militarization of scientific research in Cold War America, and both were extremely concerned by the proposals, emanating from the newly-formed NATO Science Committee directed by Fred Seitz, that NATO should take the initiative and build a European satellite. In short, the first push for a European

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5. For Britain, see Harrie Massey and M. O. Robins, *History of British Space Science* (Cambridge: Cambridge University Press, 1997). For France, see France Durand-de Jongh, *De la fusée Véronique au lanceur Ariane. Une histoire d'hommes, 1945-1979* (Paris: Stock, 1998).
 6. For the military significance of early sounding rocket work, see David H. de Vorkin, *Science with a Vengeance. How the Military Created the US Space Sciences after World War II* (New York, NY: Springer, 1992).
 7. The story is told in detail in John Krige and Arturo Russo, *A History of the European Space Agency, 1958–1987*, Vol. 1 *The Story of ELDO and ESRO, 1958–1973* (Noordwijk: European Space Agency Special Publication-1235, 2000). For the later period, John Krige, Arturo Russo, and Lorenza Sebesta, *A History of the European Space Agency, 1958–1987*, Vol. 2 *The Story of ESA, 1973–1987* (Noordwijk: European Space Agency Special Publication-1235, 2000).

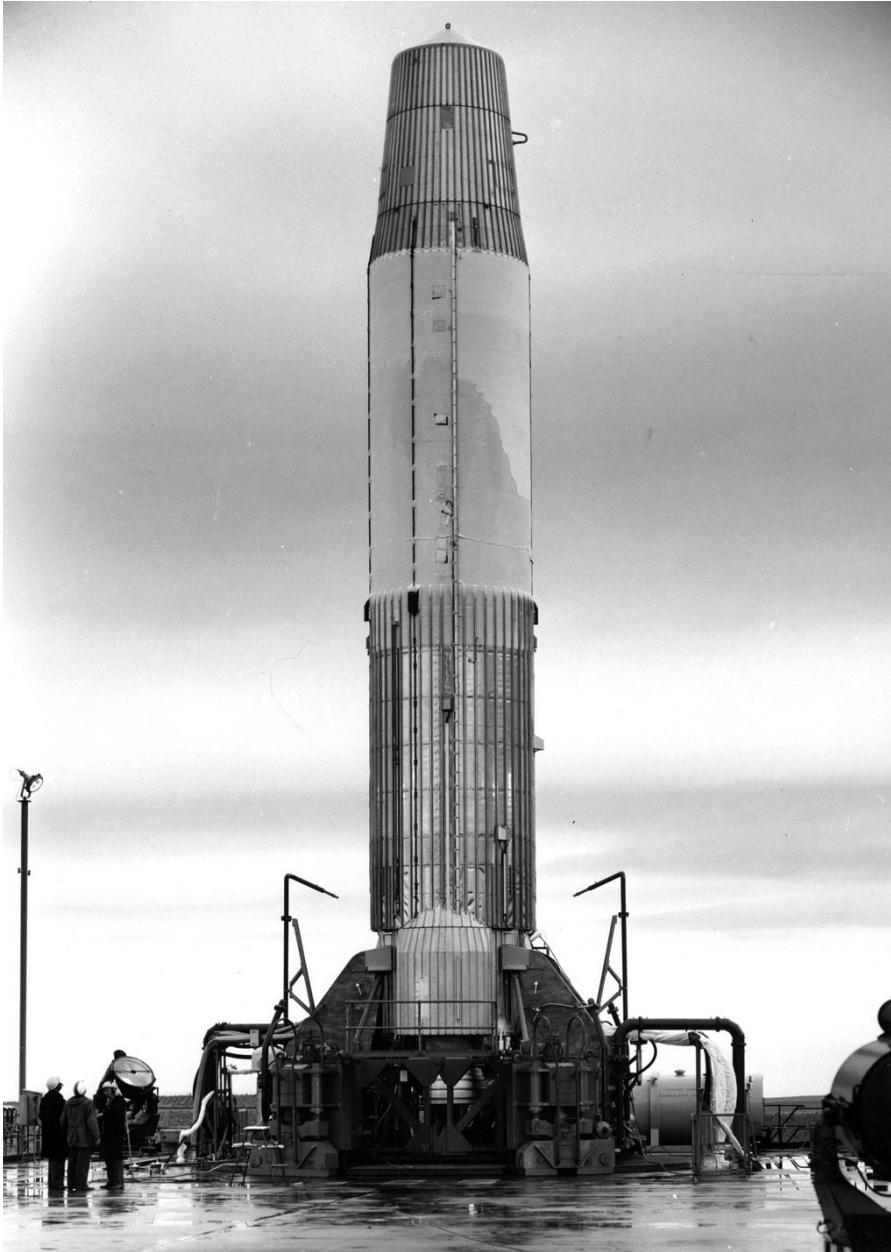
space effort was made precisely by people who were determined that it should be free from military control and independent of military funding.

These ambitions dovetailed with those of the potential member states of any future European space organization. Collaborative programs in the military sphere were politically impossible. For the British, to do so would mean jeopardizing their special relationship with the United States and the privileged access to military technology that that gave them. For the French, it would mean diluting sovereignty at the very moment when President de Gaulle was in no mood to be tied by obligations to European partners that might restrict his development of France's independent strike force (or *force de frappe*). For its part, Germany had to tread with extreme caution in all areas of potential military significance. The memories of two world wars and the role of Germany in provoking them were still fresh. Indeed, the "double containment" of Soviet communism and German nationalism and militarism was another important reason why Washington and its continental allies strongly supported the emergence of a supranational, integrated Europe. A European space effort was not and could not be dictated by military considerations. Its rationale would need to lie elsewhere.

The history of European launchers confirms this point. Amaldi and Auger originally envisioned an organization similar to NASA for Western Europe—an organization responsible for developing both launchers and scientific satellites. This plan was rejected by many countries that, while happy to be part of a collaborative scientific research effort, were not willing to work together to build a launcher (baptized Europa and built under the auspices of the European Launcher Development Organization [ELDO]). This was partly due to cost, but it was also because small countries like Switzerland, whose global weight was intimately associated with its posture of neutrality, deemed launchers as being too close to the military end of the civilian–military spectrum for their government to participate in developing such technology.

The military significance of launchers also partly explains the disastrous failure of the Europa program. This is generally, and rightly, put down to the lack of project management in ELDO and the failure to integrate the three stages of the rocket being built separately in Britain, France, and Germany.⁸ However, even if Europe had had the requisite project management skills—which it did not—the mutual mistrust between the partners and the reluctance of government and industry to let engineers from other countries have access to domestic missile and rocket technology (believed to be a national strategic asset) sabotaged any serious effort at technological integration. Europe learned the lesson. The successful Ariane launcher was not only built under French industrial and management leadership. It was also a product of the civilian

8. Stephen B. Johnson, *The Secret of Apollo. Systems Management in American and European Space Systems* (Baltimore, MD: Johns Hopkins University Press, 2002).



Britain's Blue Streak ballistic missile, designed in 1955 and tested at Woomera test range, Australia. It was used as the first-stage of the European satellite launcher, Europa. (Google Images)

French National Space Agency Centre Nationale des Études Spatiales (CNES) and so financially and formally independent of the French missile program.⁹ I could provide multiple examples, but the point is, I hope, clear: space in Europe was predominantly civil, and whenever that boundary risked being blurred, above all in industry, some countries simply did not participate in that particular aspect of space activities.

SCIENCE AND APPLICATIONS

Science has been a preferred site for international collaboration, at least in times of peace and between traditional allies. Yet, contrary to what one might think, science could not directly bear the weight of building a strong European regional capability in the early years of their space program.

One of the main reasons for this was that bilateral programs with the United States were very attractive and even essential alternatives to multilateral programs with European partners. At the Committee on Space Research (COSPAR) meeting in The Hague in March 1959, the American delegate announced that NASA was willing to fly experiments by foreign scientists on U.S. satellites, even going so far as to help scientists in other countries build an entire scientific payload for launching on American Scout rockets. Several factors informed NASA's policy. It was a tangible expression of the requirement specified in the Space Act of 1958 that NASA foster international collaboration. It could trade on the longstanding tradition of international scientific exchange and mobilize networks and institutions already in place that were familiar with working outside national frameworks. It raised no obvious risks to national security, nor of technological exchange—useful work could be done with relatively simple and inexpensive instruments that perfectly embodied the strategy of “clean interfaces” and “no exchange of funds” that quickly became the hallmark of NASA's international programs.¹⁰ Finally, NASA was particularly interested in seeing that a country from the Western bloc be the first to launch a satellite after the superpowers had done so, a position consistent with the all-pervasive logic of Cold War rivalry that marked every aspect of U.S.–Soviet relations in space contained in the earlier McDougall reference.¹¹ Seen from Europe, where the space science community was small, inexperienced, and

9. Emmanuel Chadeau, ed., *L'Ambition technologique: naissance d'Ariane* (Paris: Rive Droite, 1995); Claude Carlier et Marcel Gilli, *Les trente premières années du CNES. L'Agence Française de l'Espace, 1962 – 1992* (Paris: CNES, 1994).

10. Arnold Wolfe Frutkin, *International Cooperation in Space* (Englewood Cliffs, NJ: Prentice-Hall, 1965).

11. John Krige, “Building a Third Space Power: Western European Reactions to Sputnik at the Dawn of the Space Age,” in Roger D. Launius, John M. Logsdon, and Robert W. Smith, *Reconsidering Sputnik. Forty Years Since the Soviet Satellite* (Chur: Harwood, 2000), pp. 289–307.

fragmented, NASA's offer was a godsend. Indeed, French space scientists are unstinting in their praise for NASA's generosity and support in these early days and recognize that without it their own program could never have taken root and been as successful as quickly as it was. But it had a downside from a European collaborative perspective. Space science was a fragile platform for integration since so much first had to be done through bilateral arrangements with the United States.

The lukewarm enthusiasm in the 1960s for major collaborative space science projects had tangible effects. The European Space Research Organization (ESRO), established along with ELDO, had a pitifully small budget and had great difficulty in developing any major scientific satellite program of its own. The attempt to build a Large Astronomical Satellite that was sufficiently costly and complex to serve as an integrative glue collapsed ignominiously.¹² The point of having a European-based science program at all was vigorously contested by the French in the early 1970s when the future of ESRO, or at least its mission, hung in the balance. It was only saved by reorienting the organization towards application satellites (to the dismay of the scientific founding fathers) and at the insistence of the British, who demanded that science be made a mandatory component in the new ESA that emerged in 1975. This was a sign of the vulnerability of the collaborative science program, not of its strength. At the time it was feared that, if science was made optional like all the other major programs then being agreed on for ESA, it would simply collapse for lack of political and financial support.

One reason for the assault on science in the early 1970s was a determination in Europe, led by the French, to make launchers and application satellites the backbone of the European space effort. The rationale in Paris combined a Gaullist determination to become independent of the United States with a recognition that space not only had important commercial possibilities, but was a crucial domain in which one could hope to close the technological and managerial gap that has opened up between the two sides of the Atlantic. However, France did not entirely get its way. Germany insisted on building Spacelab in collaboration with the United States, and the science program actually became one of ESA's outstanding domains of activity. The fact remains, though, that European foreign and industrial policy are central drivers of the regional space effort, a point that is so important (and which makes Europe so different from the United States) that it deserves further elaboration.

12. John Krige, "The Rise and Fall of ESRO's First Major Scientific Project: The Large Astronomical Satellite (LAS)," in John Krige, ed., *Choosing Big Technologies* (Chur: Harwood, 1993), pp. 1-26.

EUROPEAN SPACE AS AN INSTRUMENT OF FOREIGN AND
INDUSTRIAL POLICY

European foreign policy is expressed in its space policy. Space industry, science and technology provide the material infrastructure that lock governments into formal multilateral agreements. The United Kingdom is the exception that proves the rule as far as the integrative urge is concerned. Britain emerged from the war much impoverished with respect to the United States, but it still remained the leading scientific and technological power in Western Europe. It was the first country after the U.S. and the Soviet Union to test both atomic and hydrogen bombs, it had the first commercial nuclear power reactor dedicated to civilian energy production in the free world, and it built the first commercial jet passenger aircraft.¹³ By virtue of this leadership and its close alliance with the United States and the Commonwealth, it had little interest in collaborative European space efforts. There was just one brief moment when matters were otherwise. In 1960, after some hesitation, Prime Minister Macmillan decided that the time had come to accept that Britain was no longer a major world power and as a result should draw closer to its neighbors across the English Channel. In June 1961, he deposited Britain's request to join the Common Market. While the six existing members of the club debated the terms and conditions of British entry, two major Franco-British aerospace projects were launched. One was Concorde, the supersonic airliner. The other was the Europa rocket to be built by ELDO. In January 1963, President de Gaulle vetoed British entry, arguing that London was not really committed to European integration and that its inclusion would do little more than serve as a Trojan horse for American interests on the Continent. Concorde survived, but Britain's commitment to ESRO and especially ELDO did not. For the British, space policy became something to be conducted primarily at a national level and through multilateral agreements: they would not be tied into a supranational organization in which their control over programmatic decisions would be diminished. The result was predictable: Britain maintains a strong presence in space science, but it is totally absent from rocketry and has a selective approach to the development of applications.

The place of science and technology in German foreign policy is somewhat unique since here the European option was an essential path back into scientific and technological collaboration with its erstwhile enemies.¹⁴ It also relegitimated technological projects in sensitive areas such as nuclear energy and space. The precedent was set in high-energy physics in 1950 when Isidor I. Rabi from Columbia University proposed at a United Nations Educational, Scientific

13. David Edgerton, *Warfare State. Britain 1920-1970* (Cambridge University Press, 2006).

14. Niklas Reinke, *The History of German Space Policy: Ideas, Influences and Interdependence, 1923-2002* (Paris: Beauchesne, 2007). Translated from the German.

and Cultural Organization (UNESCO) meeting in Florence, Italy, that a new European physics laboratory built around big equipment be established and that Germany be included in this venture. This meeting happened just after the West German state had been formed but before it was admitted to UNESCO, when the odor of opprobrium still hung over the German physicists who had stayed behind and worked in Nazi Germany and when research with accelerators was highly restricted by the occupying powers. This change of approach reflected a larger change of tack in U.S. foreign policy. Germany was no longer to be treated as an occupied state and a threat to stability in Western Europe, but as a scientific, technological, industrial, and economic force to be reintegrated back into Europe if its potential for the growth and security of the region and the free world were to be realized. Rabi was party to those debates. For Germany, membership of CERN gave a new legitimacy to its physics community and to research with particle accelerators, in addition to opening the way for its reacceptance into the international scientific community.¹⁵

Ten years later, Germany's national interests in the space sector were served in precisely the same way when it was admitted to ESRO and ELDO. The allies imposed tight constraints on German rocketry after the war. Many of her rocket scientists and engineers fled the country for fear of reprisals, leaving a demoralized, isolated, and restricted community at home. Some hoped to return one day to build up their national space effort: Von Braun and his team are not to be taken as typical of the German engineering community.¹⁶ The regional European option provided a way back for a nation that had been effectively barred from space pursuits for more than a decade. By allowing the German space program to grow under the auspices of a supranational regime, government, industry, engineers, and scientists could once again embark on building the infrastructure for a major space effort at the national, regional, and international levels.

Space policy is not only a matter of foreign policy in Europe; it is also a matter of industrial policy. European nations are not shy in admitting that they work together in space to build a shared industrial infrastructure and the pool of scientific and engineering skills that will enable them better to position themselves competitively in the global market, notably vis-à-vis the world leader, the United States. It must be said that this consideration also has some weight in the United States, even though it is given far less prominence both in the media and in scholarship. Indeed, as the Cold War moved from confrontation to détente, and the two superpowers sought stability in their separate blocs, arguments other than superpower rivalry had to be found to maintain a major space program that could ensure the future of NASA after the Apollo Moon

15. Krige, *American Hegemony*, chapter 3.

16. Michael J. Neufeld, *Von Braun. Dreamer of Space. Engineer of War* (New York: Alfred Knopf, 2007).

landings.¹⁷ One of those arguments, used by Caspar Weinberger in his famous memo to President Nixon in favor of developing the Shuttle, was that it would save jobs in the aerospace sector.¹⁸ Space policy is tightly linked to industrial strength and competitiveness on both sides of the Atlantic, even though this is more obvious in Europe than in the United States.

It is also more explicit. The Europeans have developed the so-called principle of fair return in which the proportion of money contributed by a government to a collaborative program should be the same as the share of technologically significant contracts that flow back to national industry from that program. This policy provides smaller nations with one of their most important incentives for remaining engaged in space since the industrial leaders are “obliged” to include their firms in European-wide consortia to secure contracts through ESA. It also explains the major contributions to the European space program made by countries that were technologically “lagging” behind the rest of Europe in the 1970s, specifically Spain as it recovered from the drag of the Franco regime.

THE TENSION BETWEEN THE REGIONAL AND THE NATIONAL

This paper has stressed the importance of space as an instrument for building a regional capability in Western Europe. That process is not “natural” or spontaneous: it requires ongoing work by scientists, engineers, industrialists, and politicians. Regional agreements require that states dilute their sovereignty, industries build transnational consortia, and scientists take deliberate efforts to construct multinational, multi-institutional collaborative payloads and satellites. In short, the European path is not a necessity for many of the major European states: it is an option. That option will be adopted only after careful consideration and sometimes heated debate and power struggles between interest groups both within nations and between them.

The economic historian Alan Milward has argued, somewhat controversially, that the integration of Europe did not occur at major cost to the sovereignty of the nation state.¹⁹ On the contrary, it was compatible with the rescue of the nation state as a major historical actor. For Milward, the European option involved the pursuit of national interest through instruments and institutions in which the benefits of integration were believed to outweigh the costs. This view has many merits. The application of the principle of fair return

17. Jeremi Suri, *Power and Protest. Global Revolution and the Rise of Détente* (Cambridge: Harvard University Press, 2003).

18. Reproduced in Roger D. Launius, *NASA. A History of the U.S. Civil Space Program* (Malabar, FA: Krieger, 1994), Reading No. 19.

19. Alan S. Milward, *The European Rescue of the Nation State* (London: Routledge, 1992).

nicely illustrates the point. So does the case of postwar Germany, for whom, as we have seen, the European road was a crucial path back into scientific and technological collaboration in sensitive domains. In the early days when most national programs were weak, the loss of autonomy required by supranational integration was, at least for the larger powers, a useful way to acquire the scientific, technological, and industrial capacity needed for an independent national program (that is, if a government eventually decided that it wanted one). In this sense, then, Milward is right. But his argument must be relativized to take account of the changing circumstances under which national space policies were defined in Western European states with the passage of time and the evolving attraction of “going it alone” or working with select partners as national space programs matured.

The ongoing debates over industrial policy illustrate the changing equilibrium between the national and the regional. When ESRO established the principle of fair return in the 1960s, a coefficient of 0.8 was deemed acceptable. Today, however, member states demand a coefficient very close to unity, itself an expression of the enormous weight that they attach to space as an industrial activity in the high-tech sector. Smaller states such as Belgium are particularly emphatic about this since they cannot dream of having significant national space programs of their own, and they justify their participation in space at the political level by the advantages it brings to domestic industry. Larger states see matters otherwise. Fair return was important to France, Germany, and Italy in the 1960s and Spain in the 1970s. By the 1990s, however, a country like France had developed such a broad-based strength in all dimensions of space that were of interest to it, and its government was so committed to the space effort, that it was in a position to go it alone or to work bilaterally with selected partners. Regional collaboration, with the requirement imposed by the fair return principle—that French firms become integrated into transnational consortia, sometimes with partners far less experienced than themselves—turned from an asset into an albatross, especially if there were firms that could do the same job in France itself. Put differently, the stronger a nation becomes, the less interest it has in collaborating meaningfully with others in supranational projects. The political motivations have to override the centrifugal pull of industrial and commercial benefits and the control over programmatic matters that a purely national or loosely collaborative project allows. Regional and international collaboration in advanced technology is not a taken-for-granted given: it has to be constantly sustained if it is to survive.

THE UNITED STATES AND EUROPEAN INTEGRATION IN SPACE

I have discussed at length the role and the interests of the United States in fostering international collaboration in space with Western Europe at two previous NASA conferences.²⁰ I do not want to repeat myself here. The central point to bear in mind is that NASA, in consultation with the State Department and other arms of the administration have, loosely speaking, two modes of interaction with their international partners. One involves sharing: the sharing of data, skills, and technology. The other involves denial of these self-same assets. The boundary between the two is fluid, and NASA may often be unwilling to share a particularly advanced version of a technology, but be quite happy with allowing partners access to an earlier, less sophisticated variant (e.g. inertial guidance technology). The boundary also shifts depending on the domestic situation in the United States, the availability of the technology from other nations, and the strength of potential partners. NASA's role, after all, is to promote both international collaboration and American space leadership. On the face of it, these two goals are contradictory unless the partners are relatively weak and pose no threat to American leadership.

Policy fluctuations between sharing and denial have marked NASA-Western European relations over the last 50 years. In the early 1960s, as I have explained, most Western European countries depended on international collaboration with NASA to acquire the basic skills required to kick-start key parts of their space programs. NASA gladly collaborated, and the Europeans enthusiastically appreciated their gesture.²¹ This willingness to work with Europe was politically easy in science, which was eminently suited to international collaboration and posed no threat to U.S. leadership; indeed, leadership was made manifest in generosity and openness. But it also extended to more sensitive areas like rocket technology when, in 1966, NASA seriously considered offering a wide-ranging package of technological assistance, including cryogenic technology, to keep ELDO afloat. The proposals defined at this time ingeniously respected national security constraints, furthered U.S. foreign policy

20. John Krige, "Technology, Foreign Policy, and International Cooperation in Space," in Steven J. Dick and Roger D. Launius, eds., *Critical Issues in the History of Space Flight* (Washington, DC: National Aeronautics and Space Administration Special Publication-2006-4702), pp. 239-260; John Krige, "NASA as an Instrument of U.S. Foreign Policy," in Steven J. Dick and Roger D. Launius, eds., *Societal Impact of Spaceflight* (National Aeronautics and Space Administration Special Publication-2007-4801).

21. Jacques Blamont, "La creation d'une agence spatiale: les Français à Goddard Spaceflight Center, en 1962-1963," and Jean-Pierre Causse, "Le programme FR1," in Hervé Moulin, *Les relations franco-américaines dans le domaine spatial (1957 - 1975)*, Quatrième rencontre de l'IFHE sur l'Essor des recherches spatiales en France, 8-9 décembre 2005, Paris, France (Paris: Institut Français de l'Histoire de l'Éspace, in press).

interests in the European theater, and made a substantial contribution to European technological development.

As Europe emerged from adolescence to maturity in the space sector beginning in the 1970s, the relationships with NASA became more strained. The unilateral cancellation by Washington of America's contribution to the International Solar Polar Mission (ISPM) has been recounted too often to bear repeating.²² Suffice it to say that it left a bitter taste in Europe and damaged U.S.–European collaboration in space science for many years. Far more significant for the present argument, however, was the (alleged) refusal of NASA and the State Department to launch the Franco–German telecommunications satellite, *Symphonie*. The precise details surrounding the negotiations over the request for this launch in the early 1970s are still the subject of heated controversy and will probably never be resolved.²³ NASA's interlocutors still believe that they imposed no unfair or illegitimate restrictions on providing a launcher for *Symphonie*. The Europeans, and the French in particular, insist that matters were otherwise and that, as negotiations proceeded, the position in Washington became increasingly untenable. All are agreed on one thing: that the conditions imposed on launching *Symphonie*, or more precisely perhaps, European willingness to interpret U.S. behavior as a refusal to launch *Symphonie*, played into the hands of engineers in CNES who insisted that America was not to be trusted and that France (and Europe) had to have their own launcher to guarantee them independent access to space. In other words, politically speaking, Ariane was a child of Washington's perceived denial of launch technology to Europe for its first (experimental?) telecommunications satellite.

The *Symphonie* affair, combined with others like ISPM, and the recent application of the terms of ITAR (International Traffic in Arms Regulations) to the export of space technology are embittering many people in Europe, and undermining the prospects for constructive U.S.–European space collaboration.²⁴ Indeed, in several interviews that I had with European space scientists, engineers, policymakers, and senior government officials in summer 2007, there were repeated complaints about the new constraints on international collaboration and technological sharing in the space sector that have been put in place since 9/11 and of the disastrous effects that ITAR is

22. Roger M. Bonnet and Vittorio Manno, *International Cooperation in Space: The Example of the European Space Agency* (Cambridge MA: Harvard University Press, 1994).

23. Richard Barnes, "Symphonie Launch Negotiations" and the comment by Bignier in Moulin, *Les relations franco-américaines*. See also Arnold Frutkin interview by John Krige, Angelina Long, and Ashok Maharaj, Charlottesville, VA, August 19, 2007, (NASA Historical Reference Collection, History Division, NASA Headquarters, Washington DC); André Lebeau interview, Paris, France, by John Krige, June 4, 2007, (NASA Historical Reference Collection, History Division, NASA Headquarters, Washington DC.)

24. David Southwood interview, Paris, France, by John Krige, July 16, 2007, (NASA Historical Reference Collection, History Division, NASA Headquarters, Washington DC.)

having on international space collaboration and the perception of the United States in Western Europe.

From the United States' point of view, dealing with partners involves striking a delicate balance between the outward push for scientific and technological collaboration and the inward pull of national security concerns—the conflict between sharing and denial. Sharing builds alliances and secures American access to foreign skills. Denial alienates allies, and encourages them to develop their own capabilities and to seek partners other than the U.S. These dilemmas often pit NASA and the State Department against the Department of Defense and other bodies concerned with national security. The management of that tension in the next few years will, I am persuaded, have a major impact on the future of the space programs not only in Europe, but throughout the world. In the meantime, it is ensuring that Western Europe's regional capability and identity as an independent player in space is being reinforced. The vulnerable child of the 1960s is the mature adult of the 21st century who now seeks genuine rather than junior partnership with the United States, along with the mutual political respect and technological sharing that that entails.

CHAPTER 4

IMAGINING AN AEROSPACE AGENCY IN THE ATOMIC AGE

Robert R. MacGregor

Much has been written about the 184-pound satellite lofted into the heavens by the Soviet Union on October 4, 1957. The story is an insidiously seductive one; it is the romantic narrative of a small metal ball usurping the assumed technological authority of the United States. The frenzy of the media and the swift political backlash seem almost comical in light of the diminutive physical size of Sputnik.

The launch of Sputnik was one of the most disruptive singular events in the history of the United States.¹ The temptation to label it a discontinuity is strong. The year following the Sputnik launch saw the formation of the Advanced Research Projects Agency (ARPA), the creation of the new post of Special Assistant for Science and Technology to the President and its associated committee (PSAC), the transformation of the National Advisory Committee for Aeronautics (NACA) into NASA, and the National Defense Education Act (NDEA). Walter A. McDougall in . . . *the Heavens and the Earth: A Political History of the Space Age* traces the roots of technocracy in America to this “spark”:

Western governments came to embrace the model of state-supported, perpetual technological revolution . . . What had intervened to spark this saltation was Sputnik and the space technological revolution . . . For in these years the fundamental relationship between the government and the new technology changed as never before in history. No longer did state and society react to new tools and methods, adjusting, regulating, or encouraging their spontaneous development. Rather, states took upon themselves the primary responsibility for generating new technology.²

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1. For a good overview of the Western reaction to Sputnik see Rip Bulkeley *The Sputniks Crisis and Early United States Space Policy: A Critique of the Historiography of Space* (London: MacMillan Academic and Professional Ltd., 1991).
 2. Walter A. McDougall, . . . *the Heavens and the Earth: A Political History of the Space Age* (Baltimore, MD: The Johns Hopkins University Press, 1985), pp. 6-7.

McDougall has since revised his original argument by noting that the space technological revolution was an “ephemeral episode in the larger history of the Cold War, rather than the Cold War having been an episode in the larger story of the march of technocracy.”³ This revisionism addresses the eventual fate of the space technological revolution. It is the purpose of the current essay to revise the story of the birth of that technological revolution. Specifically, it will be argued that the conception of the Sputnik launch as a discontinuity that ushered in a technocratic revolution in modern America does not fit the historical record. The environment in which the Sputnik crisis unfolded in the United States was already saturated with preconceived, technocratic notions of the relation of science to the state. The crystallization of the new Agency that would become NASA was a process that was both simultaneously instigated by a singular event and followed in the footsteps of institutional ancestors. The two are not mutually exclusive; contingency must be embedded in a framework of continuity. The precursor of the space technological revolution was the Atomic Energy Commission (AEC).

“Technocracy” is a contentious term, with definitions running the gamut from a literal etymological interpretation as “the control of society or industry by technical experts”⁴ to the idolization of science for propaganda purposes by non-scientific bureaucrats.⁵ An attempt at a precise definition is necessarily doomed to failure, but for the purposes of this essay I will adopt McDougall’s definition of technocracy as “the institutionalization of technological change for state purposes, that is, the state-funded and -managed R&D explosion of our time.”⁶ McDougall’s definition captures the key features relevant to the current analysis: massive state funding and intentional control of technological development to serve state purposes. There exist a myriad of other possible definitions, which remain outside the scope of the present argument.⁷

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3. Walter A. McDougall, “Was Sputnik Really a Saltation?” in *Reconsidering Sputnik: Forty Years Since the Soviet Satellite*, ed. Roger D. Launius, John M. Logsdon, and Robert W. Smith (Harwood Academic Publishers, 2000), pp. xviii.
 4. *The Oxford English Dictionary* (New York, NY: Oxford University Press, 1989).
 5. A famous example in space history is Nikita Khrushchev’s shrewd tactical use of spaceflight for internal and external political maneuvering. For an overview of Khrushchev’s manipulation of the space program, see Asif Siddiqi *Sputnik and the Soviet Space Challenge* (Gainesville, FL: University Press of Florida, 2003), especially pp. 409–460.
 6. McDougall, . . . *the Heavens and the Earth*, p. 5.
 7. David Noble in *America by Design: Science, Technology, and the Rise of Corporate Capitalism* (Oxford University Press, 1977) inverts the hierarchy and sees this explosion not as state-centric manipulation, but as a “wholesale public subsidization of private enterprise” to serve the ends of technocratic corporate managers working as government contractors (p. 322). John Kenneth Galbraith in *The New Industrial State* (Boston, MA: Houghton Mifflin, 1967) envisions technocracy as having a decision-making mind of its own within a given institutional constellation, the “Technostructure,” which operates autonomously from corporate or governmental intentions, often to the detriment of the public good. Don Price argues in *The*

The AEC and NASA are far and away the canonical American institutional examples of technocracy under this definition. The similarities on the surface are obvious. Both the AEC and NASA were characterized by geographically dispersed scientific research laboratories operating as scientific fiefdoms in a confederate framework.⁸ Both consolidated to a great extent an entire realm of technology in federal, civilian agencies. Unlike other new technologies, such as the microcomputer or early aviation, both were handed over wholesale to civilian agencies created specifically to oversee them rather than entrusting progress to the military or private sector. In introducing the problem the framers of the Atomic Energy Act faced, AEC historians Richard G. Hewlett and Jack M. Holl noted: “How does one best go about introducing a new technology into society? A familiar problem for large manufacturers, the management of technological innovation was hardly a common function for federal officials, except in the area of regulation . . . in the case of nuclear power, the entire technology was confined within the government.”⁹ This fundamental historical similarity, domination and encapsulation of an entire area of technology by a civilian government agency, is the basis for the current argument.

This paper will examine the links between atomic energy and the processes in the executive and legislative branches that culminated in the signing into law of the National Aeronautics and Space Act on July 29, 1958. While a detailed comparative history of the roles, structures, and functions of NASA and the AEC would immensely contribute to the historical literature, the current analysis will focus more narrowly on the way in which the experience with atomic energy produced unspoken assumptions and shaped the very imagination of politicians of what the new NASA should and could become during the ten-month period from the launch of Sputnik to the passing of the National Aeronautics and Space Act. Specifically, it will be argued that NASA’s rise in the 1960s as an engine of American international prestige was rooted in atomic diplomacy, and that certain debates in Congress about the new Agency

Scientific Estate (Belknap Press: 1965) that the fusion of political and economic power seen in the nuclear and Space Age has corrupted market principles by creating corporations solely dependent on government subsidies, resulting in a diffusion of political sovereignty that threatens the American constitutional order. Finally, no discussion of technocracy in America would be complete without mentioning Frederick Winslow Taylor’s *Principles of Scientific Management* (New York, NY: Harper Brothers, 1911), which called for applying scientific principles to the training and management of workers to replace “rule of thumb” factory methods.

8. Peter J. Westwick in *The National Labs: Science in an American System, 1947-1974* (Cambridge, MA: Harvard University Press, 2003) perhaps borrowing from dialectical materialism stresses that the systemicity of the labs is central to an understanding of their operation. A single national lab cannot exist in isolation; classified journals and conferences and competition for personnel and research programs were central issues that defined the individual labs.
9. Richard G. Hewlett and Jack M. Holl *Atoms for Peace and War* (Berkeley, CA: University of California Press, 1989), p. 183.

were largely approached from within a framework of atomic energy, thereby limiting the range of discourse and influencing the shape of the new Agency.

While NASA grew by orders of magnitude in the 1960s, the features that specifically identified NASA as technocratic were frozen into the bureaucracy in this formative period. The sudden influx of money after Kennedy's famous decision to set NASA's sights on a Moon landing merely inflated NASA's existing latent potential.

THE ROLE OF PRESTIGE

A large debate in the historiography of NASA centers on the question of prestige. Is NASA's mission coincident with or even driven by American political imperialism? How did national prestige come to be measured by a cosmic yardstick? These questions are often posed in light of the two temporal sides of the Sputnik rupture. On the one hand, the Eisenhower administration was seemingly caught unawares of the worldwide impact the launch of Sputnik would have on public perceptions of American strength. On the other hand, John F. Kennedy would soon after catapult his career on the program to send humans to the Moon, a program that "transformed NASA from a scientific research agency into a goal-oriented bureaucracy."¹⁰

In the fall of 1957, high-level officials extrapolated the Sputnik launch into an across-the-board American deficiency in scientific ability. The Democratic majority under Senator Lyndon B. Johnson jumped on the opportunity to place blame on the Republican Eisenhower administration and relaunched hearings by the Preparedness Investigating Subcommittee of the Committee on Armed Services in the Senate in late November. General James H. Doolittle provided one of the early testimonies.¹¹ In his testimony, Doolittle felt convinced "that the rate of Russian progress is much more rapid than ours; that, in some areas, she has already passed us. If the rate continues, she will pass us in all."¹²

In a meeting of the Office of Defense Mobilization Science Advisory Committee (SAC) with President Eisenhower on October 15, Edward H. Land explained to the president the reasons for Soviet success:¹³

10. Giles Alston; Shirley Ann Warshaw, ed., Chap. "Eisenhower: Leadership in Space Policy" in *Reexamining the Eisenhower Presidency* (Westport, CT: Greenwood, 1993), p. 117.

11. Doolittle was already famous for his bombing raid on Tokyo shortly after the initiation of hostilities between the United States and Japan in 1942. He later went on to become Chairman of the NACA board, a position he held at the time of his testimony.

12. *Hearings before the Preparedness Investigating Subcommittee of the Committee on Armed Services, 85th Congress, 1st and 2nd sessions, pt. 1, p. 111.*

13. At the meeting, I. I. Rabi noted "most matters of policy coming before the President have a very strong scientific component" and "he didn't see around the President any personality who would help keep the President aware of this point of view." Eisenhower concurred and "said that he had felt the need for such assistance time and again." This discussion led to the suggestion by

The structure of Russian culture and thinking is such that they are learning to live the life of science and its application . . . Is there a way to tell the country that we should set out on a scientific adventure in which all can participate? If this can be done, with our concept of freedom and the independent, unfettered man, we can move far ahead. We need a scientific community in the American tradition.¹⁴

Whether or not Land had accurately assessed the Soviet mentality towards science or of the true implications of the Sputnik launch is of little importance. The notable point is the reaction produced in the very highest echelons of scientific and military advisory circles. Clearly, the hysteria and “fever” that swept the country in the wake of the Sputnik launch was not limited to an uninformed public. Indeed, the media and public were simultaneously concerned with the integration crisis at Central High School in Little Rock, Arkansas. For those in the government primarily concerned with national security, Sputnik produced a larger effect than in the public at large.

The conception of Sputnik as a discontinuity is linked to the conception of scientific prestige as a benchmark for national strength. Since Eisenhower misjudged the impact Sputnik would have on the perception of the United States, so the argument goes, only after the media frenzy and political attacks of fall 1957 did the administration recognize the importance of science to national prestige in the international sphere. Even in the face of Sputnik, Eisenhower seemingly remained steadfast in his dislike of federal bureaucracy and shied away from setting prestige as a goal of space research. On November 7, 1957, Eisenhower announced the creation of the post of Special Assistant to the President for Science and Technology in a televised address on national security. The address summarized American nuclear assets while noting deficiencies in science education in America. The speech concluded with a warning against runaway spending:

It misses the whole point to say that we must now increase our expenditures of all kinds on military hardware and defense—as, for example, to heed demands recently made that we restore all personnel cuts made in the armed forces. Certainly, we need to feel a high sense of urgency. But this

James Killian for the creation of a scientific advisory panel to assist the proposed advisor. This would become the President's Science Advisory Committee (PSAC), which began meeting in November with Dr. Killian as its head. “Detailed (largely verbatim) notes on a meeting of the ODM Science Advisory Committee with the President on October 15, 1957,” folder 012401, NASA Historical Reference Collection, NASA Headquarters, Washington, DC.

14. *Ibid.*

does not mean that we should mount our charger and try to ride off in all directions at once. We must clearly identify the exact and critical needs that have to be met. We must then apply our resources at that point as fully as the need demands. This means selectivity in national expenditures of all kinds.¹⁵

By analyzing metaphor in his speeches and press conferences, Linda T. Krug notes Eisenhower's "images created a vision of a nation of scientist-generals already hard at work planning how to unlock the secrets of the universe."¹⁶ But the conclusion she draws that "Eisenhower was the only president who saw the space program as a viable entity in and of itself" is based on the assumption that Eisenhower never clothed hidden intentions in crowd-pleasing rhetoric.¹⁷ Such sweeping conclusions about Eisenhower's personal views cannot be drawn from televised statements. All presidents must maintain a carefully groomed public persona. While Eisenhower's public proclamations often criticized big government, policy decisions and internal White House discourse did not match his rhetoric.

The National Security Council (NSC) engaged the question of prestige in relation to the planned American and Soviet satellite launches during the International Geophysical Year of 1957-1958. A Technological Capabilities Panel (TCP) was formed in 1954 under James Killian to investigate the satellite question and other technical issues deemed vital to national security.¹⁸ The TCP issued its final report in February 1955 and the NSC, following the TCP's recommendation, concluded in May of that year that the U.S. effort (Project Vanguard) should be given high priority as "considerable prestige and psychological benefits will accrue to the nation which first is successful in launching a satellite."¹⁹ The importance of such benefits was paramount to

15. Dwight D. Eisenhower, "Radio and Television Address to the American People on Science in National Security," November 7, 1957, <http://www.eisenhowermemorial.org/speeches/19571113%20Radio%20and%20Television%20Address%20on%20Our%20Future%20Security.htm>.

16. Linda T. Krug, *Presidential Perspectives on Space Exploration: Guiding Metaphors from Eisenhower to Bush* (New York: Praeger Publishers, 1991), p. 29.

17. *Ibid.*

18. The TCP also drew the famous conclusion that establishing freedom of over-flight in space, i.e., sovereignty claims of airspace not extending beyond the atmosphere, was in the long-term interests of the U.S. This was motivated by the expectation that the U.S. would have a large lead over the U.S.S.R. in electronic satellite reconnaissance capability. For an overview of the TCP and its impact on the freedom of space, see McDougall . . . *the Heavens and the Earth*, ch. 5. Dwayne A. Day has recently uncovered documents tracing the origin of this principle to a CIA intelligence officer, Richard Bissell, and an Air Force aide working for the CIA. Dwayne Day, "The Central Intelligence Agency and Freedom of Space," paper presented at Remembering the Space Age: 50th Anniversary Conference, NASA History Office and National Air & Space Museum Division of Space History, Washington, DC, October 22, 2007.

19. "National Security Council Report 5520: Missile and Space Programs." See *A Guide to Documents of the National Security Council, 1947-1977* ed. Paul Kesaris, (University Publications of America, 1980).

U.S. foreign policy since “the inference of such a demonstration of advanced technology and its unmistakable relationship to inter-continental ballistic missile technology might have important repercussions on the political determination of free world countries to resist Communist threats, especially if the U.S.S.R. were to be the first to establish a satellite.”²⁰

The NSC concluded the U.S. scientific satellite effort should not hinder military missile developments and, therefore, should be vested in a separate, civilian-run program headed by the National Science Foundation. It is absolutely clear that the Eisenhower administration intended to use the satellite launch to reinforce American scientific prowess in the international arena.

The fact that prestige was an important element after that fateful October 4 and during the formative period of NASA is uncontroversial. In a PSAC meeting in March 1958, Hans Bethe commented, “it would be a great mistake for us to oppose popular enthusiasm even though misguided.”²¹ And in a recently declassified Office of Research and Intelligence Report issued just two weeks after Sputnik on October 17, 1957, it was concluded:

The technologically less advanced—the audience most impressed and dazzled by the sputnik [*sic*]—are often the audience most vulnerable to the attractions of the Soviet system . . . It will generate myth, legend and enduring superstition of a kind peculiarly difficult to eradicate or modify, which the USSR can exploit to its advantage, among backward, ignorant, and apolitical audiences particularly difficult to reach.²²

The report went even further in claiming the United States itself had fanned the flames of the fire in three ways: “first by fanfare of its own announcement of its satellite plans, second by creating the impression that we considered ourselves to have an invulnerable lead in this scientific and technological area, and third by the nature of the reaction within the U.S.”

The importance of science to national prestige in the Eisenhower administration existed long before Sputnik; it originated in the experience with atomic energy. Eisenhower had long been an advocate of using atomic energy

20. Ibid.

21. PSAC Meeting, March 12, 1958. The transcribed notes of the PSAC are spotty at best, and the argumentative logic is nearly incomprehensible. They are reproduced in *The Papers of the President's Science Advisory Committee, 1957-1961*, microfilm, (University Publications of America, 1986).

22. Office of Research and Intelligence Report, “World Opinion and the Soviet Satellite: A Preliminary Evaluation,” declassified 1993, folder 18106, (NASA Historical Reference Collection, NASA Headquarters, Washington, DC).

to further U.S. foreign policy, a fact exemplified by his personal championing of the Atoms-for-Peace program.

In his December 8, 1953 address to the U.N. General Assembly, President Eisenhower called for the establishment of an “international Atomic Energy Agency” to serve as a stockpile of nuclear materials for peaceful uses around the world. The proposal was “enunciated by the President almost as a personal hope,” with few advisors and only one of the five Atomic Energy Commissioners, Lewis Strauss, aware of the proposal ahead of time.²³ The original proposal was devoid of details but is significant in that Eisenhower displayed a personal desire to use science and scientific prestige as a tool of international diplomacy. The policy was consciously constructed around the issue of prestige, e.g., the amount of uranium to be contributed by the United States was set at a high enough figure that the Soviet Union would not be able to match the American contribution.²⁴ While the implementation of the plan was slow in arriving, the middle of the decade saw tangible, albeit often ineffective, international cooperation in atomic technology with the U.S. as the international lynchpin and guarantor of atomic security. Science in the Eisenhower administration was part and parcel of foreign policy.

The tendency to employ science in the service of international prestige was expressed early on in the discussions concerning a new space agency. Coincidentally, Eisenhower asked James Killian (then president of MIT) to become his personal science advisor over breakfast on October 24, the purpose of the meeting being Killian’s briefing of Eisenhower in preparation for the Atoms-for-Peace award being given to Neils Bohr later that day.²⁵

In an Office of Defense Mobilization (ODM) Memorandum issued in January for Secretary of Health Arthur S. Fleming, the analogy to atomic energy was clearly enunciated: “In addition to the military importance of the scientific satellite one should not overlook the benefits of adequate emphasis on peaceful applications of rocketry just as the atoms-for-peace program has served to divert world attention from nuclear weapons.”²⁶ And in a legislative leadership meeting on February 4, President Eisenhower cautioned against pouring “unlimited funds into these costly projects where there was nothing of early value to the nation’s security. He recalled the great effort he had made for the Atomic Peace

23. Hewlett and Holl, *Atoms for Peace and War*, pp. 210-213.

24. John Krige, “Atoms for Peace, Scientific Internationalism, and Scientific Intelligence” *Osiris* 21 (1996): 164.

25. James R. Killian, Jr., *Sputnik, Scientists, and Eisenhower*, (Cambridge, MA: The MIT Press, 1977), p. 24.

26. Executive Office of the President ODM Memorandum to Arthur S. Fleming, “Scientific Satellites,” January 23, 1957, folder 012401, NASA Historical Reference Collection, NASA Headquarters, Washington, DC.

Ship but Congress would not authorize it, even though in his opinion it would have been a very worthwhile project.”²⁷

The relation of prestige to spaceflight has trickled down to the present day. Political pundits still routinely call the value of human spaceflight into question. NASA is frequently attacked as a wolf in sheep’s clothing; that is, NASA’s stated peaceful exploratory goals are often argued to be merely a facade covering deeper political and military motives. The origins of this dichotomy can be traced directly back to the emphasis placed on prestige during the conception of NASA in the Eisenhower administration, which was in turn based on the experience of atomic foreign policy. By the time a man-in-space investigatory panel was commissioned in 1959 by George Kistiakowsky, then head of the PSAC, it was clear that putting humans in space was solely a prestige issue:

In executive session of the panel, we talked about these things and I emphasized the need to spell out in our report what cannot be done in space without man. My opinion is that that area is relatively small and that, therefore, building bigger vehicles than Saturn B has to be thought of as mainly a political rather than a scientific enterprise.²⁸

Indeed, it can be concluded that space represented a welcome new opportunity for Eisenhower’s continuing desire to demonstrate American technological prowess because of a decline in the perception of atomic energy as a positive international technology, a decline spurred on by rising fears of global nuclear annihilation. Certainly the destructive element of nuclear technology had been publicly decried immediately after the Hiroshima and Nagasaki bombings, but the shift in scale from local (bomber-delivered atomic bombs) to global (intercontinental ballistic missile [ICBM]-delivered hydrogen bombs) damned any hope for an unproblematic public perception of nuclear technology. The first hydrogen bomb tests by the United States in 1952 and the Soviet Union in 1953 were followed by the irradiation of the Japanese fishing boat *Lucky Dragon 5* by the Castle Bravo test in March 1954, leading to a widespread public concern over the effects of nuclear radiation.

An illustrative example of the qualitative transformation of atomic energy in the public imagination can be drawn from science fiction. Isaac Asimov’s Foundation trilogy, published between 1951 and 1953, portrayed humanity in the far future as a galactic empire in decline. The Foundation, created by a

27. Supplementary Notes, Legislative Leadership Meeting, February 4, 1958, folder 18106, NASA Historical Reference Collection, NASA Headquarters, Washington, DC.

28. George Kistiakowsky *A Scientist at the White House: The Private Diary of President Eisenhower’s Special Assistant for Science and Technology* (Cambridge, MA: Harvard University Press, 1976), p. 409.

visionary scientist who foresaw the collapse of civilization using new historical-predictive methods, becomes the sole possessor of knowledge of atomic technology and hence the last hope for humanity's future.²⁹ But by the end of the 1950s, post-apocalyptic novels set in nuclear winter ruled the genre: Nevil Shute's *On the Beach* (1957), Pat Frank's *Alas, Babylon* (1959), and Walter M. Miller, Jr.'s *A Canticle for Leibowitz* (1959). Space, then, was a natural avenue into which the Eisenhower administration could expand its policy of scientific prestige in the service of the state while avoiding the stigmas becoming associated with nuclear technology.

THE NATIONAL AERONAUTICS AND SPACE ACT OF 1958

Of special importance to the current analysis are the sections of the National Aeronautics and Space Act of 1958 that were inspired by the Atomic Energy Acts of 1946 and 1954. Specifically, these are: the relation of the Department of Defense to the new Agency, the role of international cooperation, and the apportionment of intellectual property.

When President-elect Eisenhower was briefed on AEC activities in November 1952, he took special exception to Gordon Dean's acquiescence to the Air Force's demand for atomic-powered plane research in the face of good evidence that such a program would not produce a viable aircraft. "Looking out the window he declared that this kind of reasoning was wrong. If a civilian agency like the Commission thought that a military requirement was untenable or wasteful in terms of existing technology, there was an obligation to oppose it."³⁰ This was a prescient moment for it foreshadowed the problem of divvying up responsibility between competing civilian and military institutions during the formation of NASA.

Analogies to the Atomic Energy Commission were widespread throughout the legislative creation of the new space agency. During the congressional hearings, Eilene Galloway, a national defense analyst at the Library of Congress, was invited by representative McCormack (the chair of the House committee) to write a report on the issues facing Congress in the drafting of the National Aeronautics and Space Act.³¹ Her report was widely read and was reprinted in both the Senate and House proceedings and is notable for several reasons. First, Galloway drew the immediate conclusion that a comparison to the issues

29. Special thanks to Dan Bouk for pointing out this poignant example from a trilogy I have read four times yet somehow overlooked: Isaac Asimov's *Foundation* (Gnome Press, 1951), *Foundation and Empire* (Gnome Press, 1952), and *Second Foundation* (Gnome Press, 1953).

30. Hewlett and Holl, *Atoms for Peace and War*, p. 14.

31. Galloway also served as special consultant to Lyndon Johnson during the Senate hearings and has since become a noted aerospace historian.

facing the drafters of the Atomic Energy Act of 1946 (informally known as the McMahon Act) would be fruitful. To Galloway, the similarities were obvious:

Atomic energy and outer space are alike in opening new frontiers which are indissolubly linked with the question of war and peace. They combine the possibility of peaceful uses for the benefit of man and of military uses which can destroy civilization. Both are national and international in their scope. They involve the relation of science and government, the issue of civilian or military control, and problems of organization for the executive branch and the Congress. If only their similarities are considered, the legislative task would appear to be the easy one of following the pattern of our present atomic energy legislation.³²

According to Galloway, the dissimilarities between the two are centered around the problem of delineating military and civilian aspects of aerospace technology. While the boundaries are reasonably clear in the atomic case (bombs versus reactors), nearly every aspect of aerospace technology overlaps the two sides of the military-civilian divide. This is perhaps an oversimplification in that much effort had gone into the Atomic Energy Act of 1954 to allow the development of a civilian atomic energy industry and the civilian-military divide in practice was quite problematic. Still, it remains true that, in the case of atomic energy, a relatively clear boundary between civilian and military applications could be established through strict regulation of nuclear materials. In the case of NASA this was not true, yet still a formal divide was automatically assumed to be of paramount importance. In part this was due to concerns of needless duplication of effort and bureaucratic infighting over jurisdictional matters. However, previous experience with the AEC weighed heavily on lawmakers, particularly in the House of Representatives, who now saw science as intimately tied up with national security and felt a need for such a relationship to be codified in law. The administration favored a more informal relationship, as had been the case with the NACA. Both sides weighed heavily on precedent to reinforce their arguments.

The debate surrounding the obligations of the new space agency to the Department of Defense and vice versa has long been the center-point of the history of the National Aeronautics and Space Act of 1958. This is for the reason that the delineation of the role of military and civilian agencies has obvious current political implications, but it remains true that much of the contemporary debate also surrounded the issue. The wording of §102(b) of

32. Eilene Galloway, *The Problems of Congress in Formulating Outer-space Legislation*, (Washington, DC: U.S. Government Printing Office, March 1958).

the National Aeronautics and Space Act established the following criterion by which specific projects could be judged to be NASA- or Defense-centric:

The Congress declares that the general welfare and security of the United States require that adequate provision be made for aeronautical and space activities. The Congress further declares that such activities shall be the responsibility of, and shall be directed by, a civilian agency exercising control over aeronautical and space activities sponsored by the United States, *except that activities peculiar or primarily associated with the development of weapons systems, military operations, or the defense of the United States . . . shall be the responsibility of, and shall be directed by, the Department of Defense . . .*³³

The Act also established a National Aeronautics and Space Council headed by the President and including the Secretary of State, Secretary of Defense, NASA Administrator, and the Chairman of the AEC. The inclusion of the AEC chairman here is quite curious. In addition, any disputes between departments and agencies over jurisdictional matters were to be settled by the President under advisement of the council.

The original Bureau of the Budget draft bill was quite different from the arrangement in the AEC, which embodied communication with the Department of Defense in its Military Liaison Committee. In his official commentary sent to the Bureau of the Budget on the original bill, Strauss suggested “the act provide for inter-agency liaison similar to that which has operated so satisfactorily in the case of the Military Liaison Committee in the atomic energy program.”³⁴ The House bill included such a liaison committee and, in addition, another for the AEC. The administration had favored informal cooperation in the form of uniformed seats on the advisory in the same style as the NACA had traditionally pursued. The Senate kept the administration’s arrangement. In the final compromise bill, the military liaison committee was added, while the AEC liaison was dropped.

An internal Bureau of the Budget memo in May snidely remarked on the House bill that “among the trappings of the Atomic Energy Act inserted in this bill are sections establishing and prescribing the functions of a Military Liaison Committee and an Atomic Energy Liaison Committee. Both Committees are to be headed by chairmen appointed by the President . . . The Department of Defense as well as NACA has opposed this creation of statutory liaison committees, and

33. National Aeronautics and Space Act of 1958, Public Law 95-568, <http://history.nasa.gov/spaceact.html>. Emphasis and ellipses added.

34. Lewis Strauss to Maurice Stans, Director of the Bureau of the Budget, March 31, 1958, folder 012405, (NASA Historical Reference Collection, NASA Headquarters, Washington, DC).

every effort should be made to secure their elimination in the Senate.”³⁵ The inclusion of the liaison committees in the House bill suggests a strong tendency to adopt portions of the AEC paradigm wholesale. It is particularly remarkable in this case because the civilian-military boundary proposed for NASA was quite different than the model in the AEC. That is, NASA would by default carry on the bulk of aerospace research, but the Department of Defense, by sufficiently justifying its need directly to the President, could develop its own aerospace projects. This is in stark contrast to the complete monopolization of basic atomic research by the AEC, which necessitated a reliable and clear avenue of communication to and from the military.

The differences between NASA's and the AEC's relationships with the military deserves elaboration. From the beginning, the AEC was to encompass all levels of nuclear research, nuclear materials production, reactor design, and bomb construction. This centralization was a result of the realities of atomic energy. First, the Manhattan District was already in place during the establishment of the AEC and maintaining its internal configuration was necessary for the uninterrupted production of atomic weapons. Second, and more important, atomic energy as a technology is unique for a material reason: the regulation of atomic technology is in large part the regulation of a single element and its derivatives. Indeed, the Atomic Energy Act categorically transferred “all right, title, and interest within or under the jurisdiction of the United States, in or to any fissionable material, now or hereafter produced” to the Commission. In effect, all atoms on U.S. territory with 92 or more protons were declared to be the property of the federal government. In addition, an entire new class of information was created. Termed “Restricted Data,” this wide umbrella automatically “classified at birth” any and “all data concerning the manufacture or utilization of atomic weapons, the production of fissionable material, or the use of fissionable material in the production of power.”³⁶ Regulation of fissionable material was also the assumed primary task of early atomic weapons nonproliferation efforts. Containment of atomic technology was seen as synonymous with ownership of nuclear materials.

From the inception of the AEC the production and control of nuclear materials was the prime directive of the organization. Fissionable material was simultaneously obviously dangerous, necessary for national defense, and could be relatively easily collected and controlled. The implication of this material reality was tremendous for the bureaucratization of atomic technology in a central governmental agency. In the case of aerospace technology, such a clear compartmentalization was not a natural outgrowth of the relevant technology.

35. Letter from Alan L. Dean to William Finan, June 2, 1958, folder 12400, NASA Historical Reference Collection, NASA Headquarters, Washington, DC.

36. Atomic Energy Act, 1946. Public Law 585, 79th Congress, <http://www.osti.gov/atomicenergyact.pdf>.

Still, the basic structure of the AEC was to provide a perceived “obvious model” for creating an aerospace agency.

§205 of the National Aeronautics and Space Act provided engagement in “a program of international cooperation . . . and in the peaceful application of the results thereof.” The Senate Special Committee had noted in a report entitled *Reasons for Confusion over Outer Space Legislation and how to Dispel it* that “the main reason why we must have a civilian agency in the outer space field is because of the necessity of negotiating with other nations and the United Nations from some non-military posture.”³⁷

The Act specifically authorized the Administrator to grant access to NASA employees to AEC restricted data. This violated long-standing AEC policy, which based access on AEC classified status. Strauss thus raised the concern that the act would allow the President to “disseminate Restricted Data to foreign governments . . . We think that an extension of this existing authority to the proposed Agency would be undesirable and unworkable.”³⁸ In his testimony before the Senate Special Committee, Strauss stressed his preference for limiting international agreements at the outset, and noted that “the history of these new agencies, if the Atomic Energy Commission is a prototype, has been that, in the course of time, the basic law is amended by spelling out in greater detail the extent to which cooperation with other nations may be carried on.”³⁹ The strong ties to the AEC are evident.

The issue of intellectual property centered on the allocation of patents. The House bill patterned itself on the Atomic Energy Act, giving the government exclusive ownership of any intellectual property arrived at due to NASA-related work. The American Patent Law Association lobbied against such a provision, for the obvious reason that long-term profits from owning patents was a prime incentive for firms bidding on contracts.⁴⁰ In a letter to William F. Finan, Hans Adler (both were in the Bureau of the Budget) wrote in reference to the patent provision in H.R. 12575 (the bill that became the National Aeronautics and Space Act): “this provision is also based on the Atomic Energy Act. However, we doubt that the Atomic Energy Act should serve as the proper precedent, since inventions in the atomic area have peculiar defense and secrecy aspects

37. Senate Special Committee on Space and Astronautics Report, “Reasons for Confusion over Outer Space Legislation and how to Dispel it” May 11, 1958, folder 012389, NASA Historical Reference Collection, NASA Headquarters, Washington, DC.

38. Letter, Lewis Strauss, General Manager of AEC, to Maurice Stans, Director Bureau of the Budget. March 31, 1958, folder 012405, NASA Historical Reference Collection, NASA Headquarters, Washington, DC.

39. Hearings Before the Special Committee on Space and Astronautics, United States Senate, 85th Congress, 2nd session, p. 50.

40. Richard Hirsch and Joseph John Trento, *The National Aeronautics and Space Administration* (New York: Praeger Publishers, 1973), p. 26.

which make private ownership difficult.”⁴¹ Again, we have an example of the adoption of policies crafted for atomic energy without reasoned analysis of their relevance to an aerospace agency. The final language adopted assigned intellectual property to the government, with the Administrator having the right to waive this right if he so desired.

It cannot be overstated how formative the experience with atomic energy was on the psyche of those determining the shape of NASA. The belief that atomic energy would infuse all aspects of future technology was widely held in 1950s America, and rocketry was no exception. The realities of chemical reactive propulsion dictate a maximum theoretical efficiency (specific impulse) due to limited available chemical enthalpy, but the exit velocity of a thermal nuclear rocket is limited only by material failure at high temperatures. The AEC, for these reasons, launched just such a nuclear rocket research program (ROVER) in 1956. Stanislaus Ulam, testifying before the House Select Committee on Astronautics and Space Exploration, reaffirmed that “it is not a question of conjecture or optimism, but one might say it is mathematically certain that it will be the nuclearly powered vehicle which will hold the stage in the near future.”⁴² With historical actors like Ulam making such statements, it becomes clear that the birth of NASA as an institution must be historically analyzed through the lens of the atomic experience. The concept of the stewardship of the state over technological affairs had become ingrained in the imagination in the atomic era and was adopted without serious protest during the formation of NASA. Indeed, a sharp contrast can be drawn to the violent reaction by private interests to the original Atomic Energy Act and the relatively benign reception of the National Air and Space Act. A profound transformation had occurred in the intervening years.

CONCLUSION

Under the Atomic Energy Commission, technocracy had been introduced to America. Under NASA, it was wedded to the federal framework. There are fundamental differences to the two cases, as in the ability to control nuclear material and the need to enforce atomic secrecy through the curtailment of granting patents. But throughout the whole of the discussions in both the executive and legislative branches during 1957–1958, it remains clear that the framers of the new aerospace agency were profoundly affected by their experience with atomic energy, specifically the AEC. When conceiving of a new agency, bureaucrats and legislators actively reached into the past and

41. Hans Adler to William Finan, “Subject: HR 12575.” June 4, 1958, folder 12400, (NASA Historical Reference Collection, NASA Headquarters, Washington, DC).

42. *Hearings Before the Select Committee on Astronautics and Space Exploration*, 85th Congress, 2nd session, p. 602.

cherry-picked elements from their prior experience with atomic energy while passively making unconscious assumptions based on the technological realities of atomic energy. Often the decisions they arrived at were not appropriate for the aerospace case.

NASA represented a form of technocracy that divorced military interests as completely as possible. In the 1960s, NASA would become an Agency mobilized for social change. Thomas Hughes argues in *American Genesis* that, during the Great Depression, the Tennessee Valley Authority (TVA) was a push for regional social development by progressive politicians via electrification and the management of water resources.⁴³ NASA followed in these footsteps. Perhaps not so coincidentally one of the original commissioners of the TVA, David Lilienthal, would later become the first chairman of the AEC.

But NASA was technocracy in an evolved form. It combined three trends that had not yet together existed in any American organization: 1) Big Science, i.e., the close cooperation of large numbers of scientists and engineers in a vertically integrated hierarchy organized for the production of massive projects; 2) a mandate that pushed science for social benefits and simultaneously minimized obligations to the military; and 3) science in the service of national prestige abroad.

The Atomic Energy Commission took over the operation of the entire American atomic machine, from enrichment to reactor design to bomb testing in the South Pacific. NASA, instead, was given a mandate to push the boundaries forward in aerospace technology only insofar as they could be peacefully used. This was, then, a pivotal transformation in the history of American technocratic institutions. Under the presidencies of Kennedy and Johnson, NASA was a juicy target to be expanded, but this was merely opportunism. NASA's form had already been cemented in 1958, a form which had atomic roots.

43. Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm 1870-1970* (New York, NY: Viking Penguin, 1989), pp. 360-381.

CHAPTER 5

CREATING A MEMORY OF THE GERMAN ROCKET PROGRAM FOR THE COLD WAR

Michael J. Neufeld

In the middle of April 1945, as Allied armies swept into what little remained of the Third Reich, American newspapers carried horrifying reports, followed by photos of recently liberated concentration camps in central Germany. Prominent among them was a camp in the city of Nordhausen. Several thousand corpses and a few hundred emaciated survivors were found, along with a smaller number of dead and dying a few kilometers away at the Mittelbau-Dora main camp, which was located next to an amazing underground V-weapons plant known as the Mittelwerk. A couple of weeks later, a new wave of shock spread through Allied populations when official newsreels of the camp liberations reached movie theaters, including footage of Bergen-Belsen, Buchenwald, and Nordhausen. Some American newspapers explicitly made the connection between the horrors of the latter and V-2 missile production.¹

Yet within a year or two, that connection had almost sunk without a trace. By the time the U.S. Army held a war crimes trial for Nordhausen in 1947, the U.S. press almost ignored it as yet another trial. When former project leaders Gen. Walter Dornberger and Dr. Wernher von Braun, both by then living in the U.S., came to give interviews and publish memoirs in the 1950s about the V-2 project and the Peenemünde rocket center, they were able to essentially omit the underground plant and its concentration-camp prisoners from their stories as there was little information in the public domain to challenge such a formulation. Other writers, notably Willy Ley—the former German spaceflight society member and refugee from the Nazis who more than anyone else founded space history in the English-speaking world—also said virtually nothing about

1. "Tunnel Factory: Yanks Seize V-2 Plant in Mountain," *Washington Post*, April 14, 1945; Ann Stringer, "Dead and Dying Litter Floor of Nazi Prison Barracks," *Los Angeles Times*, April 15, 1945; "Germans Forced to Bury Victims," *New York Times*, April 15, 1945; "Tribune Survey Bares Full Horror of German Atrocities," *Chicago Tribune*, April 25, 1945; "Waiting for Death" (photo), *Los Angeles Times*, April 26, 1945; Bosley Crowther, "The Solemn Facts: Our Screen Faces a Responsibility to Show Newsreels and Similar Films," *New York Times*, April 29, 1945; "Camp Horror Films are Exhibited Here," *New York Times*, May 2, 1945; "Mrs. Luce Tells Nazi Slave Policy, Aimed to Protect Secret Weapons," *New York Times*, May 4, 1945.



Two survivors in the Nordhausen-Boelcke Kaserne camp at the time of liberation by the U.S. Army in April 1945. The horrors of Nordhausen and the nearby underground V-weapons plant were briefly infamous in the Western press. (National Archives)

these atrocities. It appears likely that Ley knew little about them due to a deliberate policy of silence by the ex-Peenemünders and the U.S. government. The former clearly had strong motivations of self-interest, and the latter wished to protect the program of importing engineers, scientists, and technicians from Nazi Germany that became best known as Project Paperclip.²

Of course, those were not the primary reasons why Ley, von Braun, and Dornberger gave interviews and wrote books and articles. These pioneers wanted to tell their part in the exciting story of German rocket development

2. On Paperclip, see Clarence G. Lasby, *Project Paperclip: German Scientists and the Cold War* (New York: Atheneum, 1971); Linda Hunt, "U.S. Coverup of Nazi Scientists," *Bulletin of the Atomic Scientists* (April 1985), pp. 16–24, and *Secret Agenda: The United States Government, Nazi Scientists and Project Paperclip, 1945 to 1990* (New York: St. Martin's Press, 1991); Tom Bower, *The Paperclip Conspiracy: The Battle for the Spoils and Secrets of Nazi Germany* (London: Michael Joseph, 1987). My assertions about U.S. press coverage of Nordhausen between 1945 and the 1980s are based on keyword searches of Proquest Historical Newspapers. Smithsonian researchers have electronic access to seven papers: *New York Times*, *Washington Post*, *Boston Globe*, *Christian Science Monitor*, *Chicago Tribune*, *Atlanta Journal-Constitution*, and *Los Angeles Times*.

from the Weimar amateur groups through the creation of the V-2 and its export to the U.S. Ley and von Braun in particular were also trying to sell the public something they fervently believed in: spaceflight. However, in the process, they were compelled to provide a sanitized history of Nazi rocket activities palatable to Western audiences during the Cold War. Because von Braun's German-led engineering team played an important role in American missile development in the 1950s, they needed to justify the Germans' presence and the obvious continuities between Nazi and American rocketry, as did the U.S. government, which faced episodic Soviet-bloc denunciations over the issue. After Sputnik, when the space race with the Soviets became a central public concern, popular writers supplemented the pioneering efforts of Ley, von Braun, Dornberger, and others with books built on the foundation laid by the three former Germans.

Among the most noteworthy aspects of this early German rocket historiography as it developed in the 1960s are: 1) a romanticization of the Nazi rocket center at Peenemünde as fundamentally aimed at space travel, rather than weapons development for Hitler—although that was less the case for Dornberger, the military commander; 2) a corresponding depiction of the Peenemünders as apolitical or even anti-Nazi engineers driven by space dreams, which was both an exaggeration and a conflation of von Braun's experience with that of his group; and 3) a suppression of almost all information about concentration-camp labor and membership in Nazi organizations. These tendencies were bolstered by the deeper Cold War memory cultures of the United States and West Germany, which promoted an often selective view of World War II that neglected the Holocaust. As a result, the Mittelwerk and its attached Mittelbau-Dora camp virtually fell out of history—at least outside the Soviet bloc—until the 1970s, and in the United States, for the most part until 1984. This paper will examine the phases of the creation of this memory of the German rocket program and what social, cultural, and political factors allowed it to flourish relatively undisturbed for three decades.

The postwar history of the German rocket program—and the genre of space history in the English-speaking world—began largely with one book, Willy Ley's *Rockets*. It originally appeared in May 1944 before he had any knowledge of the V-2, but it was greatly expanded after the war in multiple editions such as *Rockets and Space Travel* (1947) and *Rockets, Missiles and Space Travel* (1951). From the outset, Ley included not only the origins of rocketry, early space travel ideas, and the history of military rockets, but also a memoir of his involvement with Weimar rocket activities and the VfR, the German spaceflight society (1927-1934). It was quite natural for him to add the history of the rocket programs of Nazi Germany, predominantly the Army program and its Peenemünde center that produced the V-2. His sources included various newspaper and magazine articles, notably in the 1947 edition in which he repeated a lot of wild rumors and nonsense from the press. However, over time he greatly improved his account, based on his personal contacts with Wernher von Braun and later with other

Peenemünders. In early December 1946, immediately after the U.S. government unveiled Project Paperclip to the American press and public, von Braun visited Ley at his home in Queens, New York, their first encounter since sometime in 1932 or 1933. They enthusiastically discussed the German project until 2:45 a.m. Ley told Herbert Schaefer, the only other Weimar rocketeer to emigrate during the 1930s, “that I found no reason to regard v.B. as an outspoken anti-Nazi. But just as little, if not even less, did I find him to be a Nazi. In my opinion the man simply wanted to build rockets. Period.” While this judgment contained a lot of truth, it would not be the last time that von Braun received a free pass on his Third Reich activities from his fellow space enthusiasts.³

Ley had fled to the U.S. in 1935 to escape the Nazi crackdown on the private rocket groups and later wrote for the leftist New York tabloid *P.M.*, so this willingness to accept von Braun’s account is intriguing and not entirely easy to explain. The end-of-war concentration camp revelations were not far in the past. Certainly a passionately shared absorption with space travel has everything to do with it, but it also seems likely that Ley willingly accepted the assumptions that Americans brought to the problem of the complicity of scientists, engineers, and doctors with Nazi crimes: that it was fairly straightforward to separate the few fanatical Nazis from the bulk of mere opportunists who only wanted to work in their specialty. Crimes against humanity were ascribed to the SS; technically trained people were given almost a free pass unless there was evidence of specific involvement and/or Nazi enthusiasm. In the case of the V-2 and its underground plant, those assumptions can be seen at work from an early stage in the reports of Major Robert Staver, who led U.S. Army Ordnance’s technical intelligence team there; he described the rocketeers as “top-notch engineers” no different than Allied “scientists” in developing weapons of war. These assumptions also played out in Project Paperclip, where behind a veil of classification, U.S. military agencies screened engineers and scientists almost solely on the basis of membership in Nazi organizations while explaining away virtually all “problem cases” as opportunism. Even Wernher von Braun, who had been (admittedly somewhat reluctantly) an SS officer, was finally legalized as an immigrant in 1949 on those grounds. But his file, like those of the others, remained classified until the 1980s, so he was able to leave the potentially damaging fact of his SS membership out of his memoirs and the official biographies that the U.S. Army and later NASA distributed.⁴

3. Willy Ley, *Rockets: The Future of Travel Beyond the Stratosphere* (New York: Viking, 1944), *Rockets and Space Travel* (New York: Viking, 1947), *Rockets, Missiles and Space Travel* (New York: Viking, 1951). Compare the Peenemünde chapters in the latter two. For von Braun’s visit and the quotation: Ley to Schaefer, December 8, 1946, in file 165, box 5, Ley Collection, National Air and Space Museum Archives (original in German, my translation).

4. Staver to Ordnance R&D, June 17, 1945, in Box 87, E.1039A, RG156, National Archives College Park; Hunt, *Secret Agenda*, chaps. 3, 4, 7; Michael J. Neufeld, *Von Braun: Dreamer of Space, Engineer of War* (New York: Alfred A. Knopf, 2007), pp. 120–122, 234–238, 245, 323–324, 347–348, 404–406, 428–429.



Willy Ley (right) and Wernher von Braun (middle) with Heinz Haber (left), c. 1954. These three were the scientific advisors to Walt Disney's mid-1950s space television series. (National Air and Space Museum, Smithsonian Institution)

Von Braun wrote his first memoir in 1950 for a British Interplanetary Society book never came to pass. It eventually appeared in the society's journal in 1956, somewhat rewritten and, in one case at least, bowdlerized. His original manuscript made a rather bald statement of amoral opportunism regarding the 1932 discussions between his Berlin rocket group and the German Army, which led to his working for the latter as a civilian: "We felt no moral scruples about the possible future use of our brainchild. We were interested solely in exploring outer space. It was simply a question with us of how the golden cow could be milked most successfully."⁵ That statement vanished in the published version, but it had already appeared in print five years earlier in a lengthy and fascinating profile of von Braun in the *New Yorker* magazine on April 21, 1951. Whether he

5. Wernher von Braun (hereinafter WvB), "Behind the Scenes of Rocket Development in Germany 1928 through 1945," ms., 1950, in file 702-20, WvB Papers, U.S. Space and Rocket Center (hereinafter USSRC); WvB, "Reminiscences of German Rocketry," *Journal of the British Interplanetary Society* 15 (May-June 1956): 125-145.

actually said it to the writer, Daniel Lang, during the interview or Lang lifted it from the manuscript that von Braun lent him is unclear. But the memoir and the profile offered the same fundamental account: von Braun, seized with dreams of spaceflight since his teenage years in the 1920s, went along with the German Army as it offered money for rocketry, then Hitler came to power, which led to vastly increased resources and the building of Peenemünde and the V-2. Late in the war, the intervention of higher Nazi powers increased as these weapons became of interest to Hitler—who von Braun saw a few times—leading to Heinrich Himmler’s attempt to take over the rocket program for the SS. After von Braun rebuffed Himmler’s initiative, he was arrested by the Gestapo with two colleagues in early 1944 for drunken remarks in which they stated that they would rather go into space than build weapons. He was only rescued because of the intervention of his mentor, General Dornberger. When the Third Reich collapsed a year later, von Braun led his team away from the Soviets and surrendered to the Americans. He hoped that in the U.S. he would eventually realize his space dreams, albeit again in the employ of the military.⁶

As an account of the trajectory of his life to that point, the article was reasonably accurate; what he left out was that which not-so-subtly altered the story. For example, he did not mention joining the Nazi Party in 1937, when the party pressed him to do so, although Lang did quote one of von Braun’s U.S. Army superiors, who dated it to 1940. In fact, von Braun himself told the Army in 1947 that he had joined the Party in 1939, so he himself consciously or unconsciously falsified the date. Over time, this key indicator of Nazi commitment, or the lack of it, drifted in popular accounts, such that his first biographer in English, Erik Bergaust, dated von Braun’s entry to 1942; the latter made no attempt to correct him. Von Braun naturally also suppressed his brief membership in an SS cavalry unit and riding club in 1933–34 and his 1940 “readmittance” (as his SS record calls it) to the black corps as an officer. His memoir article did discuss the underground plant near Nordhausen briefly, but the brutal exploitation of concentration-camp workers was blamed solely on SS General Hans Kammler, thereby holding the whole matter at arm’s length. Von Braun left the impression that the underground plant was completely separated from Peenemünde. The fact that SS prisoners had also worked at the rocket center and many other V-2 sites, and that he had been inside the Nordhausen facility at least a dozen times, he also suppressed. Given his intimate encounters with the Nazi elite, however, it was hard for him to deny that his prominent place in that regime, but his arrest by the Nazis allowed him to depict himself as ultimately more a victim of the regime than a perpetrator.⁷

6. Ibid.; Daniel Lang, “A Romantic Urge,” in *From Hiroshima to the Moon: Chronicles of Life in the Atomic Age* (New York: Simon & Schuster, 1959), pp. 175–193, quote on p. 180, originally published in *New Yorker* (April 21, 1951): 69–70, 72, 74, 76–84.

7. “Affidavit of Membership in NSDAP of Prof. Dr. Wernher von Braun,” June 18, 1947, Accession 70A4398, RG330, National Archives College Park; WvB NSDAP file card, former

In mid-1952, another memoir appeared under his name, “Why I Chose America,” in a periodical aimed at women and families, the *American Magazine*. Ghostwritten by an interviewer with von Braun’s superficial editing, this article came in the wake of a sudden increase in his fame. In March, he had finally made his space-advocacy breakthrough with the publication of his lead article in a space series in *Collier’s* magazine, which had a circulation of millions. Although “Why I Chose America” was clearly written less in his voice than that of the ghostwriter, it is revealing for how much it makes transparent the context of that time, specifically, the era of McCarthyism and the Red Scare. It centered his alleged decisive moment at the end of the war, when he had to choose between East and West—in fact, he was basically in the power of General Kammler and scarcely in a position to do anything but follow his orders to evacuate southwest to get away from the Soviets. It was fortunate that Kammler’s orders matched his own desires. “Why I Chose America” also makes much of his disillusionment with Nazism and with totalitarianism in general, notably as a result of his arrest, and it hammers on his Americanization, his conversion in El Paso to born-again Christianity, and his happiness with his new home in Huntsville. In short, this article made von Braun—a German who could not be naturalized until 1955 because of his delayed legal entry—into a patriotic Cold-War American.⁸

It is not at all clear how much “Why I Chose America” influenced the later literature on von Braun and Peenemünde. While certainly read by a much larger initial audience than his own memoir, which only came out in 1956 in an obscure space periodical, the latter was reprinted in a book and taken as a fundamental source by many later journalists and authors. The 1952 piece, on the other hand, probably faded away, especially in comparison to the Lang 1951 profile in a much more prominent magazine. In any case, the canonical von Braun stories of his rise, success at Peenemünde, arrest, and rescue by the U.S. Army were reinforced in the summer of 1958 when the Sunday newspaper supplement, the *American Weekly*, published his third and longest memoir, also ghostwritten, “Space Man—The Story of My Life.” This three-part piece came in the wake of Sputnik, and the national hero status he achieved as a result of his prominent place in launching the first U.S. satellite, Explorer 1. The topic of Nordhausen and concentration-camp labor appear again only in the most marginal way. His Americanization was once again emphasized, a seemingly necessary strategy in view of his burdensome past. It is noteworthy that by this time von Braun’s life story, at least for that concerning his past in Nazi Germany, had hardened into

BDC records, microfilm in National Archives College Park; WvB, “Behind the Scenes...,” ms., 1950, in file 702-20, WvB Papers, USSRC; WvB, “Reminiscences”; Lang, “A Romantic Urge”; Erik Bergaust, *Reaching for the Stars* (Garden City, NY: Doubleday, 1960), p. 23.

8. WvB, “Why I Chose America,” *The American Magazine* 154 (July 1952): 15, 111-112, 114-115.

a clichéd pattern of anecdotes visible in all media profiles and in the first book-length biographies that appeared in English and German in 1959 and 1960.⁹

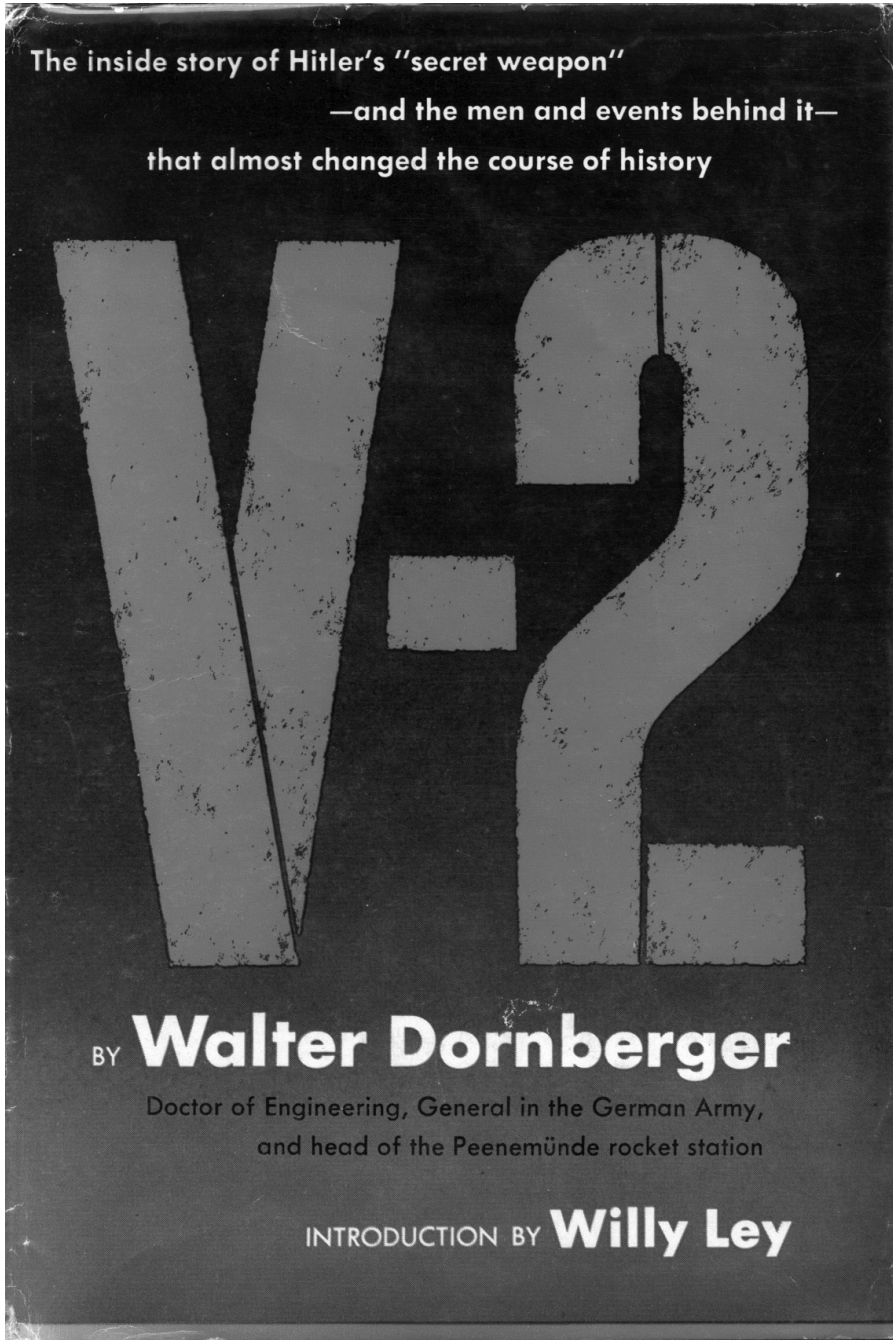
Several years earlier, General Walter Dornberger published his book, *V-2*, which became the most influential account of the German rocket program aside from the specifics of von Braun's life. Judging by a manuscript in English now in the Deutsches Museum's archive in Munich, Germany, Dornberger originally tried writing it for an American audience in a language he then scarcely commanded, probably while working for the U.S. Air Force in Dayton, Ohio, from 1947 to 1950. (He then joined Bell Aircraft in Buffalo, New York, to work on rocket plane projects, ultimately becoming its vice president for engineering.) In 1951, von Braun pointed out his former boss's manuscript to his new German publisher, Otto Bechtle, who was arranging for von Braun's own bad science-fiction novel, *Mars Project*, to be rewritten in German by a popular aviation writer and former Nazi propagandist, Franz Ludwig Neher. Neher did the same, and much faster, for Dornberger's memoir, which appeared as *V-2: Der Schuss ins All (V-2: The Shot into Space)* in the fall of 1952. It would be nice to know who invented the subtitle, which so neatly captures the reinvention of a Nazi terror weapon as the space rocket it most certainly was not, at least before it was launched at White Sands, New Mexico, with scientific instruments.¹⁰

Although Dornberger was a space enthusiast as well, the book was a straight military account of the program, which only mentions the space aspects in passing. Neher's unacknowledged rewrite was a success; *V-2* became an instant classic. Translations appeared in Britain and America in 1954, the latter edited and introduced by Willy Ley.¹¹ It entrenched certain stories about the German Army rocket program, some of which have been almost impossible to dislodge in the popular media, such as the claim that the Reichswehr only began working on rockets because they were not banned in the Versailles Treaty. Noteworthy is Dornberger's account of the relationship between the rocket program and the Nazi leadership, above all Hitler. The former rocket general claimed that because the Führer's doubts early in the war, the program was delayed by two years, making it "too late"

9. WvB, "Space Man—The Story of My Life," *American Weekly* (July 20, 1958), 7-9, 22-25; (July 27, 1958), 10-13; (August 3, 1958), 12, 14-16; Heinz Gartmann, *Wernher von Braun* (Berlin: Colloquium, 1959); Bergaust, *Reaching* (see above).

10. On the story of von Braun's novel see Michael J. Neufeld, *Von Braun: Dreamer of Space, Engineer of War* (New York: Knopf, 2007); chaps. 10-11; WvB to Otto Bechtle, March 9, 1951, in German Corr. 1949-54, Box 43, WvB Papers, Library of Congress Manuscript Division; Walter Dornberger, Ms., "V 2: Around a Great Invention" (1948), NL165/010 and NL165/011, Deutsches Museum Archives, Munich; Walter Dornberger, *V-2: Der Schuss ins Weltall* (Esslingen: Bechtle, 1952), reprinted as *Peenemünde: Die Geschichte der V-Waffen* (Frankfurt/Main and Berlin: Ullstein, 1989). Von Braun's novel was recently published as *Project Mars: A Technical Tale* (Burlington, Canada: Apogee, 2006).

11. Walter Dornberger, *V-2* (New York, NY: Viking, 1954).



Walter Dornberger's 1954 memoir, along with the works of Ley and von Braun, fundamentally shaped the initial manner in which the German rocket program was remembered. (author's collection)

to affect the outcome—an argument much in line with the postwar memoirs of other German officers, who scapegoated Hitler for everything. In Dornberger's influential account—but also in von Braun's memoirs—their breakthrough with Hitler only comes on a visit to his Wolf's Lair in July 1943, when the dictator suddenly became a missile enthusiast. To emphasize the story, both Dornberger and von Braun omitted a visit they made to Hitler at the same place in August 1941 and underplayed the steps on the road to V-2 mass production made by Armaments Minister Speer with Hitler's approval in 1942. Blaming the Führer certainly fit the mood in the new West German Federal Republic, the population of which was inclined to focus on German suffering, while blaming a handful of leading Nazis for all crimes, above all for the crime of losing the war.¹²

With hindsight created by the revelations about the Mittelbau-Dora camp in the 1970s and 1980s, the most striking thing about Dornberger's book is that it barely mentions the underground plant and omits any reference to concentration-camp labor whatsoever. As someone intimately involved in decision-making about slave laborers, and as one who (like von Braun) encountered them personally on numerous occasions at Nordhausen, Peenemünde, and many other construction and production sites of the rocket program, Dornberger could only written it that way as a deliberate choice to suppress a central feature of the program that was just too dangerous to the reputation of the Peenemünders to discuss. As a result, he successfully falsified history by omission. But of course, in his depiction of himself, von Braun, and other leading rocket engineers, he also managed to make them all appear as non-Nazis, even as anti-Nazis, by laying emphasis on the meddling of Himmler's SS and other National Socialist organs late in the war. Dornberger's own Nazi enthusiasm, and that of several leading members of von Braun's team, like Arthur Rudolph, Ernst Steinhoff, and Rudolf Hermann, also vanished. Regarding a conversation that he, von Braun, and others had with Himmler at the Peenemünde officer's club, Dornberger states: "We engineers were not used to political talk and found it difficult." He claimed they were all repelled by Himmler's "inhuman policy of force." Later in the same chapter, he states: "We hardly ever discussed politics in Peenemünde. We were out of the world. Whenever two people met in the canteen or at mess, their conversation would

12. On Versailles, see Michael J. Neufeld, "The Reichswehr, the Rocket and the Versailles Treaty: A Popular Myth Reexamined." *Journal of the British Interplanetary Society* 53 (2000), 163-172. On Hitler and the V-2 priority battle, see Heinz Dieter Hölsken, *Die V-Waffen: Entstehung—Propaganda—Kriegseinsatz* (Stuttgart: Deutsche Verlags-Anstalt, 1984); Michael J. Neufeld, "Hitler, the V-2 and the Battle for Priority, 1939-1943," *Journal of Military History* 57 (July 1993), 511-538, and *The Rocket and the Reich: Peenemünde and the Coming of the Ballistic Missile Era* (New York, NY: The Free Press, 1995), chaps. 4-6. On West German memory, see Robert G. Moeller, *War Stories: The Search for a Usable Past in the Federal Republic of Germany* (Berkeley, CA: University of California Press, 2001) and Jeffrey Herf, *Divided Memory: The Nazi Past in the Two Germanys* (Cambridge, MA: Harvard University Press, 1997).

turn with five minutes to valves, relay contacts, mixers, . . . or some other technical detail that was giving us trouble.” In short, he describes them as all just apolitical engineers serving their country, which certainly was how they wanted to see themselves after the war.¹³

Dornberger’s book fed into the space-oriented narrative of German rocket-program history launched by Ley, but it also helped create a second genre: the military-oriented V-weapons literature. In the late 1950s and early 1960s, several books were published, mostly in Britain, on British intelligence and countermeasures and the V-1 and V-2 campaigns, including Air Marshal Sir Phillip Joubert de la Ferté’s *Rocket* (1957), Basil Collier’s *Battle of the V-Weapons 1944-45* (1964), and David Irving’s *The Mare’s Nest* (1965). Irving, who was already noticeably pro-German but not yet infamous as a Nazi apologist and Holocaust denier, provided the most complete account on both Allied and German sides of the V-weapons campaign in the last two years of the war, but it is noteworthy that, although he did much more original research than the others, he minimized the Mittelwerk/Nordhausen story about which he certainly knew more. Surprisingly, there was more information in a contemporaneous American book, James McGovern’s *Crossbow and Overcast* (1964), which featured the transfer of the von Braun group to the U.S. Army. But even as McGovern reported the horrors discovered in and near Nordhausen in 1945, he followed von Braun’s lead in holding the whole thing at arm’s length from the German rocketeers by blaming it all on the SS—perhaps not surprisingly, as two of his key sources were Dornberger and von Braun.¹⁴

At this point, let’s step back and look at the larger contexts of the American memory of National Socialism, the concentration camps, and the Holocaust as it took shape between 1945 and 1965. Although it is not easy to demonstrate that these contexts shaped the memory of the Peenemünde and the German rocket program that Ley, von Braun, and Dornberger created and popular writers extended, it is difficult to believe that they did not have some influence. It is particularly noteworthy in regard to Mittelbau-Dora that the Holocaust was little discussed between the end of the main Nuremberg trial in 1946 and the Eichmann trial in Israel in 1961. Other than the Anne Frank story, which was presented with an uplifting, universalistic message in the book and movie, the

13. Dornberger, *V-2*, 187, 192, 194. This self-image is demolished in a new book by Michael Petersen, *Missiles for the Fatherland*, forthcoming with Cambridge University Press. Petersen demonstrates the committed work of the engineers for the Nazi regime and the intimate relations between Peenemünde and the underground slave-labor Mittelwerk plant. On Dornberger’s pro-Nazi political attitudes see his personal notes quoted in Neufeld, *The Rocket*, 182-183; on the others, see the evidence cited in *ibid.*, in Neufeld, *Von Braun*, and in Hunt, *Secret Agenda*.

14. Phillip Joubert de la Ferté, *Rocket* (London: Hutchinson, 1957); Basil Collier, *Battle of the V-Weapons 1944-45* (London: Hodder and Stoughton, 1964); David Irving, *The Mare’s Nest* (Boston and Toronto: Little, Brown, 1965); James McGovern, *Crossbow and Overcast* (New York, NY: William Morrow & Co., 1964), pp. 120-122.

topic was nearly taboo. The Jewish community in the U.S. spoke of the Shoah reluctantly, wishing to assimilate into Cold War America. Before Raul Hilberg published his groundbreaking *The Destruction of the European Jews* in 1961, he had a very difficult time finding a publishing house to take it; afterward, his book was either ignored or attacked. The American public apparently just was not ready to deal with the topic, and the same applied in Europe.¹⁵

However, the relationship between the Jewish Holocaust and Mittelbau-Dora is not straightforward, as few of the prisoners there were Jewish. The camp was filled with Soviet POWs and Polish forced laborers who had somehow ended up in SS hands, plus French and Belgian resistance fighters, German political prisoners, German criminals, gypsies, and several other groups. Jewish prisoners did not arrive in the camp until May 1944 and were rarely employed in V-2 production. But at the end of the war, thousands of starving, largely Jewish survivors of Auschwitz and Gross Rosen were dumped into the Mittelbau-Dora camp system and constituted a large fraction of the dead and dying discovered by the U.S. Army in 1945.¹⁶ Although it can be posed only as a counterfactual hypothesis, it seems to me that if the consciousness and knowledge of the camps and the Holocaust that arose after the late sixties had existed in the fifties, it would have been much harder for Dornberger and von Braun to sweep the Nordhausen story under the rug. Indeed, in the 1970s, the rising attention to the Holocaust in the Western world did have an indirect effect on the attention paid to Mittelbau-Dora, eroding the received story of Peenemünde constructed in the 1950s.

Despite the lack of interest in the worst of Nazi crimes in the late 1940s and 1950s, reinforced by the Cold War alliance with the newly constructed West Germany, it cannot be said that the American environment was entirely friendly to the Peenemünders as they told their stories of the German rocket program. There were large number of veterans of the war and members of ethnic and religious groups who had no reason to like Germans. There were many false alarms in the media about the rise of neo-Nazism in the Federal Republic. In 1960-1961, the West German government became worried about an "anti-German wave" in the American public and media as the result of anti-Semitic incidents in German cities, as well as William Shirer's best-selling book *The Rise and Fall of the Third Reich*, the movie *Judgment at Nuremberg*, and the

15. Peter Novick, *The Holocaust in American Life* (Boston/New York: Houghton Mifflin, 1999), chaps. 4-6; Raul Hilberg, *The Politics of Memory: The Journey of a Holocaust Historian* (Chicago, IL: Ivan R. Dee, 1996).

16. On the history of Mittelbau-Dora, the definitive work is Jens-Christian Wagner, *Produktion des Todes: Das KZ Mittelbau-Dora* (Göttingen: Wallstein, 2001). See also André Sellier, *A History of the Dora Camp* (Chicago, IL: Ivan Dee, 2003).

revelations of the Eichmann trial. German crimes had scarcely been forgotten, although equated for years to Communism under the label totalitarianism.¹⁷

Anti-German prejudice bubbled up repeatedly in public comments about von Braun, who rapidly became by far the most famous of the rocketeers in the 1950s. It certainly explains the heavy handed stress on his Americanization and his supposed non- or anti-Nazi record in his two ghostwritten memoirs and in the first American biography written about him. It even surfaced in the heroic movie about him released in August 1960, *I Aim at the Stars*, an American-German coproduction. Von Braun's most trusted German producer wrote to him from Hollywood in June 1958 about the process of formulating a story treatment: "As you know, they are anxiously trying to show that you were no Nazi, although you were a member of the Party and built the V-2 for Hitler." In the end, the movie script incorporated a hectoring American character who pursues von Braun with questions like why he had not been hanged at Nuremberg. Apparently, the American script writers were just not comfortable making him the unalloyed hero of his own heroic "biopic." Even so, the movie opened to protest in Munich, London, Antwerp, and New York; but it bombed basically because it was tedious. Comic Mort Sahl's punch line became the most memorable thing about it: *I Aim at the Stars* should have been subtitled *But Sometimes I Hit London*.¹⁸

Such public doubts and media fiascos notwithstanding, Wernher von Braun had an enviable image in the American, and even more so, in the West German press in the late 1950s and early 1960s. Hero worship was everywhere, and was even prominent in less friendly counties like Britain and France. Von Braun was the vindicated prophet of spaceflight, instrumental in launching the first U.S. satellite and the first U.S. interplanetary probe, and the most visible symbol of the space race with the Soviets—at least until gradually displaced by the astronauts. He was cast in the mold of scientific hero, with his Nazi past neatly explained away based on the standard accounts. As von Braun and his group of Germans had become central to American space efforts (they were transferred to NASA in 1960 to become the core of Marshall Space Flight Center in Huntsville, Alabama) it was easy to conflate von Braun's biography, and that of a tiny band of space true-believers who came with him, with his entire group. Journalists and book authors simply glossed over the fact that most of his 120-odd engineers, scientists and technicians had been hired or recruited during the Third Reich and previously had nothing to do with rocketry or spaceflight. The set storyline was that the dream of spaceflight and landing on the Moon had arisen in the Weimar

17. Brian C. Etheridge, "Die antideutsche Welle: The Anti-German Wave in Cold War America and Its Implications for the Study of Cultural Diplomacy" in Jessica Gienow-Hecht, ed., *Decentering the United States: New Directions in Culture and International Relations* (Berghahn Books: 2007).

18. Bergaust, *Reaching*; Mainz to WvB, June 12, 1958, in file 208-7, WvB Papers, USSR C; Neufeld, *Von Braun*, 325-326, 346-353.

rocket and space societies, but Von Braun & Co. had to take a “detour” via military rocket development because that is where the money was. That detour continued in work for the U.S. Army, but then von Braun began campaigning for space travel in the 1950s, and the missiles he had developed became one of the foundations of the U.S. space program, leading ultimately to his group’s central role in landing a human on the Moon in Apollo. Von Braun himself, together with close associates like Fred Ordway, went on to write space-history works in the 1960s and 1970s that fortified a spaceflight narrative privileging the Germans. Rip Bulkeley has rightly labeled this the “Huntsville school” of history.¹⁹

Detailing how the received version of the Peenemünde and von Braun story formulated in the 1950s was gradually undermined takes us beyond the scope of this paper, but it is instructive to look at a few key points. In the 1960s, the East German Communists tried several times to embarrass the United States and von Braun by outing his SS officer status and his involvement with Mittelbau-Dora. Julius Mader, a popular author who was a covert officer of the East German secret police, published *Geheimnis von Huntsville: Die wahre Karriere des Raketenbarons Wernher von Braun* (*Secret of Huntsville: The True Career of Rocket Baron Wernher von Braun*) in 1963, a book that was translated into Russian and other East-Bloc languages and circulated in nearly a half million copies. Out of it sprang a major feature film, *Die gefrorenen Blitze* (*Frozen Lighting*), that the East German official film studio released in 1967. But the Cold War divide was so strong that the book and the movie had very little impact in West Germany and none at all in the U.S., where they were almost unknown. Only slightly more effective was the East German involvement in the West German war-crimes trial in Essen from 1967-1970 of three SS men from the Mittelwerk. The chief East German lawyer succeeded in getting von Braun called as a witness, but NASA, seeking energetically to protect the rocket engineer, got the testimony moved to the German consulate in New Orleans in early 1969 and successfully kept most of the press away. During the Apollo 11 Moon landing in July of that year, the famous columnist Drew Pearson wrote that von Braun had been an SS member in the context of otherwise praising him, but offered no proof as to where he got this information. The rest of the American media completely

19. On hero-worship in West Germany and even in France, see Neufeld, *Von Braun*, pp. 323-324, 408-410. For typical products of the German-centered narrative see Ernst Klee and Otto Merk, *The Birth of the Missile: The Secrets of Peenemünde* (New York, NY: E. P. Dutton and Co., 1965) (translation of *Damals in Peenemünde*); Wernher von Braun and Frederick I. Ordway, III, *A History of Rocketry and Space Travel* (New York, NY: Thomas Y. Crowell, 1967); Ordway and Mitchell R. Sharpe, *The Rocket Team* (New York, NY: Thomas Y. Crowell, 1979). On the Huntsville school, see Rip Bulkeley, *The Sputniks Crisis and Early United States Space Policy* (Bloomington, IN: Indiana University Press, 1991), 204-205. The classic explication of the “detour” thesis, based on a reading of the earlier secondary literature and not one scrap of archival research, is William Sims Bainbridge’s *The Spaceflight Revolution: A Sociological Study* (New York, NY: Wiley, 1976).

ignored it. So entrenched was the apologetic life story that when von Braun died eight years later of cancer, his voluminous obituaries never mentioned that fact; many did not even bring up his membership in the Nazi Party.²⁰

The Essen trial, along with the publication of Albert Speer's memoirs in 1969 in German and 1970 in English, did contribute to gradually opening up the history the Mittelwerk and the Mittelbau-Dora camp system, notably in West Germany. A rising consciousness of the history of the Holocaust and the camp system worked in the background to make it harder as well to retail the old history of the German rocket program. When Ordway finally published *The Rocket Team* with Marshall Center writer Mitchell Sharpe in 1979—a narrative of the von Braun group dominated by the V-2 story—they could no longer leave out the underground plant, even if they did produce a rather one-sided and abbreviated treatment. That same year, *Dora*, the memoir of French resistance fighter Jean Michel, appeared in English translation, further opening up the topic, although the book had much less influence than the *Rocket Team*—or at least it did until it helped spark an investigation by the newly formed Office of Special Investigations (OSI) of the U.S. Department of Justice. In October 1984, it announced that one of von Braun's closest associates, Arthur Rudolph, had left the country and denounced his U.S. citizenship as part of a voluntary agreement to forestall a court trial over his denaturalization. He had to admit his early membership in the Nazi Party and his prominent role in the management of slave labor in the Mittelwerk. This announcement provoked a wave of headlines across the U.S. and around the world. Suddenly Nordhausen appeared in multiple American newspaper articles for the first time since April and May 1945. Shortly afterward, thanks to the Freedom of Information Act and the work of freelance journalist Linda Hunt, von Braun's Party and SS record came out when his Army security files were declassified. The old history of the German rocket program, although still entrenched in many quarters, would never be defensible again. When the Cold War ended only five years later, making the former East German sites of Peenemünde and Mittelbau-Dora accessible, it only reinforced the trend. It

20. Julius Mader, *Geheimnis von Huntsville: Die wahre Karriere des Raketenbarons Wernher von Braun* (Berlin-East: Deutscher Militärverlag, 1963; 2nd ed., 1965; 3rd ed. 1967); Paul Maddrell, "What We Discovered About the Cold War is What We Already Knew: Julius Mader and the Western Secret Services During the Cold War," *Cold War History* 5 (May 2005), 235-258, esp. 239-242; Thomas Heimann and Burghard Ciesla, "Die gefrorenen Blitze: Wahrheit und Dichtung: FilmGeschichte einer 'Wunderwaffe'," in *Apropos: Film 2002. Das Jahrbuch der DEFA-Stiftung* (Berlin: DEFA-Stiftung/Bertz Verlag, 2002), pp.158-180. Neufeld, *Von Braun*, pp. 404-408, 428-429, 473; Kaul Antrag, December 4, 1967, and Hueckel to WvB, November 6, 1968, in Ger. Rep. 299/160, Nordrhein-Westfälisches Hauptstaatsarchiv/Zweigarchiv Schloss Kalkum; Pearson, "Prime Moon Credit is Von Braun's," *Washington Post*, July 17, 1969; WvB to Gen. Julius Klein, August 2, 1969, copy provided by Eli Rosenbaum/OSI.

opened the way to a new, more complex and often contradictory public memory of the German rocket program in the U.S., Germany, and the Western world.²¹

Two things predominantly shaped how the V-2 and the Third Reich rocket project was remembered in the first few decades after World War II: the prominence of ex-German rocketeers in the United States and their value to the West in the Cold War. Willy Ley, an anti-Nazi refugee, rose to fame in the U.S. and elsewhere as a science writer in World War II and after, and he offered a space-oriented perspective on German rocket history. Then von Braun and Dornberger arrived under Project Paperclip and provided their technical expertise to the United States; von Braun in particular then became a national celebrity in the 1950s through space promotion in *Collier's* and Disney, followed by his central role in launching the first U.S. satellite, the first American deep space probe, the first American astronaut, and the Apollo expeditions to the Moon. Von Braun became a national and Western asset in the Cold War struggle with the Soviets, one that the media wanted to protect even without official U.S. government efforts to manage his image. Since the Nordhausen and Mittelbau-Dora story and von Braun's SS membership were virtually unknown, in large part due to government secrecy, the received story of the German rocket program held up, even in the face of East German attempts to undermine it. Nothing so clearly indicates the shaping influence of the Cold War than that fact; two competing narratives of von Braun and Peenemünde arose on either side of the "Iron Curtain," especially after Mader's 1963 book, yet even in the free press of the West, very little changed. It took the rising consciousness of the Holocaust and the history of the Nazi camp system to begin to erode the traditional narrative. Holocaust consciousness also led to the formation of the Nazi-hunting Office of Special Investigations in the U.S., which finally broke open the story.

In conclusion, I would like to appeal to space historians to begin to pay closer attention to their own history. Some good historiographic overview articles have been written, but not many attempts have been made to write the history of space history, notably in its origin phases. This history will tell us much about the constitution and mentality of spaceflight movements. More than that, the growth of the literature on public and collective memory provides another rich field for exploration: how space history, which has been written mostly by space enthusiasts and friendly journalists throughout much of its existence, has shaped popular memories of rocket development and space travel in the larger publics of the West and East—not to mention the rest of the world. Some pioneering work

21. Bernd Ruland, *Wernher von Braun: Mein Leben für die Raumfahrt* (Offenburg: Burda, 1969), 227-239; Albert Speer, *Erinnerungen* (Berlin: Propyläen, 1969), translated as *Inside the Third Reich* (New York: Macmillan, 1970); Manfred Bornemann and Martin Broszat, "Das KL Dora-Mittelbau," in *Studien zur Geschichte der Konzentrationslager* (Stuttgart: Deutsche Verlags-Anstalt, 1970) and Bornemann, *Geheimprojekt Mittelbau* (Munich: J. F. Lehmanns, 1971); Ordway and Sharpe, *Rocket Team*; Jean Michel with Louis Nucera, *Dora* (1975; New York, NY: Holt, Rinehart and Winston, 1979); Hunt, "U.S. Coverup" and *Secret Agenda*; Bower, *Paperclip Conspiracy*; Neufeld, *Von Braun*, 474-475; Eli Rosenbaum/OSI interview, July 26, 2006.

FRONT PAGE

New York Times

NEW YORK, THURSDAY, OCTOBER 18, 1984

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German-Born NASA Expert Quits U.S. to Avoid a War Crimes Suit

By RALPH BLUMENTHAL

A German-born space official who developed the rocket that carried Americans to the moon has quietly left the United States and surrendered his citizenship rather than face Justice Department charges that he had brutalized slave laborers at a Nazi rocket factory during World War II.

Announcing the action yesterday in a brief statement, the Justice Department said that the official, Arthur Rudolph, as director for production of V-2 rockets at an underground factory attached to the Dora-Nordhausen camp from 1943 to 1945, "participated in the persecution of forced laborers, including concentration camp inmates, who were employed there under inhumane conditions." A third to one half of Dora's 60,000 prisoners died.

The National Aeronautics and Space Administration, which had awarded high awards to Mr. Rudolph for his work for the agency from 1962 from 1969, had no comment on the Justice Department announcement. [Page A13.]

The announcement on Mr. Rudolph, who was brought to the United States in 1945 with Wernher von Braun and more than a hundred other Nazi German technicians and scientists, was negotiated in advance with Mr. Rudolph.

The announcement did not mention his prominent role in the United States space and missile programs. Nor did it say where he had gone. Investigators said it was West Germany.

Officials said it was unlikely that Mr. Rudolph, who is 77 years old, would face prosecution in West Germany as the statute of limitations has expired. Mr. Rudolph was not carried on an Allied list of war criminals drawn up after the war. Other officials of the rocket factory were convicted of war crimes and jailed or executed.

Mr. Rudolph's whereabouts in West Germany has not been disclosed. His lawyer, George Main of San Jose, Calif., declined to take a reporter's call

Continued on Page A12, Column 3

More than anything else, the 1984 revelation of Arthur Rudolph's involvement in the abuse of concentration-camp labor undermined the traditional narrative of the German rocket program. (author's collection)

has been done, mostly on the United States, but a rich field of opportunities exists for those who are willing to use the tools of social and cultural history and collective memory to delve into the reception of space history, not only its generation.

CHAPTER 6

OPERATION PAPERCLIP IN HUNTSVILLE, ALABAMA

Monique Laney

In 1984, Arthur Rudolph renounced his American citizenship and moved back to Germany with his wife 30 years after becoming an American citizen. Previously, Rudolph had enjoyed more than a 20-year career with the U.S. Army and NASA from which he retired in 1969. Rudolph was one of the German rocket engineers who had been brought to the United States following World War II under the secret military project that would come to be known as “Operation Paperclip.” He decided to leave the country after so many years because he was being investigated by the OSI, which alleged that Rudolph had been involved in the horrific and often deadly treatment of forced and slave laborers from the Dora concentration camp who had been used to produce V-2 rockets at Mittelwerk in the last years of the war. Before Rudolph passed away in 1996, several attempts were made to bring him back into the United States, and even today some of his former colleagues and friends want to see his name cleared.¹ According to one of his former coworkers, Huntsville responded to the government action against Rudolph with “unanimous disgust” and “did its best to try to fight it.”²

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1. The Rudolph case and attempts to have his name cleared have been covered extensively in local and national newspapers and magazines since 1984. This case has evoked strong emotions where terms such as “witch hunters” and “holocaust deniers” seem to be commonplace in an ongoing battle over some form of truth. Two authors who have interrogated the case at some length from opposite sides of this controversy, reflecting some of the accusatory and at times inflammatory rhetoric, are Thomas Franklin (pseudonym), *An American in Exile: The Story of Arthur Rudolph* (Huntsville, AL: Christopher Kaylor Company, 1987) and Linda Hunt, *Secret Agenda: The United States Government, Nazi Scientists, and Project Paperclip, 1945-1990* (New York, NY: St. Martin's Press, 1991).
 2. Charles A. Lundquist interview, Huntsville, AL, July 12, 2007. Lundquist was born and raised in South Dakota. He was awarded his Ph.D. in astrophysics at the University of Kansas in 1954. Due to an earlier education deferment, he was then drafted to join the Army Ballistic Missile Agency (ABMA) at Redstone Arsenal near Huntsville, Alabama. Lundquist left Huntsville in 1962 to work for astronomer Fred Whipple until 1973 at the Smithsonian Astrophysical Observatory (SAO) in Cambridge, Massachusetts. He returned to Huntsville in 1973 as Director of the Space Science Lab at the Marshall Space Flight Center. In 1981, Lundquist took the job of Director and later Associate Vice President for Research at the University of Alabama in Huntsville (UAH). Although officially retired, he currently still helps out at the archives at UAH.

This remark about the unanimity of the community in regards to the so-called “Rudolph case” gives me pause. Not only does it imply that there were no opposing voices in Huntsville, but it also contradicts national and international discourses about the German rocket engineers that have scrutinized these scientists past work in Nazi Germany.³ Such a remark exemplifies a counter-narrative, fighting to be heard in light of national narratives while simultaneously excluding narratives that contradict its own dominant stance in the local community. This “hegemonic counter-narrative” is the impetus for my dissertation, which explores the impact of Operation Paperclip on narratives of the first and second generation Germans, non-German Huntsville residents, and the local and national media, as well as on debates between laypersons and historians negotiating how to evaluate the engineers’ past.

Huntsville, Alabama, has been home for most of the German rocket team members associated with Wernher von Braun who were brought to the United States under the secret military project known as Operation Paperclip. Those who arrived before 1950 were sent to Fort Bliss near El Paso, Texas, where they worked for the U.S. Army and shared their expertise in rocketry developed while designing and testing V-2 rockets in Germany during World War II. After one to two years in Fort Bliss, the men’s dependents were allowed to join them. In 1950, the Army moved its rocket development program to Redstone Arsenal near Huntsville, Alabama. This meant that, with few exceptions, most members of the German team moved to Huntsville with their families, and their children would come to consider Huntsville their hometown. In 1960, NASA established the Marshall Space Flight Center on Redstone Arsenal where most of the Germans had been transferred under Wernher von Braun’s direction.

The following analysis is an excerpt of a larger project that investigates the impact of Operation Paperclip on the German families and their Huntsville neighbors. The project is based primarily on oral histories because answers concerning impact are largely dependent on how and by whom the past is told. I have interviewed German and non-German Huntsville residents with different social and cultural backgrounds who lived in Huntsville in the 1950s and 1960s. By listening to the ways in which individuals recount the past and

3. I am referring primarily to the many national and international newspaper and magazine articles and documentary films reporting on and evaluating the German rocket engineers in the United States since their presence was made public in 1946. For some book length sources, see Tom Bower, *The Paperclip Conspiracy: The Hunt for the Nazi Scientists* (Boston: Little, Brown, 1987); Linda Hunt, *Secret Agenda: The United States Government, Nazi Scientists, and Project Paperclip, 1945-1990* (New York, NY: St. Martin’s Press, 1991); John Gimbel, *Science, Technology, and Reparation: Exploitation and Plunder in Postwar Germany* (Stanford, CA: Stanford University Press, 1990); Clarence G. Lasby, *Project Paperclip: German Scientists and the Cold War* (New York, NY: Atheneum, 1971); and Michael J. Neufeld, *The Rocket and the Reich: Peenemünde and the Coming of the Ballistic Missile Era* (New York, NY: Free Press, 1995). For examples of sources that reflect a less scrutinizing approach to this history, see footnote 11 on page 94.

evaluate certain events from today's perspective, one can learn which narratives of the past have dominated and which have been marginalized and, with closer analysis, the societal discourses that influence the telling of the stories over time can be discerned.

There are many reasons for scholars to use oral histories in their research. Sometimes it is a way to humanize the subject matter and give it a sense of reality. In other cases, oral histories may be the only source available, thereby functioning as evidence in lieu of, or as a supplement to, written documents. I use oral history in a different manner. I am interested in the storytelling of oral history, (i.e., the struggle over memory). What parts of the past do people find important or significant to their lives, and how does that interact with the way they talk about events in the past and the present? How are these stories affected by the individual's position in relationship to dominant groups in society? What do discrepancies and errors tell us about "the work of desire and pain over time?"⁴

Because those on the margins of society are often affected very differently by changes at the center, listening to their stories allows us to question the logic and dynamics of dominant narratives. As pointed out earlier, knowing who is speaking from the margin or from the center is not always as clear for this project because it is determined by what grouping we focus on as the center. For example, while the German rocket engineers and their families were a minority group with unique histories and cultural backgrounds in Huntsville, their perceived "otherness" was based primarily on positive distinctions. Despite national and international scrutiny, they do not seem to have lost their status as a powerful minority that has adjusted to and blended in easily with the white Christian majority of Huntsville—making them part of "the center" in Huntsville. As members of a minority group, their positions were very different from those of other minority groups (e.g., members of the African American community). However, the idealization of the German rocket team by many Huntsvillians contrasts with national and international perceptions. So, while the German minority is part of the Huntsville majority, in regard to the German rocket engineers, Huntsville's majority perspective reflects that of a minority within the nation and internationally.⁵ This distinction is particularly important for this project because the main issue I grapple with is how narrations of the past reflect changing power structures (who is marginalized in reference to whom), sometimes reinforcing old structures, and sometimes creating new and unexpected alliances.

4. Alessandro Portelli, *The Order Has Been Carried Out: History, Memory and Meaning of a Nazi Massacre in Rome*, 1st Palgrave Macmillan ed. (New York, NY: Palgrave Macmillan, 2003), p. 16.

5. The question of national and international perspectives needs clarification because it depends largely on definitions of who speaks for the national or international community. This is a weakness of this paper that will be addressed in detail in my larger work.

In addition to first and second generation Germans in Huntsville, I interviewed members of the African American and Jewish communities and World War II veterans, as well as former coworkers, neighbors, and friends of the German rocket engineers and their families. As the following exploration will illustrate, not surprisingly, those who historically wielded little power and had practically no voice in the Huntsville community have a very different perspective on the impact of the Germans on Huntsville than those who considered themselves to be equals. Perhaps less expected is how this marginalized narrative in Huntsville seems to echo larger national and international narratives.

When asked about the impact of the German rocket engineers and their families on Huntsville, practically every interviewee, regardless of personal background, mentions music, specifically the Huntsville Symphony Orchestra. After that, they usually attribute the first Lutheran Church in town and UAH, the U.S. Space & Rocket Center, Broadway Theatre League, and the Ballet Company to efforts of the German team. The word “culture” is prominent among most of the responses, and those who grew up alongside the children of the rocket engineers emphasize how “smart” the children were, often outdoing locals in school, which was typically linked directly to the father’s reputation as “rocket scientists.”⁶

With the space program came significant economic development for the formerly small cotton town in Northern Alabama that many Huntsville residents link directly to the arrival of the German rocket experts from Fort Bliss, Texas, in 1950, despite the simultaneous arrival of many American engineers, scientists, and technicians and their families.⁷ The town’s population increased

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6. The term “rocket scientist” is a misnomer used by the media and in popular culture and applied to a majority of engineers and technicians who worked on the development of rockets with von Braun. It reflects a cultural evaluation of the immense accomplishments of the team but is nevertheless incorrect. For an explanation of why a distinction should be made between scientists and these engineers, see Michael J. Neufeld’s latest publication, *Von Braun: Dreamer of Space, Engineer of War* (New York, NY: Alfred A. Knopf in association with the National Air and Space Museum, Smithsonian Institution, 2007): “A Note On The Name And On Terms.”
 7. The notion that the Germans were the main cause for the town’s rapid development is a popular myth in Huntsville, most likely derived from the German team’s later success and prominence. It distorts the fact that the approximately 120 German rocket engineers were part of a larger Army transfer that included the move of approximately 500 military personnel, 65 civilian personnel, and 102 General Electric (GE) employees in addition to the German specialists. By 1955, employment at Redstone Arsenal had increased from 699 in June 1949 to 6,442. For more information, see “Fort Bliss, Texas, Rocket Office to Be Moved to Redstone Arsenal,” *Huntsville Times*, November 4, 1949. “Quarters: Of Guided Missile Area Set up at Redstone Arsenal,” *Huntsville Times*, April 16, 1950, “150 Redstone Families Here, Others Coming,” *Huntsville Times*, July 9, 1950. “Move Scheduled by GE Employes [sic],” *Huntsville Times*, April 3, 1950. Helen Brents Joiner and Elizabeth C. Joliff, *The Redstone Arsenal Complex in Its Second Decade, 1950-1960*, ed. Historical Division (Redstone Arsenal, AL: U.S. Army Missile Command, 1969).

almost tenfold, from 16,437 to 137,802, over the following two decades, adding people from other regions of the United States as well as from other countries.⁸ Formerly a small cotton mill town that prided itself in being the “watercress capital of the world,” Huntsville soon became known as “Rocket City,” to some even “Space Capital of the Universe,” for its new space- and missile-related industry. Today, real estate companies and travel agents like to advertise that Huntsville has the “highest percentage of engineers and more Ph.D.’s per capita than any city in the country.”⁹ Huntsville’s main newspaper perceives the town as hugely indebted to the German rocket specialists, especially Wernher von Braun, who was titled “Huntsville’s first citizen” in an article describing the ceremonies at Huntsville’s courthouse to send him and his family off to work for NASA in Washington, DC, in 1970.¹⁰ Enforcing the notion that the city owes much of its prosperity to the arrival of these immigrants, the Von Braun Civic Center was named after the most prominent member of the rocket team—a constant reminder of the Germans’ presence in town while simultaneously showcasing Huntsville’s defiant position towards more critical national and international viewpoints.

While the casual observer or newcomer to Huntsville is not likely to hear any contradictions to this impressive and positive portrayal, the people in the town were not then, nor are they now, unanimous in their assessment of the newcomers. For this excerpt of my research, I focus on interviews with members of the African-American community. I intend to illustrate the significance of social positioning based on racial categorizations in a Jim Crow environment for perceptions of the German families’ impact on Huntsville. In the larger project, I propose that some dominant narratives in Huntsville stem from power structures based in the history of slavery and Jim Crow, as well as in certain forms of anti-Semitism and elitism among those with economic power in this once small cotton mill town. The German group clearly fit well into these preexisting structures and, as we will see, were sometimes perceived as reinforcing them.

Naturally, the perspectives of individuals evaluating this event are based on personal backgrounds and level of contact with members of the German group. The most prominent public voices typically heard on this subject are either members of the German community, former coworkers, or close

8. These population numbers are for Huntsville proper. W. Craig Remington and Thomas J. Kallsen, eds., *Historical Atlas of Alabama: Historical Locations by County*, vol. 1 (Tuscaloosa, AL: Department of Geography, College of Arts and Sciences, University of Alabama, 1997).

9. Holly McDonald, “Home page: Welcome to Huntsville,” Keller Williams Realty Web site, <http://www.hollymcdonald.com/> (accessed August 22, 2007), and “Welcome to Huntsville: It’s a Great Place to Live,” *Inspired Living: Greater Huntsville Relocation Guide* (Huntsville, AL: Price-Witt Publications LLC, Fall/Winter 2005): 12.

10. Bill Sloat, “Rocket City Launches von Braun,” *Huntsville News* (February 25, 1970): 1-2.

friends of some of the German families.¹¹ My approach counters these mostly monolithic accounts and acknowledges British social historian Paul Thompson's statement that the aim of oral historians is to make history "more democratic" by "shifting the focus and opening new areas of enquiry . . . by bringing recognition to substantial groups of people who had been ignored" and by radically "questioning . . . the fundamental relationship between history and the community" because "the self-selected group will rarely be fully representative of a community."¹²

When talking about the impact of the Germans on Huntsville, the lack of voices from the African American community in a southern town is hard to ignore. I first became aware of this when reviewing a public forum titled "Creating Rocket City," recorded on video in 2003 as a contribution to the public library's celebration of the centennial of the Wright brothers' first flight.¹³ As the title implies, this panel was intended to discuss the city's development since the 1950s. It included one African American speaker, Hanson Howard, who was, according to the organizer, included "for diversity."¹⁴ A camera scan over the audience reveals that Howard was apparently also the only African American person in the room. When I asked him about that, he noted simply, "I figured that's the way it would be . . . You know, it wasn't a surprise."¹⁵

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11. The following are examples of longer articles or book-length accounts illustrating to what I am referring and do not include numerous local newspaper articles. Erik Bergaust, *Rocket City, U.S.A.; from Huntsville, Alabama to the Moon* (New York: Macmillan, 1963); Placide D. Nicaise, *Huntsville and the Von Braun Rocket Team: The Real Story*, ed. Scientists and Friends (Monterey, California: Martin Hollmann, 2003); Frederick Ira Ordway, III and Mitchell R. Sharpe, *The Rocket Team*, 1st MIT Press pbk. ed. (Cambridge, MA: MIT Press, 1982); Ruth G. von Saurma and Walter Wiesman, "The German Rocket Team: A Chronology of Events and Accomplishments," *The Huntsville Historical Review* 23, no. 1 (1996), 20-29; Ruth G. von Saurma, "Personal Recollections of Huntsville's Rocket and Space Highlights, 1949-1980," *The Huntsville Historical Review* 27, no. 1 (2000), 37-52; Ruth G. von Saurma, "Growing up in Huntsville," *The Huntsville Historical Review* 23, no. 1 (1996), 13-19; Ernst Stuhlinger, "German Rocketeers Find a New Home in Huntsville," *The Huntsville Historical Review* 23, no. 1 (1996), 3-12; Ernst Stuhlinger, "Sputnik 1957—Memories of an Old-Timer," *The Huntsville Historical Review* 26, no. 1 (1999), 26-31; Ernst Stuhlinger and Frederick Ira Ordway, III, *Wernher Von Braun, Crusader for Space: A Biographical Memoir*, Original ed. (Malabar, FL: Krieger Pub., 1994); The Marshall Retiree's Association, "Reminiscence of Space Exploration History Fireside Chats, February 17 2000," video available at http://media.eb.uah.edu/NASA_ARCHIVES/farside_chats/index.htm; Bob Ward, *Dr. Space: The Life of Wernher Von Braun* (Annapolis, MD: Naval Institute Press, 2005).
12. Paul Thompson, "The Voice of the Past: Oral History," in *The Oral History Reader*, ed. Alistair Thomson, Robert Perks (London, New York: Routledge, 1988), 26.
13. David Lilly, *A Century of Flight: 'Creating Rocket City'* (Huntsville, AL: Huntsville Public Library, 2003).
14. David Lilly, e-mail correspondence, October 10, 2005.
15. Hanson Howard interview, Huntsville, AL, May 10, 2006. Hanson Howard is a retired warrant officer who moved to Huntsville from Maryland with the Army in 1960. He was stationed in Germany twice, as well as to White Sands, New Mexico, and Vietnam. He currently works as Business Counselor at Northeast Alabama Region Small Business Development Center and is executive director of the Service Corps of Retired Executives. Howard requested to be

Why is this not a surprise? Why is the African American community not more represented in a public forum that discusses the enormous economic, cultural, and societal development of Huntsville since the Army moved its rocketry development program to town? This paper intends to shed some light on how we might answer these questions.

While the percentage of African Americans in Huntsville's population is lower than in many areas in Alabama, it has been and is again at about 30 percent.¹⁶ Segregation officially ended in the early 1960s, but the visitor today can easily observe that the town still appears to be de facto segregated into predominantly black neighborhoods in the northwest and white neighborhoods in the southeast parts of the city. However, the dominant perception is that Huntsville integrated its public facilities rather quickly in comparison to other towns in Alabama and before the signing of the 1964 Civil Rights Act.¹⁷

Charles Ray, a retired employee of the Army's Equal Employment Opportunity (EEO) office at Redstone Arsenal and the owner of Nelms Funeral Home in Huntsville was born in Madison County, Alabama, in 1936. He is an Alabama A&M alumni and has lived in the Huntsville area most of his life. Ray explains that racism in the area was less "rabid" due to the relatively

sent back to Redstone Arsenal in late 1966 after his tour in Vietnam. He is an Alabama A&M alum and active in Huntsville's community as a member of a ballet association, a United Way volunteer, and president of the board of the American Red Cross.

16. While in 1950 African Americans made up 32 percent of Huntsville's population, in 1960 and 1970 the percentage had declined to 14 percent and 12 percent respectively. This decline has been explained by the "lack of in-migration" of African Americans from the surrounding farmland into the city despite the decline in agriculture in the 1950s and 1960s. While the city's population expanded, it was mainly the white population that grew larger. According to the U.S. Census for 2000, the percentage of African Americans in Huntsville has risen back to 30 percent. U.S. Census Bureau (<http://www.census.gov/>), "Huntsville, Alabama: Factsheet," (2000), Huntsville-Madison County Public Library Archives, "Comparative Growth Rates: Huntsville, Madison County, Birmingham, Alabama; Source: US Census of Population 1920-1960," (file "Huntsville Population"), Huntsville-Madison County Public Library Archives, "General Population Characteristics—1970: Huntsville and Madison County Alabama, Source: U.S. Department of Commerce/Bureau of the Census," (Huntsville, AL: file "Huntsville Population"). See also Andrew J. Dunar and Stephen P. Waring, *Power to Explore: A History of Marshall Space Flight Center, 1960-1990, NASA Historical Series* (Washington, DC: National Aeronautics and Space Administration, NASA History Office, Office of Policy and Plans, 1999), p. 126.
17. According to the documentary film, *A Civil Rights Journey*, one of the town's historical markers received the addition "1962—First City in Alabama to begin segregation" to mark Huntsville's uniqueness in respect to civil rights in the state of Alabama. For information on the Civil Rights Movement in Huntsville, see Dunar and Waring, *Power to Explore: A History of Marshall Space Flight Center, 1960-1990, NASA Historical Series* (Washington, DC: National Aeronautics and Space Administration, NASA History Office, Office of Policy and Plans, 1999), chapter 4, and Sonnie Hereford, III, M.D., *A Civil Rights Journey*, DVD (United States: Sonnie Hereford, III, 1999). For a description of the Jim Crow system in context of Alabama 20th century history, see Wayne Flynt, *Alabama in the Twentieth Century, The Modern South* (Tuscaloosa, AL: University of Alabama Press, 2004), chapter 7.

low percentage of African Americans in the community, which meant that “we posed no political or economic threat to whites.” In addition, the rural community was not as clearly segregated.

We . . . lived in an area where there were large farms (that) had absentee owners, and they had sharecroppers as well on those farms. So, we lived together, had fun together and it was awfully inconvenient sometimes . . . for the kids, because we had to separate to go to school.¹⁸

While the private sphere of the surrounding rural areas was apparently not segregated in the first place, the urban community of Huntsville had an additional extraordinary incentive to integrate quickly—federal contracts with attached mandates to demonstrate equal opportunity employment practices.¹⁹ Michael Smith, a retired professor of political science who was born and raised in Huntsville and left the area after attending Alabama A&M at the age of 20 in 1968, returned in 1985 to teach at Calhoun Community College in nearby Decatur. He explains: “That’s how you got . . . racial integration in the town, because we got word from . . . the Kennedys . . . that if they didn’t straighten the stuff out, then the government might have to look at these contracts.”²⁰

While all interviewees note the significant economic impact that came with the arrival of German immigrants, the relationship of my African American interviewees to the Germans is characterized mostly by memories of segregation and its implications. In short, being German meant being white, especially in the 1950s when the rocket engineers and their families were trying to establish themselves in town. “When Dr. Von Braun . . . and his group (came) . . . there were celebrations and welcoming committees and so forth, but none of *our* people were invited to come to participate.”²¹

Sonnie Hereford, III, a retired family doctor and former civil rights activist, was born in Madison County in 1931. He attended Alabama A&M before moving to Nashville, Tennessee, for medical school. After his residency, he returned to Huntsville to practice medicine until 1993. Since then he has been teaching premed and prenursing students at Calhoun Community College.

18. Charles Ray, Jr. interview, Huntsville, AL, July 17, 2007.

19. For a brief history of the efforts to implement civil rights reforms at the Marshall Space Flight Center and associated businesses in the Huntsville area, see Andrew J. Dunar and Stephen P. Waring, *Power to Explore: A History of Marshall Space Flight Center, 1960-1990*, NASA Historical Series (Washington, DC: National Aeronautics and Space Administration, NASA History Office, Office of Policy and Plans, 1999), chapter 4.

20. Michael Smith interview, Huntsville, AL, July 29, 2007.

21. Sonnie Hereford, III interview, Huntsville, AL, July 19, 2007. Italics indicate emphasis by the speaker.

Hereford's above remark most likely refers to the barbecue party organized by the town's Chamber of Commerce to welcome the newcomers from Fort Bliss, Texas, as "Special Civic Guests." The event was announced repeatedly in the town's main newspaper in 1950,²² and it was clearly a well-planned and large-scale undertaking:

Local civic clubs will be asked to cancel their meetings during that week, to meet during the municipal party at the Big Spring Park . . . Elaborate entertainment and reception committees will also be established, to make sure that everyone is introduced, and has the opportunity of knowing others who will be present . . . Sponsoring Chamber officials are hopeful that the barbecue and fellowship will create continued harmonious relations between the various segments of the Huntsville population.²³

Obviously, the creation of "harmonious relations" did not apply to those between the white and black communities of Huntsville. When Ray explains, "We just did not move in the same circles," he is responding to such insults by referring to them as a matter of choice by the ones being excluded—not just by those who were actively doing the excluding. In this way, the insult is transformed and therefore rendered nonexistent. The need for such a transformation speaks to the level of pain these acts of exclusion caused.

In light of these segregated circumstances that were not unusual during the 1950s in the United States, it does not surprise that interest in and knowledge of the group of Germans was and is relatively low among members of the African American community. Ray adds,

I did not know of their . . . direct participation in the affairs of Huntsville. I'm sure, you know, the financial uplift that they brought to Huntsville with the program was controlled not by Germans, but by the white management at NASA.

22. "2,700 Attend Newcomer Fete Despite Rains," *The Huntsville Times*, August 10, 1950, "Invitations Sent for Civic Party [sic]," *Huntsville Times*, July 17, 1950, "Newcomer Party of Welcome Set," *Huntsville Times*, July 16, 1950, "Newcomers' Civic Party Rescheduled for Aug. 9," *Huntsville Times*, July 26, 1950, "Rain Will Not Halt Newcomer Outing Today," *Huntsville Times*, August 9, 1950.

23. "Chamber to Hold Barbecue Party," *Huntsville Times*, July 23, 1950. The guest list included not only the German rocket engineers and their families. In fact, they were in the minority. Invited were "Incoming scientific personnel at Redstone Arsenal, the contract companies, enlisted men and officers and their families." Ibid.

And that's essentially what the community dealt with, was the white power structure at NASA.²⁴

The Germans' commonality with other white citizens of the area expressed itself in other ways as well. Just like most white Southerners of Huntsville, the newly arrived Germans did not appear to be openly opposed to the system of racial segregation. The fact that they had been members of the privileged majority in Nazi Germany in a system that segregated and persecuted Jews and other minorities made their silence towards the Jim Crow system appear to be a continuation of the same tragic callousness towards those constructed as racially or otherwise inferior.²⁵ The commonality based on beliefs in being of the same race seemed tightly linked to common experiences and histories of racial privilege.²⁶

Smith points towards this important relationship and connects the use of slave labor for the production of the V-2 rockets during World War II with the slave labor system of the United States in the seemingly not so distant past, offering one explanation for why the German rocket engineers' past seems to be overlooked by many in Huntsville:

And, so these people love von Braun and will not hear about the Mittelwerks . . . (in) Huntsville . . . I don't hear any

24. Ray interview, July 17, 2007.

25. Germans who were adults during the Nazi period in Germany may not have all known to what extent the persecution of Jews was being carried out, but there is no doubt they saw and would have often been part of the treatment of Jews and other minorities as second class citizens or worse. Very few tried to intervene. Robert Gellately, *Backing Hitler: Consent and Coercion in Nazi Germany* (Oxford and New York: Oxford University Press, 2001).

26. The term "race" is a highly contested and socially constructed term. Which race a person is associated with or applies to himself or herself depends on factors such as location and historical context. As in many other countries, racism and racialization have a long standing history in the United States and in Germany. For the relationship of racism and racialization between Europe and the United States, see, for example, David Theo Goldberg, *Racist Culture: Philosophy and the Politics of Meaning* (Cambridge, MA, Oxford, UK: Blackwell Publishers Inc., 1993) and Stefan Kuhl, *The Nazi Connection: Eugenics, American Racism, and German National Socialism* (New York, NY: Oxford University Press, 1994). For the United States specifically, see: Michael Omi and Howard Winant, *Racial Formation in the United States* (London: Routledge, 1994); Edward W. Said, *Orientalism* (London: Penguin, 1978); Kimberlé Crenshaw, Neil Gotanda, Gary Peller, Kendall Thomas (eds.), *Critical Race Theory* (New York, NY: The New Press, 1995); Lipsitz, *The Possessive Investment In Whiteness*, (Philadelphia, PA: Temple University Press, 1998). For Germany specifically, see: Tina Camp, *Other Germans: Black Germans and the Politics of Race, Gender, and Memory in the Third Reich* (Ann Arbor, MI: University of Michigan Press, 2004); Heide Fehrenbach, *Race After Hitler: Black Occupation Children in Postwar Germany and America* (Princeton, NJ: Princeton University Press, 2005); Friedrichsmeyer, Sarah, Lennox, Sara, Zantop, Susanne, *The Imperialist Imagination: German Colonialism and Its Legacy* (Ann Arbor, MI: University of Michigan Press, 1998); Uli Linke, *German Bodies: Race and Representation after Hitler* (New York, NY: Routledge, 1999).

particular outrage over the fact that it might be true . . . Again, Huntsville is in no position . . . because . . . you had slavery right here . . . and many of the same people are still here today . . . And even if they're not, they're from other parts of the South . . . and you have the same immorality.²⁷

Smith emphasizes the slave labor system of the South, even though the system was not limited to this area of the United States. This may be his interpretation of the Jim Crow system that was implemented only in the Southern States and is generally seen as having continued the racist ideals of the earlier slave labor system. The mentality of those who enforced and complied with the Jim Crow system is, therefore, similar to that of those who enforced and complied with the previous slave labor system. This implies that white Northerners had potentially acquired a different mindset since the slave labor system ended while white Southerners had not. Whether that is a fair assertion or not, Smith's comment is significant because of the connection he makes between German and American histories of cruelties committed against those perceived as racial minorities.

Sonnie Hereford describes how white people in Huntsville dealt with segregation, which seems remarkably similar to attitudes of the majority of Germans towards the plight of Jewish people and other minorities during the Third Reich.

Many Caucasians here . . . were just nonchalant. I mean with some of them, they knew that the black people were being mistreated, but they weren't trying to do anything about it, and then there were some of them *doing* the mistreating. You know what I mean. And there were a few that wanted to work with us to try to change it.²⁸

Of course, what made the Germans different from other white people in town was their newcomer status and foreignness. That status apparently came with expectations on behalf of African American residents that were quickly disappointed.

Well, we were hoping that . . . they might join us in our fight for freedom . . . But I guess we were naïve . . . We were thinking . . . since they were encountering some resistance . . . maybe they'll join with us and all of us will fight . . . But . . . I

27. Smith interview, July 29, 2007.

28. Hereford interview, July 19, 2007.

don't recall any . . . of the people from the German community actually helping us.²⁹

The resistance some of the Germans may have encountered when they first arrived in Huntsville obviously did not make them feel as much solidarity with the African American minority as apparently expected.³⁰ The expectation on behalf of African American residents in Huntsville may have been the result of reports from Germany during the first years of the allied occupation.³¹ While the economic situation was still very dire for most Germans in Germany, and the Allied Occupation was still in full force immediately after the war, many Germans reportedly treated African American soldiers quite cordially. They were presumably responding to experiences with African American soldiers who were generous and friendly despite their position of relative power as occupying soldiers. The Germans' friendliness was surprising for many African American soldiers, who had heard horrific stories about German racism and who were still segregated in their military units as well as at home. The German response was therefore reported as an unusual experience in African American magazines and newspapers around the country, which may have left the impression that Germans generally have a more favorable attitude towards African Americans and, therefore, more sympathy for their plight.³²

29. Ibid.

30. Most of my German interviewees noted that they found very little antagonism, let alone resistance to their arrival in Huntsville. This perception has been confirmed by other interviewees who were residents in Huntsville at the time. I was told of a few incidents of outright animosity but also that those sentiments seemed to dissipate quickly. I will address this phenomenon in more detail in the larger project.

31. Sentiments towards black soldiers in Germany were indeed very different after World War II, in contrast to World War I when nationalists interpreted France's use of black soldiers to occupy Germany as an added insult. After World War II, German attitudes towards African Americans varied and again became the focus of negative attention with the rise of interracial children born to African American soldiers and German women. However, the general impression seemed to be that Germany was less racist towards African American soldiers. For a discussion of the impact of the American occupation on sentiments towards African soldiers in the years immediately following the Second World War, see, John Gimbel, *A German Community under American Occupation: Marburg 1945-52* (Stanford, CA: Stanford University Press, 1961). Maria Höhn describes changing German attitudes towards African-American soldiers following the war in *GIs and Fräuleins: The German-American Encounter in 1950s West Germany* (Chapel Hill, NC: University of North Carolina Press, 2002). Heide Fehrenbach and Yara-Colette Lemke Muniz de Faria have both published important research on the treatment of interracial children born in postwar Germany. Heide Fehrenbach, *Race after Hitler: Black occupation children in postwar Germany and America* (Princeton, NJ: Princeton University Press, 2005); Yara-Colette Lemke Muniz de Faria, *Zwischen Fürsorge und Ausgrenzung: Afrodeutsche "Besatzungskinder" im Nachkriegsdeutschland* (Berlin: Metropol Verlag, 2002).

32. This perception was apparently still prevalent in the late 1950s. Recalling his service in Germany in 1958, General Colin Powell once stated that "[for] black GIs, especially those

The disappointed expectations of solidarity and active support from Germans for the causes of African Americans in Huntsville points to an important fact: being German in the United States had a very different meaning than that of being German in Germany, especially after World War II.³³ The Germans who came to Huntsville in 1950 and, therefore, to the United States very shortly after the war would not have experienced the German occupation of Germany to the same extent and have had the opportunity to bond with African American soldiers. In addition, instead of experiencing the Allied Occupation that had provoked strong feelings of humiliation by many Germans in the postwar years, the German rocket engineers and their families encountered very little difficulty in Huntsville, blended well with the white majority, and were generally welcomed with open arms by a community that appreciated the prosperity and cultural influence they brought to town.

In some ways, the German families seemed to make matters even worse for the African American community. Even though strangers to the town, they had more privileges than some of the town's longstanding residents. Hereford explains:

I think some people in my community were maybe jealous . . . because . . . *they* were permitted to go to the theatres and the concerts and to the sports arena, and *we* were not . . . And they were permitted to go to the restaurants and the hotels and motels and what have you, and we were not . . . I think there was maybe some animosity . . .³⁴

out of the South, Germany was a breath of freedom—they could go where they wanted, eat where they wanted, and date whom they wanted, just like other people.” Maria Höhn, *GIs and Fräuleins: The German-American Encounter in 1950s West Germany* (Chapel Hill, NC: University of North Carolina Press, 2002), p. 13.

33. For the meaning of being German in the United States, I refer to works on German immigrants to the United States, such as Wolfgang J. Helbich and Walter D. Kamphoefner, *German-American Immigration and Ethnicity in Comparative Perspective*, (Madison, WI: Max Kade Institute for German-American Studies, University of Wisconsin, 2004) and Russell A. Kazal, *Becoming Old Stock: The Paradox of German-American Identity* (Princeton, NJ: Princeton University Press, 2004). The post-World War II period of German immigration has not yet been analyzed thoroughly, with an important exception that focuses on the postwar emigration from Germany to the United States and Canada. For examples, see Alexander Freund, *Aufbrüche nach dem Zusammenbruch: Die Deutsche Nordamerika-Auswanderung Nach dem Zweiten Weltkrieg* (Göttingen: V & R Unipress, 2004), two articles by the same author: “Dealing with the Past Abroad: German Immigrants’ Vergangenheitsbewältigung and their Relations with Jews in North America since 1945,” *GHI Bulletin*, Fall 2002, 31:51–63, and “German immigrants and the Nazi past,” *Inroads*, Summer 2004, 15:106 (12), as well as an unpublished dissertation by Helmut Buehler, “The Invisible German Immigrants of the 21st Century: Assimilation, Acculturation, Americanization” (Ed. Dissertation, University of San Francisco, 2005).

34. Hereford interview, July 19, 2007.

The Germans were not only perceived as not supportive of African American causes or simply privileged in comparison; as Smith explains, they also appeared to actively engage in undermining African-American institutions, such as Alabama A&M, by supporting the Jim Crow system of dual education:

This is one of the negative things they've done—they were (the ones) who helped found the University of Alabama here in Huntsville. And I say negative because there was already a state supported school in Huntsville and it's called Alabama A&M. And so you now have this clash, this friction, this tension, between the new white school and the old black school, both state supported. So, that's one of the things the Germans also did. Von Braun. So, in other words, von Braun may have brought his European ethnocentrism . . . from Germany to Huntsville. And it was nothing out of the ordinary for him to . . . advocate the opening of a Jim Crow school. So, the Germans were *not* advocates of racial integration, as far as I know.³⁵

Von Braun was indeed instrumental in getting substantial funding for the University of Alabama, Huntsville, which was founded before desegregation in 1961.³⁶ Instead of pointing to von Braun, Clyde Foster offers another explanation

35. Smith interview, July 29, 2007. For more information about the dual system of education in Alabama, see the higher education desegregation case known as John F. Knight, Jr., and Alease S. Sims, et al. vs. the State of Alabama, et al., Civil Action No. CV 83-M-1676, “which began in Montgomery in 1981.” The case was “concerned with eliminating vestiges of historical, state enforced, racial segregation and other forms of official racial discrimination against African Americans in Alabama’s system of public universities.” Both Alabama A&M and UAH among others were defendants in this case. For a detailed historical overview of the “history of discrimination against African Americans in higher education” in Alabama, see Opinion 1 Fed. Supp., Vols. 781–835 787, F. Supp. 1030, Knight v. State of Ala., (N.D. AL 1991). After approving multiple remedial decrees, the court ordered the case closed in December 2006. Information about the case and full-text PDF files of the opinions are available at: <http://knightsims.com/index.html> (accessed January 5, 2008).

36. UAH existed as an extension of the University of Alabama in varying forms since 1950. In 1961, von Braun intervened in the town’s education politics by addressing the Alabama legislature, requesting funds to build and equip a research institute on the UAH campus. The Alabama legislature approved \$3 million in revenue bonds for the University. See “Alabama A&M University: Historical Sketch,” Office of Information & Public Relations, <http://www.aamu.edu/portal/page/portal/images/AAMUHistory.pdf> (accessed December 10, 2007) and “If you really investigate UAH’s history, how it all started and when and why, you might decide that the whole thing goes back to 1943 and the day Pat Richardson was hit in the neck by a softball,” Phillip Gentry, University Relations, <http://urnet.uah.edu/News/pdf/UAHhistory.pdf> (accessed December 11, 2007). For accounts of von Braun’s role in the expansion of UAH, see Ben Graves, “Panelist #7,” in *A Century of Flight: ‘Creating Rocket City’* by David Lilly (Huntsville, AL: 2003) and Bob Ward, *Dr. Space: The Life of Wernher Von Braun*, pp. 170–171.

for what happened in this case. Foster was born in 1931 and moved to the Huntsville area in 1950 from Birmingham, Alabama, to attend Alabama A&M. He worked for ABMA since 1957 and transitioned to NASA in 1960, along with most of the German rocket engineers. As the former mayor of nearby Triana, an all-black community west of Redstone Arsenal, Foster was instrumental in getting running water and a sewage system to the community, as well as building houses and creating job opportunities for community members.

Similar to Smith, Foster was appalled that Huntsville already had a university that was “A hundred and seventy-five years of age (yet) they come in and start a UAH.”³⁷ However, he also describes the difficulties in convincing the existing institution to implement an apparently much-needed engineering degree. He says,

That’s one of the things I tried to get A&M at that particular time to take advantage of . . . I couldn’t get (th)em interested. They (were) hard to convince back in the sixties, to get them to understand what’s at hand, and what would be available. I guess they d(id)n’t wanna rock the boat. A lot of it . . . had been caused by what segregation had done . . .³⁸

What Foster is referring to are the effects of systemic racism that often led to what he calls “acting like Uncle Tom.” The effects of racism had put African Americans at an immense disadvantage long before they could even think about attending college, let alone try to compete for the new jobs coming to town with the Germans. Hereford describes the school he attended: “We had no library. We had . . . no lunch room . . . no chemistry lab or biology lab, and I wanted to be a *physician*. And so I went to school (in Huntsville) for twelve years and we had none of those things.”³⁹

Foster describes the effects of this lack of educational opportunities on income opportunities available to the black community. Referring to the technical skills needed to be part of the booming space industry he states,

. . . we didn’t have a population with the prerequisites that would be needed to do this type of work . . . At that time (we) only . . . had barbershop(s), funeral home(s), beauty salon (s), (and) café(s). Depending on what city, there might have been some small type . . . hotel.

37. According to its Web site, Alabama A&M University opened in May 1875, which means that it had existed for 86 years when von Braun lobbied for UAH.

38. Clyde Foster interview, Triana, AL, July 19, 2007.

39. Hereford interview, July 19, 2007.

So, while the Germans seemed to have brought a lot of jobs to the town, being able to take advantage of that was not a matter of equal opportunity. Foster summarizes his experience as an African American man in 1950s Huntsville as follows:

To have been born . . . in one of the most difficult times to be born and to compete, here in Alabama, confronted with all of the segregation, George Wallace, and on the other hand you've got Dr. Wernher von Braun with the team from Germany from the University of Berlin! And how do you wanna compete?⁴⁰

CONCLUDING REMARKS

In my larger project, the impact of the German families on Huntsville's African American and other communities will be addressed in more detail. In this brief exploration, however, I hope to have provided some possible explanations for why Hanson Howard was not surprised to be the only African American in the room for a forum about the "creation of rocket city." Perhaps more importantly, I hope to have illustrated the significance of who is telling stories of the past, which includes the individual's relationship to dominant and normative groups in the past and the present.

It should be clear now that the assertion that Huntsville is "unanimous" on anything related to its German members' past is an overstatement. While sentiments towards the Germans in Huntsville were apparently always more positive than people not familiar with the town might expect, especially for the time shortly after World War II, they were and are certainly not unanimous. The notion of unanimity is not unique, but it creates a distorted picture, perpetuating injustices of the past. Troublesome and uncomfortable as it might be for those involved, it seems plausible that common experiences and histories of racial privilege have allowed the incoming Germans and white Huntsville residents to form a bond of complicity. As most of the Germans remained mainly silent about racial segregation in the South, most white Huntsville residents did not, and do not, raise questions about the Germans' past in Nazi Germany. Many members of both groups see themselves as victims of systems they view as beyond their control and seem to find explanations declaring the inevitability of their compliance satisfactory. In this way, the individuals are cleared from responsibility.⁴¹

40. Foster interview, July 19, 2007.

41. This is clearly a very complicated issue with many more aspects than I can discuss here. For the longer project, I will analyze individual's comments on this subject in detail, placing them in their appropriate historical and national context.

As Germans in the United States, the German rocket engineers and their families did not have to contend with the same issues as Germans in postwar Germany who were forced to confront the past as a nation for decades. However, in the United States, these immigrants were and are confronted with the histories of other immigrants, including refugees from Germany who had fled Nazi Germany during and after the war, as well as Germans of the following generations, like myself, who came to the United States at a later point in time and who are accustomed to a more honest approach to dealing with the German past.⁴² When discussing the rocket engineers' significance to the nation, we cannot afford to distort history to such an extent that we ignore the histories of other immigrants or of those who were already part of the American fabric. The controversies provoked by the Rudolph case alluded to at the beginning of this chapter make that abundantly clear.

By discussing the impact of historical events on members of the Huntsville community not typically consulted, I aim to disturb the notion of unanimity and create a more complex and complete picture. I believe this is as important for narratives about the "creation of the rocket city" as it is to the "history of rocketry" and, therefore, "space history" that should include the impact of the changes on different social groups of the Huntsville community just as much as the use and abuse of forced laborers from concentration camps for the production of Saturn V's forerunners and its implications.

This is a first attempt to listen to those often unheard voices within the Huntsville community as they tell the story of their German neighbors. However, listening to these voices alone would be a distortion as well, which is why I will continue the interview-based research weaving these and other voices into the fabric of my dissertation.

As stated earlier, the main issue with which I grapple is how narrations of the past reflect changing power structures and sometimes create new and unexpected alliances. In this case, it seems that despite their marginalization in Huntsville, voices from the African-American community may be more reflective of the larger national community, which often contrasts with the common idealization of the German rocket engineers in Huntsville. How these and other voices in Huntsville contest each other and interact with national narratives will be at the center of my dissertation where I take the concept of

42. For references on how Germans in Germany have been grappling with the Nazi past, see, for example, Michael Kohlstruck, *Zwischen Erinnerung und Geschichte: Der Nationalsozialismus und die jungen Deutschen* (Berlin: Metropol Verlag, 1997); Claudia Fröhlich and Michael Kohlstruck, *Engagierte Demokraten: Vergangenheitspolitik in kritischer Absicht* (Münster: Westfälisches Dampfboot, 1999); Charles S. Maier, *The Unmasterable Past: History, Holocaust, and German National Identity* (Cambridge, MA: Harvard University Press 1997); Jens Fabian Pyper, "Uns Hat Keiner Gefragt": *Positionen der dritten Generation zur Bedeutung des Holocaust* (Berlin: Philo, 2002); and Philipp Gassert and Alan E. Steinweis, *Coping With the Nazi Past: West German Debates on Nazism and Generational Conflict, 1955-1975* (New York, NY: Berghahn Books, 2006).

impact a step further. I argue that national histories, memories, and identities that immigrants bring with them become intertwined with those of their host society, inevitably leading to a struggle over meaning. For the Germans in Huntsville, this struggle was very different than for immigrants considered racially and culturally different or economically less desirable from those in positions of power in the 1950s in the United States.⁴³

There are, of course, other reasons for this group's very unique experience, which I will continue to interrogate as I pursue this project. I will close with the possibly most poignant comment on the interrelated nature of the histories of Germany and the United States I have encountered at this point. As he describes his visits of concentration camps in Germany, Charles Ray notes: "(H)ell, that could have been *here*, 'cause we have a tendency not to question power."⁴⁴

ON SOURCES

The video *A Century of Flight: Creating Rocket City* (2003) referred to in this paper is available at the Huntsville–Madison County library in Huntsville, Alabama. The transcript is in my possession.

The oral histories from which excerpts are used in this paper were collected based on snowball sampling during the summer of 2007 when I had the opportunity to speak to eight members of the African–American community of Huntsville. I have written permission to use the interviewees' names for research reports and to store the transcripts for future researchers at an interested and reputable archive or academic library when my project is completed. Currently, the audio files and transcripts are in my possession.

The lack of women's voices in this paper is an obvious weakness. I have made a deliberate effort to talk to African American women but have so far been unsuccessful. I am aware that this may have multiple historical reasons that challenge my project as I continue to seek interviewees.

43. This is not to say that this aspect has changed drastically for immigrants today. The spectrum of literature on immigration to the United States is vast. Here are just a few examples describing experiences of other immigrants to the United States in the postwar period. This selection illustrates the significance of professional occupation to the immigrant experience, which I will address for the German rocket engineers in my dissertation. Chaterine Cheiza Choy, *Empire of Care: Nursing and Migration in Filipino American History* (Durham and London: Duke University Press, 2003), Evelyn Nakano Glenn, *Issei, Nissei, War Bride: Three Generations of Japanese American Women in Domestic Service* (Philadelphia, PA: Temple University Press, 1986), David Guitiérrez, *Walls and Mirrors: Mexican Americans, Mexican Immigrants, and the Politics of Ethnicity* (Berkeley, CA: University of California Press, 1995), Pierrette Hondagneu-Sotelo, *Doméstica: Immigrant Workers Cleaning and Caring in the Shadows of Affluence* (Berkeley, CA: University of California Press, 2001), Matthew Frye Jacobson, *Whiteness of a Different Color: European Immigrants and the Alchemy of Race* (Cambridge, MA: Harvard University Press, 1998), and Reed Ueda, *Postwar Immigrant America: A Social History* (Boston, MA: Bedford Books of St. Martin's Press, 1994).

44. Smith interview, July 29, 2007.

I also asked my German and African American interview partners specifically about women and men who had worked for the German families as nannies, domestics, gardeners, or in any other service capacity around the house but, unfortunately, most seem to have passed away by now.

CHAPTER 7

THE GREAT LEAP UPWARD: CHINA'S HUMAN SPACEFLIGHT PROGRAM AND CHINESE NATIONAL IDENTITY

James R. Hansen

In late September 2007, the Chinese National Tourism Administration posted an article on its Web site entitled, “China to build largest aeronautics theme park.” To be located near the new Wenchang Satellite Launching Center on the island province of Hainan, the announced aeronautics theme park will cover a total area of 61 mu (over 1,000 acres), and, in addition to a “space gate” (*Tai Kong Zhi*), “simulated space hall,” and aeronautics museum, will feature “a vacation center for aeronautics experts,” an “entertainment zone,” a “commercial zone where people can buy souvenirs,” and an “aeronautics leisure center.” In the center of the park will stand a giant viewing tower from which the thousands of expected visitors may view what officials of the China Space Technology Group (the PRC organization that is working jointly with the Hainan provincial government to build the park) call China’s “spectacular satellite launching process.” Those spectators who cannot all fit onto the tower may watch the launches from bleachers on a huge floating platform just off the island in the South China Sea capable of holding over 3,000 people.

At the end of its press release, China’s National Tourism Administration (CNTA) declared that Wenchang will be the world’s largest aeronautics theme park, significantly larger than the visitor’s center at the U.S. Kennedy Space Center. Its operation will “promote international technological cooperation in the space field and greatly boost the tourist industry in Hainan.” Picking up on the story, one American news service ran the headline, “Watch Out Disneyland, China May Be Jumping Ahead of You”—a valid comparison considering that the original Disneyland in California was built on 320 acres (compared to 1,004 for the Hainan park) and the original plot of Epcot at Disneyworld in Florida only 600 acres.

The same day of the article about Wenchang, the CNTA released another story whose subject was seemingly so different from the first that it might have confused many Western analysts trying to understand the conflicting forces of modernity and traditionalism at work in today’s China. Entitled “Sacrificial ceremony to Confucius opens in Shandong,” the story covered a grand sacrificial ceremony marking the 2,558th birthday of Confucius, which was taking place in the hometown of “China’s most honored ancient philosopher.” At the local

Confucian temple, “a descendant of the great man” lit a fire signifying the root of Chinese culture, and a 3,000-year-old sacrificial dance—one recently honored by the Beijing government as part of China’s “National Intangible Heritage”—was “nobly performed.” With 3,000 people in attendance (the same number who will be able to watch a rocket launch at Wenchang from the floating platform), including dozens of representatives from Hong Kong, Macao, and Taiwan, 500 middle-school students delighted the crowd by reading aloud from Confucius’s *Analects*.

These two stories placed together in one’s mind offer a curious starting point for an exploration into the nature of Chinese national identity in the early 21st century and how that nascent identity may be bolstering today’s burgeoning Chinese human spaceflight program. A principal question addressed at “Remembering the Space Age: 50th Anniversary Conference,” held in Washington, DC, in October 2007 was, “*Has the Space Age fostered a new global identity, or has it reinforced distinct national identities?*” The argument made by this author at that conference was that anyone in the West trying to make sense of the Chinese “nation,” or even what it means to be “Chinese,” must begin by working to sort out all the ethnic, racial, and national self-identities that exist within this vast and vastly complicated land.

On its Web site, the CNTA rushes to point out that China is a “happy family” composed of 56 different “nationalities”: the Han, Manchu, Mongol, Uyghur, Zhuang, Tibetan, and so on, and that in today’s China at least four different Chinese “nations” coexist. The first is composed of all People’s Republic of China citizens. The second is the “Han” nation, as Han peoples account for more than 90 percent of the country’s population—and are always the first “nationality” to appear on any Chinese list. The third consists of the PRC plus Hong Kong, Macao, and contested Taiwan. The fourth consists of overseas Chinese who retain some feeling of dual nationality. Understanding what these different national self-identities represent, where they came from, how they have interacted with communist ideology and doctrine, and how they might still connect to Confucianism or other aspects of the “National Intangible Heritage”—not to mention how they overlap, harmonize, or rub each other the wrong way, let alone relate to China’s ambitions in space—more than merits, it requires, some very significant expertise in the social, cultural, and political history of China.

Any investigation into the character of the national identity in China today must begin by becoming familiar with the ideas and interpretations expressed in three recent books on the subject: *China’s Quest for National Identity* (Cornell University Press, 1993), an anthology edited by Lowell Dittmer and Samuel S. Kim; *Discovering Chinese Nationalism in China: Modernization, Identity, and International Relations* (Cambridge University Press, 1999), by Yongnian Zheng; and *A Nation-State by Construction: Dynamics of Modern Chinese Nationalism* (Stanford University Press, 2004), by Suisheng Zhao.

China's Quest for National Identity offers ten quality articles from 1993 on the meanings—and lack of meanings—of “national identity” in China from the early dynasties of ancient times through the imperial and colonial periods to the present day. In the book’s final chapter, its editors Lowell Dittmer (a professor of political science at Berkeley) and Samuel Kim (a Senior Research Scholar at the East Asian Institute of Columbia University) explore the question: “Whither China’s Quest for National Identity?” In a nutshell, Dittmer and Kim conclude that post-Tiananmen China faced an “unprecedented national identity crisis,” the basic dilemma for which was what to do about its “apparent inability to completely embrace or reject socialism.”¹ Not a word in the book, published ten years before the first Chinese astronaut went into space in *Shenzhou V*, mentioned Chinese missile development or its fledgling human spaceflight program. Doubtless to say, such a book would do so today.

The 1999 book *Discovering Chinese Nationalism in China: Modernization, Identity, and International Relations*, by Yongnian Zheng, a Research Fellow in the East Asian Institute of the National University of Singapore, presents a very different picture of China’s “New Nationalism” than that portrayed by most Western intelligence analysts.² Zheng, following the lead of Edward W. Said’s classic 1978 study *Orientalism*, a masterpiece of comparative literature studies and deconstruction, places his emphasis on how fundamental misperceptions occur when Westerners attempt to understand non-Western cultures.³ It was in order to emphasize the internal forces of nationalism in China, rather than those forces imperfectly or inappropriately perceived in the West, that Zheng entitled his book, *Discovering Chinese Nationalism in China*.

Western perceptions deeply distort what the recent rise of nationalist feeling in China is all about, Zheng argues. Many of the misperceptions tie into such geopolitical and strategic notions as the “China threat” and “China containment,” which derive from the West observing rapid economic growth, an increase in military spending, military modernization, growing anti-West sentiment, assertiveness in foreign behavior, and the rise of the New Nationalism, and then interpreting these developments solely from the “outside,” relying on analysts who have never even visited China. Following Zheng’s thesis, such misperceptions come directly into play when Western observers consider an

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1. Samuel S. Kim and Lowell Dittmer, “Whither China’s Quest for National Identity?” in *China’s Quest for National Identity* (Ithaca, NY and London: Cornell University Press, 1993), p. 287.
 2. A good look into U.S. intelligence approaches to understanding what has been going on in the Chinese space program can be made on the Web site <http://GlobalSecurity.org/space/world/china.index.html>. In particular, see the following: Office of the State Council, “White Paper on China’s Space Activities,” November 2000; Mark A. Stokes, “China’s Strategic Modernization Implications for the United States,” U.S. Army Strategic Studies Institute, September 1999; and J. Barry Patterson, “China’s Space Program and Its Implications for the United States,” Air University, Maxwell AFB, AL, April 19, 1995.
 3. Edward W. Said, *Orientalism* (New York, NY: Pantheon Books, 1978).

event like China's January 2007 ground-to-space missile destruction of one of its weather satellites. Many in Western intelligence saw the act as clear enough proof that Chinese nationalism is aggressive and a destabilizing force for international peace and security, though not seeing a similar American missile strike (from a U.S. warship) in mid-February 2008 to destroy an American satellite loaded with toxic fuel as anything that need greatly bother the Chinese.⁴ Though it is outside the scope of this essay to cover the arguments made by the United States and China for and against the two anti-satellite (ASAT) events, a few of the ironies associated with them may be registered in the form of the following questions: How could China warn against and then strongly criticize the U.S. missile attack of February 2008 without mentioning its own anti-satellite missile test of the previous year? Conversely, why didn't Beijing use the U.S. interception to justify ex post facto the unannounced destruction of its own defunct satellite in January 2007? By what truly legitimate arguments can China (or Russia, for that matter) call for a complete ban on space weapons and then be involved in testing such weapons? How can the United States expect other countries such as China (and Russia) to stay away from the development of space weapons technology while simultaneously opposing treaties and other measures to restrict space weapons?

Professor Zheng's insights into China's "New Nationalism" may offer some help in promoting a better understanding of what is going on inside China today, technologically and otherwise. Understood from within China's society and culture rather than from without, China's New Nationalism should be seen, in Zheng's view, not as aggressive but as an understandable voice of

4. The Chinese ASAT missile in 2007 was a medium-range ballistic missile launched from Xichang Satellite Launch Center, China's major launch complex, located in Sichuan province in south central China. The target destroyed was an eight-year-old Chinese weather satellite in orbit some 535 miles above Earth. As a number of Western commentators emphasized at the time, this apparently successful ASAT test was a major space "first"—for the first time in history a missile launched from the ground destroyed a satellite, suggesting that the Chinese could now, at least theoretically, shoot down spy satellites operated by the United States or other nations. (In a 1985 test, the U.S. shot down one of its satellites with a missile fired from a fighter aircraft.) For representative U.S. and British immediate reactions to the Chinese anti-satellite missile test in January 2007, see Marc Kaufman and Dafna Linzer, "China Criticized for Anti-Satellite Missile Test; Destruction of Aging Satellite Illustrates Vulnerability of U.S. Space Assets," *Washington Post*, January 19, 2007, A01; Jon Kyl, "China's Anti-Satellite Weapons and American National Security," Heritage Foundation Lecture No. 99, January 29, 2007, accessed at <http://www.heritage.org/Research/NationalSecurity/hl1990.fjm>; and "Chinese missile destroys satellite in space," January 21, 2007, accessed at <http://www.telegraph.co.uk/news>. For Chinese reaction to the U.S. destruction of its satellite in February 2008, see David Byers and Jane Macartney, "China and Russia cry foul over satellite," February 21, 2008, accessed at http://www.timesonline.co.uk/tol/news/world/us_and_americas/article3408155.ece; "China Warns U.S. on Satellite Missile Test," February 26, 2008, accessed at <http://www.redorbit.com/modules/news/tools.php> and Thom Shanker, "Satellite is destroyed but questions remain," *International Herald Tribune*, February 21, 2008, accessed at <http://www.iht.com/articles/2008/02/21/america/satellite.php>.

frustration over an “unjustified” international order, with many in China seeing Western interests around the world as anything but benign and Western states as anything but innocent in their intentions toward China. In the past decade Chinese leadership has worked hard to better integrate their country into the international community. Admittedly, China’s January 2007 ASAT test appeared to contradict Beijing’s oft-stated opposition to the “weaponization” of space, but, following Zheng’s thesis, one should not leap to the conclusion that China’s insistence on testing a missile defense system is a “reckless move” driven predominantly by China’s “traditional Sino-centrism” or by its “dangerously aggressive aspirations” for great power status.⁵ For the past several years, the Chinese have chafed at what they have seen as efforts by the United States to exclude it from full membership in the world’s elite space club. So by early 2007, Beijing set out to establish a club of its own—as the primary “space benefactor” to the developing world.

Some of this came quickly to fruition. In May 2007, the Chinese launched a communications satellite for Nigeria.⁶ For the central African country, Beijing not only designed, built, and launched the satellite but also provided a large loan to help pay the bill. China also signed a satellite contract with another big oil producer, Venezuela, and also began to develop an Earth-observation satellite system—and alternative to GPS—in association with Bangladesh, Indonesia, Pakistan, Peru, Thailand, and Iran.⁷ In the next several years, most observers of the PRC believe that China could launch as many as 100 satellites, not only to create a digital navigational system but also to help deliver television to rural areas, improve mapping and weather monitoring, and facilitate scientific research.

The Chinese have also chafed at not being allowed to participate in the U.S.-led ISS, a feeling of prejudice against China that became abundantly clear to NASA Administrator Michael Griffin and other members of his NASA entourage when they made an official visit to China in September 2006. Following an agreement between President Hu Jintao and President George W. Bush and U.S. acceptance of a special invitation from Dr. Laiyun Sun,

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5. Initially declining to confirm or deny that any ASAT test had happened, Beijing eventually made an official declaration that “The test was not directed at any country and does not constitute a threat to any country. . . . China has always advocated the peaceful use of space, opposes the weaponization of space . . . , and has never participated and will never participate in any arms race in outer space.” Naturally, Western observers refused to accept that China’s destruction of its weather satellite did not have any military associations driven by strategic objectives.
 6. Associated Press, “China Launches Satellite for Nigeria,” May 14, 2007, accessed at http://www.space.com/missionlaunches/070514_china_nigcomsat1.html.
 7. See Zhao Huanxin (*China Daily*), “China to develop Venezuela satellite,” November 3, 2005, accessed at http://www.chinadaily.com.cn/english/doc/2005-11/03/content_490429.htm; “Venezuela to increase oil sales to China,” August 17, 2006, accessed at http://www.chinadaily.com.cn/english/doc/2006-08/17/content_666707.htm; and “China signs 16 international space cooperation agreements, memorandums in five years,” October 12, 2006, accessed at http://english.peopledaily.com.cn/200610/12/eng20061012_311154.html.

Administrator of China's National Space Administration, Administrator Griffin and a small group of NASA officials traveled to China for a historic 5-day visit. Nothing concrete resulted from the exchange of pleasantries, but the visit was nonetheless a milestone in the history of space diplomacy as Griffin was the most senior U.S. space official ever to go to China.⁸

In Beijing and Shanghai, the NASA delegation met with officials of the China National Space Administration (CNSA), Chinese Academy of Space Technology, Chinese Academy of Sciences, Center for Space Science and Applied Research, Shanghai Institute of Technical Physics, and China Meteorological Administration. They met for talks with China's Chief Minister for Science and Technology, who asked, very frankly, if China could participate in the ISS program, an overture the NASA folks were ready always to politely but quickly sidestep. "The tone of our meetings in China was at all times very cordial, very polite, very welcoming," recalls former astronaut and NASA chief scientist Shannon Lucid, who made the trip. "But there was always the undercurrent that China really wanted to be part of the ISS. At just about every press conference, we would be asked why China couldn't be part of ISS. Administrator Griffin always handled that very well, explaining that you could not have cooperation on something like the ISS unless everything was open and above-board. You absolutely needed that for safety reasons."⁹

The Chinese space programs officials who asked that question were clearly not part of the Chinese military, which is in charge of the country's human spaceflight program. In fact, upon arrival in China, the NASA party was informed by its hosts that it would be able to visit the Jiuquan Satellite Launch Center but while there would be able to tour a few launching pads but would not be given a tour of any of the buildings where spacecraft were tested and prepared for launching. Given the time and trouble of traveling all the way out to the remote site in the high Gobi Desert just to see launch pads, Griffin informed the Chinese that the NASA delegation did not care to make the trip. What he and the NASA group hoped to see, Griffin later told Western reporters, were engineering facilities and to be in a position to have "eye-level" discussions with fellow engineers.¹⁰

Nonetheless, the NASA officials returned home with a much enhanced appreciation for China's commitment to space exploration. According to former astronaut and NASA chief scientist Shannon Lucid, the enthusiasm of the Chinese people for space exploration, experienced up close and personally, is

8. See "Transcript, NASA Administrator Michael Griffin Press Conference, Shanghai, China, September 27, 2006," accessed at http://www.nasa.gov/about/highlights/griffin_china.html.

9. Shannon Lucid, Houston, TX, telephone interview with author, June 13, 2007, transcript, 1.

10. See Warren E. Leary, "NASA Chief, on First China Trip, Says Joint Spaceflight Is Unlikely," *New York Times*, September 28, 2006, accessed at <http://www.nytimes.com/2006/09/28/science/space/28nasa.html>.

highly impressive. Their enthusiasm seems authentic—and no mere invention of the communist state. In Shannon Lucid's view, space exploration has developed into "the foremost symbol" of what the Chinese wish for their society to become. "Right now space exploration is probably more important symbolically to the Chinese than it is to the American people," says Lucid. "Of course, it was symbolically very important to us back in the 1950s and 1960s, because of the Cold War. It will become more important to Americans symbolically in the future if some other country starts to prove that it is better at it than us."¹¹

Lucid, who was born in Shanghai in 1943 to a Christian missionary couple, has returned to China as an adult no less than three times and expresses her thoughts about the feelings of the Chinese people about their space program with greater familiarity of Chinese culture and history than most Westerners: "The Chinese are very proud of their space program. As a people, they are very connected to their long history and feel that being a leader in space is part of their legacy, as the Chinese were the ones to invent rockets centuries ago." In 1997, Lucid and fellow U.S. astronaut Jerry Ross accepted a Chinese invitation to attend to an international congress on science fiction literature held in Beijing. "The Chinese were really into science fiction," Lucid recalls. "I thought at the time, this is what it must have been like in Germany in the 1920s when so many of their people got caught up in science fiction and an enthusiasm for rockets and space, or in the United States and the Soviet Union back in the 1950s." In Lucid's view, China is a dynamic and dramatically changing society whose people are very much looking forward to its future: "When you see Shanghai, wow! It is so modern with all its shops and big new buildings! It is so modern—absolutely amazing! You think to yourself, 'This is a communist country?! There is all this modern building going on, such a great hustle and bustle. There is such vitality among the Chinese.'"¹²

NASA Administrator Griffin returned from the China trip so impressed by what the Chinese were doing that before long he issued what arguably will become his most memorable, and certainly controversial, statement. At a Washington, DC, luncheon at the Mayflower Hotel on September 17, 2007, Griffin remarked that China would likely be on the Moon with human explorers before the U.S. ever manages it again. What Griffin said precisely—or not very precisely, at least in terms of his first sentence—was:

I personally believe that China will be back on the Moon before we are. I think when that happens, Americans will not like it, but they will just have to not like it. I think we will see, as we have seen with China's introductory manned spaceflights

11. Lucid to author, transcript, p. 2.

12. *Ibid.*, transcript, pp. 1-3.

so far, we will see again that nations look up to other nations that appear to be at the top of the technical pyramid, and they want to do deals with those nations. It's one of the things that made us the world's greatest economic power. So I think we'll be instructed in that lesson in the coming years.

Griffin concluded, "I hope that Americans will take that instruction privately and react to it by investing in those things that are the leading edge of what's possible."¹³

Whether there was a political design behind Griffin's seemingly impromptu comment was immediately debated. Some commentators thought what the NASA Administrator said was a good thing, because it could possibly spur the United States into a more aggressive stance on space exploration—read "Mars." Others felt Griffin's comment to be highly lamentable. One representative of the U.S.'s burgeoning private space industry offered a strongly negative opinion: "Those who have given up have already failed. It's clearly time for new leadership if (Griffin) believes what he said. To suggest that a program that plans to outspend China by more than 10 to 1 can't beat their space program hands-down practically defines pathetic."¹⁴ More considered opinions regarded Griffin's assessment to be totally genuine, not cynical, and stemming not just from the early momentum of Chinese achievements in space or its grand statements of space ambitions but from what Griffin and company personally heard and saw on their historic visit to China a year earlier.

A third book fundamental to understanding the evolution of the Chinese national identity, and placing the contemporary Chinese space program into a deeper and richer cultural perspective, is *A Nation-State by Construction: Dynamics of Modern Chinese Nationalism* (2004), by Suisheng Zhao, the Executive Director at the Center for China-U.S. Cooperation at the University of Denver's Graduate School of International Studies. Zhao's thesis is that Chinese leadership in the 1990s abandoned Marxism for "pragmatic nationalism," which author Zhao

13. Griffin's speech was reproduced in its entirety under the title "America Will Not Like It," *New Atlantis* No. 18 (Fall 2007): 128-30.

14. See comment from Stephen Metschan from September 17, 2007, published at <http://www.spacepolitics.com/2007/09/17/griffin-china-will-beat-us-to-the-moon/>. Metschan is associated with DIRECT v2.0, an alternative approach to launching missions planned under NASA's VSE program. The idea behind the DIRECT is to replace the separate Ares-I Crew Launch Vehicle (CLV) and Ares-V Cargo Launch Vehicle (CaLV) with one single "Jupiter" launcher capable of performing both roles. Metschan is also founder and president of *TeamVision* Corp, developer of the *FrameworkCT*, a new class of business intelligence software focused on improving the early decision-making process in large and complex organizations. Prior to founding *TeamVision*, Metschan worked for Boeing on Advanced Engineering projects for NASA for over ten years. His primary focus was on the integration of analysis, design, manufacturing, finance, and marketing teams into a cohesive team framework to enhance the understanding of problems and their solutions for advanced space vehicle systems. He earned a B.S in mechanical engineering in 1989 from the University of Portland.

defines as a commitment to “avoid dogmatic constraints and [rather] adopt whatever approach proves most effective in making China strong.”¹⁵

Specifically, Zhao demonstrates how the policies of the past two Chinese presidents, Ziang Zemin, and Hu Jintao, employed nationalism with “great diplomatic prudence,” not just as an instrument by which the Chinese Communist Party could preserve its rule but also as the most effective way to assemble domestic support from the many disparate divisions in Chinese necessary prerequisite to the building of an effective modern state.¹⁶ Zhao’s book endorses “pragmatic nationalism” as an effective approach to Chinese governance and foreign policy, one that promotes economic development and is bringing a better life to the masses of Chinese people while at the same time avoiding major confrontations with the West.

Not that there are no alternative “nationalisms” in play in today’s China. Zhao also identifies “liberal nationalism,” whose spokesmen since the end of the Cold War have been pressing for greater public participation in the political process, challenging authoritarian rule (such as at Tiananmen Square), and explicitly calling for the adoption of liberal democratic ideas as the best means of promoting China’s renewal. Zhao also shows how there is still a strong strand of “nativism” in China, which calls for a return to self-reliance and Chinese tradition and traces the roots of China’s weakness to the impact of imperialism on China’s self-esteem as well as to the subversion of indigenous Chinese values, such as Confucian ethics. Finally, there is “anti-traditionalism,” a very different sense of nationalism that holds that China’s very traditions, such as a Confucian hierarchy and an inward-looking culture, constitute the main source of its weakness. Anti-traditionalists call for the complete rejection of these backward traditions and the rapid adoption of foreign culture and Western models of economic and political development. The anti-traditionalist strand also calls for China to accommodate a “progressive” internationalist system. Starting in the 1980s, anti-traditionalists called on the Chinese people to rejuvenate their nation by assimilating Western culture, adopting Western models of modernization, and adjusting to the capitalist world system. To achieve this goal, they demanded a fundamental change in the Chinese mindset, toward one supporting “the spirit of science and technology.”¹⁷

What can Western observers of the Chinese space program really learn from this literature on Chinese national identity? How might it help us comprehend the conjunction between China today building the world’s largest aeronautics theme park at Wenchang while simultaneously celebrating the 2,558th birthday of Confucius at Shandong?

15. Suisheng Zhao, *A Nation-State by Construction: Dynamics of Modern Chinese Nationalism* (Stanford University Press, 2004), p. xxx.

16. *Ibid.*, p. xxx.

17. *Ibid.*, p. xxx.

Regrettably, none of the books examined in this essay said much of anything about China's space program. Given that Zhao's book was published in 2004, one might think that at least his book would have done so. In an e-mail to Professor "Sam" Zhao at the University of Denver, I asked how he would apply the thesis of his book to the recent history of China's space program, particularly its recent achievements and present ambitions for human spaceflight. Zhao answered my inquiry: "China develops its space program because it sees the program as reflecting its comprehensive national strength and is an indication of China's growing levels of science and technology. The human spaceflight program will enhance China's international prestige and status and increase the *ninjin li*, or 'cohesiveness,' of the Chinese people and the nationalist credential of the government domestically. Also, it will position China in the future competition for outer space resources."¹⁸

Although interesting and concise, Zhao's response was not very satisfying, as there must be more to deconstruct about the political, social, and cultural meanings of the Chinese human spaceflight program than his response suggested—certainly much more given how space exploration has been capturing the popular imagination in China since their first human spaceflight in *Shenzhou V* in 2003.

In a provocative 1997 book entitled *Space and the American Imagination* (Smithsonian Institution Press), American University political science professor Howard McCurdy delved deeply into the relationship of American space exploration to the larger U.S. popular culture. Adopting a cultural studies type approach, McCurdy showed how visions of the inevitability of human space exploration arising from ideas and imagery in popular science and science fiction connected in powerful ways to preexisting mythologies in American culture, most notably the myth of "the frontier." This public perception of space exploration as it boiled and bubbled in the 1950s and 1960s influenced the decisions of American policymakers to pursue exploration, and to pursue it via human spaceflight, which was the predominant vision to capture the popular imagination, rather than going with the often cheaper, perhaps more scientifically justifiable and technologically sophisticated unmanned programs. Without this tight linkage between reality and imagination, McCurdy concluded, the Apollo lunar landings would surely not have even been tried, let alone accomplished so quickly.

What was true for the American experience in terms of dynamic linkages between reality and imagination must also be true, in similar yet distinct fashions, for other national cultures. Another outstanding example of such a study into the culture of spaceflight rests in the scholarship of historian Michael Neufeld, particularly his 1990 article in the journal *Technology and Culture*, "Weimar Culture and Futuristic Technology: The Rocketry and Spaceflight Fad in Germany, 1923-1933," which analyzed how the enthusiasms of German

18. E-mail, Suisheng "Sam" Zhao to author, June 2, 2007.

science fiction writing, notably that of Max Valier (someone who did not truly even understand the principles of rocketry) ultimately led to the rocket being forged into a weapon of war.¹⁹ Just previous to Neufeld's work, historian Walter McDougall in his 1985 book Pulitzer Prize-winning book . . . *the Heavens and the Earth: The Politics of the Space Age* (New York: Alfred A. Knopf) explored the critically important associations between literary and social movements in Tsarist Russia and the Soviet Union and subsequent technological developments related to rockets and spaceflight. Recent excellent studies of the cultural context of the roots of the Russian space program have also been made by James Andrews²⁰ and Slava Gerovitch.²¹ Given the fertility of such studies for our understanding of the history of spaceflight within the national cultures of the Soviet Union, Germany, and America, one must ask, how would a similar analysis of Chinese culture inform our understanding of the meaning of space exploration to the Chinese? To date, very few books and articles on the Chinese space program offer anything like the penetrating insights that have been provided for the United States, Germany, and Russia.²²

Similarly, just as there is no way to fathom what the U.S. space program has meant to American society over the past half century without understanding what Americans have wanted from their heroes—"space" heroes and otherwise—there is also no way to understand what the Chinese are after in space without understanding the iconography that has developed around their *y'uhángyuán* or "universe navigators." If the particular types of heroic iconography that have come to surround China's first space traveler, *Shenzhou V's* Yang Liwei, is any sort of reliable indicator, Chinese society by 2003 was well on its way toward successfully mixing a rising sense of pragmatic nationalism, communist ideology, traditional Confucian values, and drive for economic and high-tech industrial competitiveness into an effective recipe for an expansive program of human spaceflight.²³ Evidently the Chinese space program has been tapping into

19. *Technology and Culture*, Vol. 31, No. 4 (October 1990): 725-52.

20. See James T. Andrews, *The Bolshevik State, Public Science, and the Popular Imagination in Soviet Russia, 1917-1934*, and *Visions of Space Flight: K. E. Tsiolkovskii, Russian Popular Culture, and the Roots of Soviet Cosmonautics 1857-1957*, published in 2003 and 2007, respectively, both by Texas A&M University Press.

21. See Slava Gerovitch, "'New Soviet Man' Inside Machine: Human Engineering, Spacecraft Design, and the Construction of Communism," *OSIRIS*, vol. 22 (2007): 135-5, and "Love-Hate for Man-Machine Metaphors in Soviet Physiology: From Pavlov to 'Physiological Cybernetics,'" *Science in Context*, vol. 15, no. 2 (2002): 339-374.

22. The most complete treatment of the Chinese space program can be found in Brian Harvey, *China's Space Program: From Conception to Manned Spaceflight* (Chichester, U.K.: Springer, 2004), but the book suffers from its lack of historical and cultural perspective.

23. On the Chinese enthusiasm for their first countryman to make a spaceflight, see my article, "The Taikonaut as Icon: The Cultural and Political Significance of Yang Liwei, China's First Space Traveler," in *The Societal Impact of Spaceflight* (NASA Special Publication-2007-4801, 2007), eds.

sources of popular support for human space exploration that belong not just to the predominant strand described by Suisheng Zhao as “pragmatic nationalism” but also into the other strands of nationalism with currency in China today, including liberal nationalism, anti-traditionalism, and even nativism.

If true, it will be no wonder if many thousands of Chinese tourists will soon be sitting on floating bleachers out in the South China Sea watching rockets lift off from their new Chinese Disneyland, perhaps taking Yang Liwei or his fellow “taikonauts” to humankind’s next landing on the Moon, as NASA Administrator Michael Griffin has warned.

Unfortunately, many Western observers—especially in the defense intelligence community—persist in understanding Chinese developments from without instead of probing deeper into China, as today’s top scholars on the modern Chinese identity would have them, from within the remarkably rich and infinitely complicated character of Chinese society—past, present, and future.

POSTSCRIPT

August 6, 2008: “Spaceman Yang to launch torch relay in Beijing,” by Chen Jia, *China Daily*, accessed on September 11, 2008, at http://www.chinadaily.com.cn/olympics/torch/2008-08/06/content_6907463.htm.

“Yang Liwei, China’s first astronaut, will run the opening leg of the Olympic torch relay in Beijing, which starts at 8 am today at the Meridian Gate of the Forbidden City. Basketball star Yao Ming, who some media said would run the first leg, will be the ninth torchbearer. “Yang helped China realize its dream to travel in space, and now we are living another dream of hosting the Games,” Sun Xuecai, deputy director of the Beijing sports administration, told a news conference Tuesday.

September 9, 2008: “The New Red Scare—Avoiding A Space Race With China,” by Loretta Hidalgo Whitesides, in *Wired*, accessed on September 11, 2008, at <http://blog.wired.com/wiredscience/2008/09/the-new-red-sca.html>.

“In the wake of the pageantry and sheer enormity of the Beijing Olympics, China is getting ready for its next beautifully scripted display of power and prestige: Its first space walk will be televised live by mid-October. The mission will carry three crew members, two of whom will move into the newly created EVA (extra-vehicular activity) airlock at the top of the Soyuz-like vehicle. One of these crew members will wear a newly designed Chinese EVA space suit, of which the country is very proud.”

Steve J. Dick and Roger D. Launius, pp. 103-117. A slightly different version of my essay appeared as “Great Hero Yang,” in *Air/Space Smithsonian* (Feb/March 2007), and can be accessed at http://www.airspacemag.com/issues/2007/february-march/great_hero_yang.php?page=1.

CHAPTER 8

“THE ‘RIGHT’ STUFF: THE REAGAN REVOLUTION AND THE U.S. SPACE PROGRAM”

Andrew J. Butrica

This paper addresses two questions related to the overall theme of “National and Global Dimensions of the Space Age”: 1) has the Space Age fostered a new global identity or has it reinforced distinct national identities? and 2) how does space history connect with national histories and the histories of transnational or global phenomena? The evolution of the U.S. space program, I argue, is a direct outgrowth of the impact of ideology, specifically the conservative ideology of the so-called New Right. Because of the connection to this ideological agenda, space history has become linked with national history.

The intellectual origins of this paper began many years ago as an investigation into the influence of ideology on technology.¹ The ideology was the internationalist, pacifist, feminist, religious, and other beliefs of the Saint-Simonians. Named after its founder, Claude Henri de Rouvroy, le comte de Saint-Simon, the Saint-Simonians belonged to a French movement that flourished from roughly 1830 to 1870. Many of its members were engineering graduates of the prestigious *École Polytechnique* employed by the French state in a number of technical positions. They and the Saint-Simonian bankers sought to use transport technologies—such as canals and railways—to achieve a number of their ideological goals, one of which was to bridge the divide between the Christian and Moslem worlds using, among other means, a canal linking the Mediterranean and Red seas.²

In this study of the conservative space agenda, I suggest how the Reagan administration—as the triumph of the New Right—projected into space the conservative political agenda that elected it into office. America’s turn to the right took place over several decades, and its intellectual origins can be traced back to the 1950s at the start of the Cold War. As historian George H. Nash

1. Recently, this question was taken up by Paul Forman in his “The Primacy of Science in Modernity, of Technology in Postmodernity, and of Ideology in the History of Technology,” *History and Technology* 23, 1 (March 2007): 1-152.

2. This research was the subject of the paper “Saint-Simonian Engineers: An Aspect of French Engineering History” presented at the History of Science Society meeting in Philadelphia, Pennsylvania in October 1982.

wrote in 1976: “In 1945 no articulate, coordinated, self-consciously conservative intellectual force existed in the United States. There were, at best, scattered voices of protest, profoundly pessimistic about the future of the country.”³

The emergence of the so-called New Right began in earnest during the 1960s, in parallel with—and to a large degree in response to—the rise of the New Left. The presidential candidacies of Barry Goldwater and George Wallace embodied the movement,⁴ which was propelled by a zealous, if not obsessive, anticommunism belief; support for business and defense interests over social issues; and downright antipathy for the Great Society program—considered the epitome of the “welfare state” and “big government”—and the so-called “rights revolution,” which sought equal protection under the law for African and Hispanic Americans, women, gays, and the disabled. Rather than address a range of social concerns, the New Right wanted to deregulate commerce, cut the size of government, and reduce corporate and individual taxes.⁵ They believed in the positive benefits of technological progress and scorned the prevalent notion of limits to growth.⁶

The impact of ideology on the space program’s evolution already has been taken up by Roger Launius and Howard McCurdy in their milestone work on presidential leadership, *Spaceflight and the Myth of Presidential Leadership* in which they wrote that, of all the factors influencing the space program, “ideology (was) the most important.” Indeed, “From the beginning of the space age in 1957, the ideological debate over the program has revolved around the expense

3. Nash, *The Conservative Intellectual Movement in America: Since 1945*, 1st ed. (New York: Basic Books, 1976), p. xv.

4. Phyllis Schlafly, “A Choice, Not an Echo,” in *Conservatism in America since 1930: A Reader* by Gregory L. Schneider, (New York: New York University Press, 2003), pp. 231–237. Schlafly discusses Goldwater’s candidacy as the embodiment of conservative philosophy from the perspective of 1964.

5. For my discussion of these political events, I have relied mainly on William C. Berman’s *America’s Right Turn*, 2nd ed. (Baltimore: The Johns Hopkins University Press, 1998), pp. 2–3, 6–8, 21, & 39, as well as Mary C. Brennan’s *Turning Right in the Sixties: The Conservative Capture of the GOP* (Chapel Hill: University of North Carolina Press, 1995); Dan T. Carter, *The Politics of Rage: George Wallace, the Origins of the New Conservatism, and the Transformation of American Politics* (New York: Simon and Schuster, 1995); Carter, *From George Wallace to Newt Gingrich: Race in the Conservative Counterrevolution* (Baton Rouge: Louisiana State University Press, 1997); and Godfrey Hodgson, *The World Turned Right Side Up: A History of the Conservative Ascendancy in America* (Boston: Houghton Mifflin, 1996).

6. Paul Neurath, *From Malthus to the Club of Rome and Back: Problems of Limits to Growth, Population Control, and Migrations* (Armonk, New York: M. E. Sharpe, 1994) reviews the limits to growth debate from the 18th century to the present, including the Club of Rome, and has a bibliography of the literature. Robert McCutcheon, *Limits to a Modern World: A Study of the Limits to Growth Debate* (London: Butterworths, 1979) provides a contemporary overview of the debate.

and direction of the enterprise, particularly the emphasis placed on human spaceflight initiatives as opposed to scientific objectives.”⁷

According to Launius and McCurdy, during the 1950s conservatives endorsed a limited civilian space program focused on scientific research. With the launch of Sputnik, liberals clamored for an aggressive space program featuring human spaceflight with sizable federal expenditures and management in the form of NASA. Liberals also pushed the need to garner national prestige—something eschewed by conservatives—by taking on the Soviet Union in a space race. These ideological divisions began to shift as Richard Nixon entered the White House. By approving the Space Shuttle project, Nixon accepted the liberal space agenda of expensive spaceflight; however, he and his cabinet also saw the Shuttle’s potential for conducting various military missions consistent with the conservative agenda.⁸

In addition, I argue, conservatives during the first years of the Reagan presidency envisioned the Shuttle as the principal technology for realizing their goals in space, namely, the commercialization and militarization of space. In many ways, it was tailor-made for their purposes. The Shuttle’s technological limitations as an Earth-orbiting vehicle suited it ideally for an agenda that emphasized exploiting space rather than exploring it, especially regarding space applications (business and defense) in near-Earth space. All of the conservative space policy initiatives focused more on space applications than on exploration. Furthermore, the decision to place military and intelligence payloads on the Shuttle blurred the line between civilian and military missions, raising the question as to whether NASA—after a brief hiatus in fulfillment of Nixon’s strategy of détente—was again in the service of the Cold War.

As conservative support shifted toward the space program, Launius and McCurdy explain, liberal support moved away from it. This “sea change in ideological attitudes toward space . . . drew its strength from the confluence of . . . the changing nature of American liberalism and the conservative embrace of frontier mythology.” President John Kennedy made liberal use of the frontier analogy in his speeches, especially as a rationale for the ambitious Apollo project and the space race with the Soviet Union.⁹ Once liberal interest in the Cold War

7. Launius and McCurdy, “Epilogue,” in Launius and McCurdy, eds., *Spaceflight and the Myth of Presidential Leadership* (Urbana: University of Illinois Press, 1997), p. 235. James A. M. Muncy also made the point that, while space has been a partisan issue, “space has always risen and fallen on the waves of *ideology*.” Muncy, “After the Deluge: What the GOP Takeover Could Mean for Space,” *Space News* 4, 51 (December 19-25, 1994): 4.

8. Launius and McCurdy, “Epilogue,” pp. 235-238.

9. One must not forget, too, the extensive references to “frontiers” and pioneering in Kennedy’s July 15, 1960, acceptance speech to the Democratic National Convention in Los Angeles. The “New Frontier” slogan morphed into a label for his administration’s domestic and foreign programs. “Address of Senator John F. Kennedy Accepting the Democratic Party Nomination for the Presidency of the United States,” Memorial Coliseum, Los Angeles, July

waned, so did the necessity of dominating “this new sea.” Liberals also increasingly rejected the frontier myth and its implied associations with exploitation and oppression. Conservatives lacked these misgivings about the frontier and embraced the economic benefits and material progress associated with the frontier myth.¹⁰

However, the impact of conservative ideology on the space program was far more pervasive than that described by Launius and McCurdy. The conservatives’ own comparison of the space program under the Reagan administration with that of the Kennedy years was not without grounds. At the very least, the numerous new space initiatives undertaken by the Reagan administration made this a major turning point in U.S. space history at least on a par with that of the Kennedy–Johnson era.

Perhaps the most unforgettable Reagan space program was the Strategic Defense Initiative (SDI), a space-based antiballistic missile defense system. With homage to President Kennedy and the Apollo effort, Reagan committed the nation to building a space station by the decade’s end. Less memorable was the National Aero–Space Plane (NASP), commonly confused with the Orient Express. The Orient Express would have been the nation’s fastest aircraft capable of flying from Washington to Tokyo in two hours, while the NASP would have been the world’s first single-stage-to-orbit spaceship. The most influential and lasting of the Reagan space initiatives was the formulation of the first national policy to foster the commercial use of space. As a result, the role of the private sector in space grew tremendously following the end of the Cold War, providing the aerospace industry with a respite from the defense cuts that came in the immediate ending of formal hostilities.

In addition to President Kennedy’s space and frontier rhetoric, conservatives also embraced the Kennedy era’s enthusiasm for large-scale space ventures overseen by NASA. One of the principal prophets of this conservative space agenda was Newt Gingrich. Elected to the House of Representatives from Georgia for the first time in 1978, Gingrich began formulating his ideas about the future, space, and technology in late 1982 and early 1983 as the economy began to turn around and a mood of optimism spread among conservatives and the public in general.¹¹ His ideas about space and technology are less important as reflections of his personal thinking than as a mirror held up to reflect the thoughts of a number of like-minded individuals who also viewed space as a new frontier for planting the flag of conservative ideas. Like the fabled frontier

15, 1960, John F. Kennedy Presidential Library and Museum, Historical Resources, <http://www.jfklibrary.org/Historical+Resources/Archives/Reference+Desk/Speeches/JFK/JFK+PrePres/Address+of+Senator+John+F.+Kennedy+Accepting+the+Democratic+Party+Nomination+for+the+Presidency+of+t.htm> (accessed November 12, 2007).

10. Launius and McCurdy, “Epilogue,” pp. 238.

11. James A. M. Muncy interview, Washington, DC, January 12, 1999, tape recording and transcript, NASA Historical Reference Collection, NASA Headquarters, Washington, DC.

of the Old West, space was where new resources and new business opportunities abounded, and where there were no limits save those of the imagination. Another spokesperson for the conservative space agenda, James A. M. Muncy, Chairman of the Space Frontier Foundation, explained that “space is a natural extension of the Earth’s frontiers, and that opening space to human enterprise and settlement is a unique American response to some liberals’ calls for limits to growth as a rationale for ever-more-powerful statism.”¹²

Implicit in Gingrich’s writings is an enthusiasm for technological progress that went hand in hand with an intrinsic disdain for the idea of limits to growth and the associated notions of a future of lowered expectations and the need for state control and planning, all of which Gingrich attributed to liberalism.¹³ In Gingrich’s mind, which drew upon both futurology and science fiction, technology would take the lead in solving certain social issues. “Breakthroughs in computers, biology, and space,” he declared, “make possible new jobs, new opportunities, and new hope on a scale unimagined since Christopher Columbus discovered a new world.”¹⁴ Technology and space were a fundamental part of the American ethos, the frontier spirit. In this future world driven by the frontier spirit and technological progress, the handicapped would no longer depend on welfare, having found gainful (tax revenue-generating) employment thanks to new technologies—“compassionate high tech”—and scientific discoveries. Essentially, the compassionate high tech position held that the benefit of investing in commercial and military space technology (in fulfillment of the conservative space agenda) would “trickle down” to Earth and lighten, if not resolve, the need for social welfare in a technology-oriented version of what came to be known as “trickle down economics.”¹⁵

In order to turn this futuristic vision into reality, Gingrich proposed raising NASA’s budget to its historic Apollo-era high and endorsed (as President Reagan did) both the Space Shuttle and the International Space Station. NASA’s budget was way too small, he argued; the Agency’s annual budget would run the Defense Department for only 11 days or Health and Human Services for only 8 days. Over 30 corporations—including such NASA contractors as RCA, General Electric, IBM, Westinghouse, and Western Electric—were larger than NASA. Gingrich saw nothing inconsistent with being a conservative and

12. Muncy, “After the Deluge: What the GOP Takeover Could Mean for Space,” opinion piece written for *Space News*, published as Muncy, “After the Republican Deluge,” *Space News*, 4, 51 (December 19-25, 1994): 4, fax copy, folder 644, box 22, X-33 Archive, Record Group 255, National Archives and Records Administration, Suitland, Maryland (hereafter, X-33 Archive).

13. Newt Gingrich and James A. M. Muncy, “Space: The New Frontier,” in *Future 21: Directions for America in the 21st Century*, eds. Paul M. Weyrich and Connaught Marshner, (Greenwich, CN: Devin-Adair, 1984), p. 61.

14. *Gingrich and Muncy*, 62; Gingrich, *Window of Opportunity: A Blueprint for the Future* (New York, NY: Tom Doherty Associates, Inc., 1984), ix; Muncy, interview, 67.

15. Gingrich, 1, 7-9, 10, 27, 46, 49-50, 52, & 65-66.

favoring such large-scale federal expenditures. “Conservatives are not against a strong Government,” he explained. “Conservatives are against big, bureaucratic welfare states.”¹⁶

The large, expensive, bureaucratic programs started by the Reagan administration were consistent with the conservative space agenda, the two main pillars of which were the commercialization and the militarization of space. All of the Reagan administration’s major space initiatives—from SDI to the Space Station Freedom and the NASP, with the exception of the commercialization of space per se—exemplified the expensive, large-scale, long-term projects that characterized the Cold War era. Furthermore, the commercialization and militarization of space were intimately interrelated in conservative thinking, creating a space-based mirror-image twin of the writings of Alfred T. Mahan (1840-1914)—a famous naval strategist and professor at the Naval War College.

Mahan stressed the interconnection between the commercial exploitation of the oceans and the military advantages of dominating the seas. He based his beliefs on studies of the role played by control of the sea, or the absence thereof, in the course of history up to the Napoleonic wars. He concluded that control of the seas was the chief basis of “the power and prosperity of nations.” As with the New Right and traditional Republican thinking, encouraging commerce was a fundamental priority. In addition, Mahan saw no difference between “national interest” and “national commerce.”¹⁷ The use of private security forces in Iraq is yet another step in conservatives’ continuing linkage of military and commercial interests.

Mahan’s ideas appeared in print as Turner’s frontier was closing and as the seas (and overseas interests) promised to serve the United States as a new imperial frontier. Mahan sought to extend the commercial and military influence of the United States in the Gulf of Mexico and the Caribbean Sea, especially at the Isthmus of Panama where a French company was planning to build a canal. Mahan’s message that military dominance of the seas was essential to assuring both the nation’s military and commercial strength became the foundational philosophy on which the conservative space military agenda was built. Maxwell W. Hunter, II and Lt. Gen. Daniel O. Graham, two of the principal architects and proponents of SDI, consciously followed in Mahan’s intellectual foot steps by arguing for the construction of a space-based global defense system to bring

16. Gingrich, 53-54; Gingrich and Muncy, 62.

17. On Mahan and his theories, see Robert Seager, *Alfred Thayer Mahan: The Man and His Letters* (Annapolis, MD: Naval Institute Press, 1977); William Edmund Livezey, *Mahan on Sea Power*, rev. ed. (Norman, OK: University of Oklahoma Press, 1980); and Mahan, *The Influence of Sea Power on History, 1660-1783* (Boston, MA: Little, Brown, 1897), reprinted (New York, NY: Dover Publications, 1987).

about a Pax Americana similar to the oceanic Pax Britannica, in which national security and commercial interests were intertwined and mutually serving.¹⁸

The conservative military strategy in space also took as its starting point the rejection of the conduct of the Cold War instituted by the administration of President Richard Nixon. The two cardinal facets of Nixon’s Cold War policy that Reagan and the conservatives rejected were détente and the 1972 Antibalistic Missile Treaty (SALT I). Instead, President Reagan chose to heighten the struggle against what he termed “the evil empire.” Reagan also spoke against the reigning defense philosophy known as mutual assured destruction (MAD). The MAD strategy, simply stated, was that each party would be able to wreak destruction on the other, even if an initial strike substantially reduced the missile and nuclear forces of one side. Essentially, each side became the hostage of the other. Reagan’s stance against MAD combined with ongoing studies of high-energy lasers and satellite weaponry to become SDI.

The military use of space was not new but rather a constant over the course of the Cold War. Starting in the 1960s, the U.S. military relied on satellites for reconnaissance (photographic, electronic, and oceanic), early warning of offensive missile launches, detection of nuclear explosions, communication, navigation, weather, and geodetic information. One might even say that, at least at one point in the conflict, all space efforts served a Cold War agenda. The Apollo program represented the Cold War at one level. Following the flight of Soviet cosmonaut Yuri Gagarin, on May 25, 1961, President Kennedy initiated the space race, a new Cold War battleground. He warned that the United States had to challenge the Soviet Union’s space feats “if we are to win the battle that is now going on around the world between freedom and tyranny.”¹⁹ The Cold War and the nation’s civilian space programs were now joined. This was truly total warfare that conscripted civilians and civilian agencies into a global struggle.

During this war, the construction of defensive systems served as a bargaining chip in treaty negotiations with treaties helping to limit the seemingly boundless search for, and construction of, new weapons. SDI was no exception; however, it took military space policy in a new direction by proposing to place defensive weapons in space. In contrast, earlier space strategies had

18. Erik K. Pratt, *Selling Strategic Defense: Interests, Ideologies, and the Arms Race* (Boulder, CO: Lynne Rienner Publishers, 1990), p. 96. See also, Graham, *High Frontier: A New National Strategy* (Washington: The Heritage Foundation, 1982); Graham, *The Non-Nuclear Defense of Cities: The High Frontier Space-Based Defense Against ICBM Attack* (Cambridge, MA: Abt Books, 1983).

19. *Public Papers of the Presidents of the United States: John F. Kennedy, 1961* (Washington, DC: Government Printing Office, 1962), 403–404. Asif A. Siddiqi, *Challenge to Apollo: The Soviet Union and the Space Race, 1945–1974*, NASA Special Publication-4408 (Washington: NASA, 2000), shows that Soviet military officers soon lost interest in civilian space projects following Sputnik. They felt that civilian projects hurt their attempts to fund military rocketry programs essential to the Cold War.

positioned defensive weapons on the ground until their use in space to “kill” enemy satellites. Another new direction taken by military space policy was the idea that, instead of protecting just the country’s military defenses—as had been the case of earlier space weaponry—SDI would protect the entire population, both military and civilian. The first ground-based ASAT systems, which dated back to 1958,²⁰ involved launching a killer satellite atop a booster rocket to match the orbit of the target, then track it and detonate the killer satellite near the target. ASAT was not a designation for a single weapon system, but rather a generic term covering anything that could be used to attack, disable, or destroy a satellite from Earth or (in the case of SDI) from space. The 1972 Anti-Ballistic Missile (ABM) Treaty did not ban ASAT systems as neither side wanted to give up a space weapon that both sides were developing.

After a hiatus resulting from a combination of budgetary, political, and technical factors, the Soviet Union resumed ASAT testing in February 1976.²¹ The resumption of testing galvanized the Ford administration into authorizing the development of an ASAT system, and President Jimmy Carter continued the ASAT project while seeking to revive existing arms control negotiations.²² The U.S. and the Soviet Union once more were engaged in a space race with the Soviet Union again in the lead. SDI functioned as a continuation of this space race.

Part of the concern over the Soviet anti-satellite program was that country’s progress in developing directed energy weapons using lasers and particle beams, which potentially could serve to arm ASAT weapons.²³ The United States was not without its own particle-beam and laser weapon research, which started under ARPA’s Project Defender virtually from the time of the agency’s creation. Laser weapons received increased interest following the invention of the gas-dynamic laser in the late 1960s.²⁴

These developments in laser weapons and antiballistic missile systems, critics of MAD, and opponents of the 1972 ABM Treaty all came together under the rubric of SDI. According to historian Donald Baucom, the first appearance of the space-based battle station concept in the open literature was in a 1978 issue of *Aviation Week*.²⁵ The most likely source was Lockheed Corporation’s

20. Paul B. Stares, *The Militarization of Space: U.S. Policy, 1945-1984* (Ithaca, NY: Cornell University Press, 1985), pp. 107, 109-110, 117-131, 135-136 & 145-146.

21. Stares, pp. 107, 109-110, 117-131, 135-136 & 145-146.

22. Pratt, 53; Donald R. Baucom, *The Origins of SDI, 1944-1983* (Lawrence, KS: University Press of Kansas, 1992), p. 76.

23. Clarence A. Robinson, Jr., “Soviets Push for Beam Weapon,” *Aviation Week & Space Technology* 106, 18 (May 2, 1977): 16-23.

24. J. London and H. Pike, “Fire in the Sky: U.S. Space Laser Development from 1968,” IAA-97-IAA.2.3.06, pp. 1-3, paper read at the 48th International Astronautical Congress, October 6-10, 1997, Turin, photocopy, folder 40, box 2, X-33 Archive; Pratt, 16-18; Baucom, 15-17.

25. Robinson, 42-43, 45, 48-49, 51-52; Baucom, 118.

Maxwell W. Hunter, II.²⁶ Hunter was a key figure in promoting what became SDI; indeed, he, along with three others, formed the so-called Gang of Four that pushed the concept in Congress.

The other major figure was retired Lt. Gen. Danny Graham, who had advised Ronald Reagan on national security matters during his gubernatorial and presidential campaigns. After Reagan’s election, using Project High Frontier, help from members of the President’s kitchen cabinet, and funding from the conservative Heritage Foundation,²⁷ Graham pushed his own version of a space-based defense system. Graham felt that by redirecting the arms race to space—where he believed the United States held the technological advantage—the country would achieve a “technological end run” around the Soviets and once again establish U.S. strategic superiority.²⁸ Once more, a belief in the positive benefits of technological progress drove the conservative agenda in space.

Reagan was disposed favorably toward antiballistic missile defense and against MAD, as he made clear several times, even as early as his 1976 bid for the Republican nomination.²⁹ The process that led to Reagan’s call for creation of a space-based defense was slow and took many turns over the year and a half between the initial September 1981 meeting in Meese’s office and Reagan’s so-called Star Wars speech. That story has been told in some detail elsewhere.³⁰

Despite the number of unconventional facets of SDI, it served as a bargaining chip in arms negotiations, namely in regards to the Nuclear and Space Talks (NST) in Geneva, not unlike the role of Nixon’s Safeguard in SALT I talks. Through this diplomatic dialogue, which started in March 1985, the United States hoped to legitimize SDI and push its claims that the Soviet Union had violated the 1972 ABM Treaty. For its part, the U.S.S.R. denounced SDI as an impediment to arms control, and at the Reykjavik October 1986 summit talks, the Soviet Union proposed that both sides observe the ABM Treaty for another ten years, including the restriction on testing space-based ballistic missile defense systems outside the laboratory. The United States refused. In 1987, the Soviets “decoupled” the SDI from treaty negotiations; ending the program was no longer a prerequisite to an agreement. During September 1987 talks in

26. Baucom, 119; Hunter, “Strategic Dynamics and Space-Laser Weaponry,” manuscript, October 31, 1977, file 338, box 13, X-33 Archive.

27. Graham, *Confessions of a Cold Warrior: An Autobiography* (Fairfax, VA: Preview Press, 1995), 118–120; Baucom, 145–146 & 150; Berman, 67–68; David Vogel, *Fluctuating Fortunes: The Political Power of Business in America* (New York, NY: Basic Books, 1989), 224–225; Dilys M. Hill and Phil Williams, “The Reagan Presidency: Style and Substance,” 11 in Hill, Raymond A. Moore, and Williams, eds., *The Reagan Presidency: An Incomplete Revolution?* (New York, NY: St. Martin’s Press, 1990).

28. Pratt, 96; Baucom, 164.

29. Pratt, 102, 103 & 104; Baucom, 130.

30. See, for example, Baucom; Graham, *Confessions*; Pratt; Stares; and Edward Reiss, *The Strategic Defense Initiative* (New York, NY: Cambridge University Press, 1992).

Geneva, the U.S.S.R. further modified its position to allow some antiballistic missile research in space. Talks later that year in Washington, DC, cemented a new relationship between the two countries, and on January 15, 1988, the Soviet Union presented a draft Strategic Arms Reduction Treaty (START) protocol, which committed both countries to abide by the 1972 ABM Treaty for ten years and froze the number of launchers.³¹

The 1972 ABM Treaty lasted for more than ten years until President George W. Bush, who was always critical of the treaty, took the next step and announced in December 2001 that the country was withdrawing from the treaty—a major goal of the conservative space agenda—effectively terminating the treaty on June 13, 2002.³² Additionally, in recognition of the national priority that Bush gave to missile defense, Defense Secretary Donald Rumsfeld announced the elevation of the effort to agency status and its new designation, the Missile Defense Agency, on January 4, 2002.³³ With that bureaucratic boost, the conservative space agenda seemed alive and well.

The other major element of the conservative space agenda was the commercialization of space. As political scientist W. D. Kay has pointed out: “for the first several months of his presidency, Ronald Reagan did not appear to even have a science policy of any sort, let alone a plan for the U.S. space program.”³⁴ That changed after the first flight of the Space Shuttle *Columbia* in April 1981, when “the general feeling within the White House after *Columbia* was that anything was possible.”³⁵ The Space Shuttle, Kay added, “appeared to provide the Reagan White House with the final ingredient—the requisite technology—that it needed to integrate the U.S. space program into its larger political and economic goals.”³⁶

Indeed, the Space Shuttle stoked the Reagan administration’s fires of enthusiasm for commercializing space, among other projects. The commercialization of space under the Reagan administration was an entirely new space initiative and was one of the two key pillars of the conservative space agenda along with the militarization of space. Reagan’s commercial space policy grew out of an examination of military space policy carried out at the highest level, the

31. John C. Lonnquest and David F. Winkler, *To Defend and Deter: The Legacy of the United States Cold War Missile Program*, USACERL Special Report 97/01 (Champaign, IL: U.S. Army Construction Engineering Research Laboratories, 1996), 129–130; Reiss, 89–90.

32. U.S. Department of State, Fact Sheet, “ABM Treaty Fact Sheet,” December 13, 2001, <http://www.state.gov/t/ac/rls/fs/2001/6848.htm> (accessed November 13, 2007).

33. “BMDO’s Name Changed to Missile Defense Agency,” *Aerospace Daily*, January 7, 2002, article 196406, [electronic edition].

34. W. D. Kay, *Defining NASA: The Historical Debate over the Agency’s Mission* (Albany, NY: State University of New York Press, 2005), p. 125.

35. Kay, 128–129.

36. Kay, 127.

National Security Council, by order of the President in August 1981. A Senior Interagency Group, known as SIG (Space), came together under the direction of the President’s Science Advisor, George Keyworth, and the National Security Council. It addressed a range of issues, such as launch vehicle needs, the adequacy of existing space policy for national security requirements, Space Shuttle responsibilities and capabilities, and potential new legislation.³⁷ The study led to the issuance of the National Space Policy (National Security Decision Directive 42) on July 4, 1982, which for the first time ever included business in space policy and marked the start of a national policy on space commerce.

The economic benefits of space (such as telecommunications, weather forecasting, remote sensing, and navigation) were not new; however, this was the first time in the history of the U.S. space program that a high-level official document made a direct reference to the American business community. The new National Space Policy thus marked a dramatic redefinition of space policy not seen since the launch of Sputnik in 1957.³⁸ Specifically, it laid out four goals to be accomplished in space; the third and fourth of which called for “obtain[ing] economic and scientific benefits through the exploitation of space” and for “expand[ing] United States private-sector investment and involvement in civil space and space-related activities.”³⁹

The release of the 1982 National Space Policy revealed its indebtedness to the Space Shuttle. National Security Decision Directive (NSDD) 42 called for making the Space Shuttle available to all commercial users, provided only that national security conflicts did not result. On July 4, 1982, the same date as the new space policy, President Reagan spoke before an audience of some fifty thousand people at Edwards Air Force Base, with American flags flying in the background, as the Space Shuttle *Columbia* landed.⁴⁰ This was the Space Shuttle’s final test mission and the beginning of its operational status. It also was the first mission to carry a Pentagon payload and the first “Get Away Special” experiments conducted for a NASA business customer.⁴¹ The Space Shuttle was now fully in the service of the conservative space agenda.

37. “National Space Policy,” July 4, 1982, folder 386, box 15, X-33 Archive.

38. Kay, 127.

39. Christopher Simpson, *National Security Directives of the Reagan and Bush Administrations: The Declassified History of US Political and Military Policy, 1981-1991* (Boulder, CO: Westview Press, 1995), 136-143 (classified version) and 144-150 (unclassified version); Kay, 128.

40. Lyn Ragsdale, “Politics Not Science: The U.S. Space Program in the Reagan and Bush Years,” Launius and McCurdy, eds., *Spaceflight and the Myth of Presidential Leadership* (Urbana, IL: University of Illinois Press, 1997), p. 133.

41. Judy A. Rumerman and Stephen J. Garber, *Chronology of Space Shuttle Flights, 1981-2000*, HHR-70 (Washington, DC: NASA, October 2000), p. 5.

The Space Shuttle's dual commercial-military purpose was renewed by a subsequent National Security Decision Directive issued on May 16, 1983,⁴² with the central objective of encouraging the U.S. commercial launch industry. That policy made the Space Shuttle available to all domestic and foreign users, whether governmental or commercial, for "routine, cost-effective access to space." It also promoted the commercial use of expendable rockets by making government ranges available for commercial launches at prices "consistent with the goal of encouraging" commercial launches and by encouraging competition "within the U.S. private sector by providing equitable treatment for all commercial launch operators."⁴³

The special National Policy on the Commercial Use of Space released on July 20, 1984, reflected the opinions that White House senior officials had heard from representatives from a range of companies interested in conducting business in space, such as Federal Express, McDonnell Douglas Astronautics, Grumman Aerospace, General Dynamics, and Rockwell International. It set out a series of initiatives that included research and development tax credits, a ten percent investment tax credit, accelerated cost recovery, timely assignment of radio frequencies, and protection of proprietary information.⁴⁴

On November 18, 1983, President Reagan designated the Department of Transportation (DOT) as the lead agency to "promote and encourage commercial ELV [expendable launch vehicle] operations in the same manner that other private United States commercial enterprises are promoted by United States agencies." Rather than emulate the regulatory agencies scorned by the New Right, hampering commerce and inflating consumer prices, the DOT would "make recommendations . . . concerning administrative measures to streamline federal government procedures for licensing of commercial" launches (by the DOT). The agency also would "identify federal statutes, treaties, regulations and policies which may have an adverse impact on ELV commercialization efforts and recommend appropriate changes to affected agencies and, as appropriate, to the President."⁴⁵ Here was a regulatory mandate to encourage industry. Space commercialization was becoming a model of the Reagan Revolution, and the conservative space agenda.

42. Letter, Rosalind A. Knapp to David A. Stockman, December 12, 1983, folder 696, box 23, X-33 Archive.

43. Draft National Security Decision Directive, April 22, 1983, folder 696, box 23, X-33 Archive.

44. Craig L. Fuller to Richard G. Darman et al., note and attachment, "Space Commercialization," August 2, 1983, and Agenda, Space Commercialization Meeting, August 3, 1983, folder 696, box 23, X-33 Archive.

45. "Executive Order: Commercial Expendable Launch Vehicle Activities," attached to Michael J. Horowitz to Robert Kimmitt, December 12, 1983, and Rosalind A. Knapp to David A. Stockman, December 12, 1983, folder 696, box 23, X-33 Archive.

Congress subsequently gave the DOT’s new role a legal basis with the passage of the Space Launch Commercialization Act, H.R. 3942 (Senate bill S.560), better known as the Commercial Space Launch Act of 1984. Members of Congress felt that the designation of a lead agency was insufficient because it lacked “legislative authority. The result could inhibit decision-making and interagency coordination and allow the present inefficient approaches to commercial launch approvals to persist.”⁴⁶ Acting on the authority of both the Act and a Presidential Executive Order, Secretary of Transportation Elizabeth Hanford Dole established the Office of Commercial Space Transportation (OCST), which issued launch licenses and in general regulated the new launch-for-hire industry. NASA itself recapitulated the Reagan administration’s evolving commercial space policy by issuing its own Commercial Space Policy⁴⁷ and creating its own Office of Commercial Programs in 1984.⁴⁸

As a result of the new projects that the Reagan presidency started in conscious fulfillment of the conservative agenda, the United States ended up with a space program that was, at least in the eyes of the New Right, “politically correct.” The malfunctioning Hubble Space Telescope and other issues suggested fundamental flaws in the way NASA operated, while the *Challenger* accident (coupled with the military’s grounded expendable launchers) and the subsequent reevaluation of the space program brought on by the end of the Cold War signaled a turning point in U.S. space history. The conservative space agenda shifted accordingly. Although from society’s perspective the changes that followed *Challenger* were neither as profound nor as pervasive as those wrought by Sputnik, the space program was never the same.

Conservatives now abandoned the Shuttle, which they held up as a symbol of everything wrong with NASA, and called for basic changes to NASA management. The chief institutional voice for these changes was Vice President Dan Quayle, who acted as head of the recently (1988) reestablished National Space Council. Quayle wanted to “shake up” NASA, which he believed was “to a great extent, still living off the glory it had earned in the 1960s.” He complained that NASA projects were “too unimaginative, too expensive, too

46. U.S. House of Representatives, *Commercial Space Launch Act*, 98th Congress, 2d session, Report 98-816 (Washington, DC: GPO, 1984), 9.

47. “NASA Commercial Space Policy,” October 1984, ii & v, “Summary of Policy Initiatives,” and “Research and Development Initiatives,” folder 386, box 15, X-33 Archive.

48. NASA Special Announcement, “Establishment of the Office of Commercial Programs,” September 11, 1984; NASA News Press Release 87-126, “Assistant Administrator Gillam to Retire from NASA,” August 19, 1987; “NASA Commercial Space Policy,” October 1984, “Summary of Policy Initiatives;” and Isaac T. Gillam IV, “Encouraging the Commercial Use of Space and NASA’s Office of Commercial Programs,” *NASA Tech Briefs*, n.v. (Spring 1985): 14-15, all in folder 383, box 15, X-33 Archive; John M. Cassanto, “CCDS Shock Waves,” *Space News*, January 24-30, 1994, 21.

big, and too slow.”⁴⁹ He, like many other NASA reformers, wanted the Agency to undertake “faster, cheaper, smaller” projects. If NASA shifted from large, prolonged, expensive projects to smaller, faster, cheaper projects, critics argued, the Agency would be able to accomplish more science for less money. Quayle pushed NASA to undertake “faster, cheaper, smaller” projects in imitation of the management style of the Strategic Defense Initiative Organization. The favored management style of the New Right became the *de rigueur* management style of NASA under Quayle and the Agency’s new Administrator, Dan Goldin.⁵⁰

The Space Shuttle was a programmatic relic of the Cold War; it embodied the expensive, large-scale, long-term projects that characterized the Cold War era, which conservatives had embraced unabashedly. Now it was out of place in the fiscally conservative post-Cold War environment that favored cheaper, smaller, short-term projects. Although NASA was expected to conform to the management style born in the “black” world of national security secrecy, conservatives persisted in burdening the country with expensive, large-scale, long-term projects, the embodiment of which now became the Space Exploration Initiative (SEI), a grandiose plan to return to the Moon and then land astronauts on Mars.⁵¹ With the return to power of conservatives under George W. Bush, the Space Exploration Initiative returned from the dead as the “Vision for Space Exploration.”⁵²

As we consider the “National and Global Dimensions of the Space Age,” we need to keep in mind how ideology—and in particular the conservative space agenda—has so profoundly shaped the U.S. space program and how we think about it. The changes brought about may appear to be the outcome of a rational policymaking process, but are laden with the values of the New Right. General acceptance of this conservative space agenda, of course, is assured by the nation’s ongoing turn to the Right. This ideological agenda, therefore, reflects the country’s own turn to the Right, and that conservative bent has shaped and molded the distinct national identity of the United States and its space program.

49. Dan Quayle, *Standing Firm: A Vice-Presidential Memoir* (New York, NY: HarperCollins Publishers, 1994), pp. 179 & 180.

50. Butrica, *Single Stage to Orbit: Politics, Space Technology, and the Quest for Reusable Rocketry* (Baltimore: Johns Hopkins University Press, 2003), pp. 134-137 & 150-151; and the general discussion in Howard E. McCurdy, *Faster, Better, Cheaper: Low-Cost Innovation in the U.S. Space Program* (Baltimore, MD: Johns Hopkins University Press, 2001), *passim*.

51. The most recent and complete scholarly treatment of the Space Exploration Initiative is Thor Hogan, *Mars Wars: The Rise and Fall of the Space Exploration Initiative* (Washington, DC: NASA, August 2007).

52. White House, Office of the Press Secretary, “President Bush Announces New Vision for Space Exploration Program,” January 14, 2004, <http://www.whitehouse.gov/news/releases/2004/01/20040114-3.html> (accessed November 13, 2007).

CHAPTER 9

GREAT (UNFULFILLED) EXPECTATIONS: TO BOLDLY GO WHERE NO SOCIAL SCIENTIST OR HISTORIAN HAS GONE BEFORE¹

Jonathan Coopersmith

The start of the Space Age, its morphing into the space race, and President John F. Kennedy's launch of Project Apollo excited not only engineers and scientists but also social scientists and historians. Neil Armstrong's words, "One small step for man, one giant leap for mankind," embodied not only the justified pride of a spectacular technological accomplishment but also the bold hopes of the American Academy of Arts and Sciences (AAAS) to harness the space program to apply the social sciences for the benefit of society and government.

For the AAAS, its "ultimate goal . . . would be to develop a system for the continuing monitoring of important effects of space efforts, together with a reporting of these effects in appropriate terms to the appropriate agency."² The participating historians had goals no less impressive. MIT professor Bruce Mazlish declared "In short, we are really attempting to set up a new branch of comparative history: the study of comparative or analogous social inventions and their impact on society."³

This paper examines this NASA-funded AAAS project in the mid-1960s to understand why such lofty goals existed, what the project accomplished, and where the humanities and social sciences stand in relation to the space program some four decades later.

AAAS PROJECT

Like the American President who set the Apollo program in motion, this effort had a Massachusetts origin. In February 1962, the AAAS established the Committee on Space Efforts and Society, which bid on and received a \$181,000

1 I would like to thank Steven Dick, Roger Launius, and Peter Stearns for looking at early versions of this paper.

2. Earl P. Stevenson, "Report of the Committee on Space," *Records of the Academy (American Academy of Arts and Sciences)*, 1963/1964, 151.

3. Bruce Mazlish, "Historical Analogy: The Railroad and the Space Program and Their Impact on Society", in Bruce Mazlish, ed. *The Railroad and the Space Program. An Exploration in Historical Analogy* (Cambridge, MA: MIT Press, 1965), p. 12.

NASA grant for the “Conduct of a study of long-range national problems related to the development of the NASA program”⁴ in April 1962.

According to its charter, the Boston-based AAAS was established in 1780, “to cultivate every art and science which may tend to advance the interest, honour, dignity, and happiness of a free, independent, and virtuous people.”⁵ Conducting such a project with significant societal implications fit fully with its activities. Indeed, its president Paul Freund considered this project “a major Academy study.”⁶

The AAAS proposal to NASA asked

From the standpoint of NASA objectives how can the resources of the nation be mobilized for the achievement of national goals developing out of advances in scientific knowledge and engineering capabilities, and what will be the predictable impact of enterprises so conceived on various sectors of our society? What will be the reciprocal impact back on NASA? Basically, the effort will be to develop a system by which the feedback indicators to NASA may be improved and to assist in making the NASA experience and achievements most meaningful in the public interest.⁷

Based upon an original proposal of two years, the AAAS project ultimately consumed four years and \$45,000 more than expected.⁸ This was one of several efforts funded by NASA as part of its 1958 mandate to study the “potential benefits to be gained from, the opportunities for, and the problems involved” in the space program.⁹ Overall, in its first decade NASA spent nearly \$35 million on 365 contracts to study the impact of the space program. Most of these contracts studied technology transfer and economic impacts.¹⁰

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4. Earl P. Stevenson, “Report of the Committee on Space Efforts and Society,” *Records of the Academy (American Academy of Arts and Sciences)*, 1962/1963, 141.
 5. Accessed at <http://www.amacad.org/about.aspx> (downloaded August 7, 2007).
 6. Paul A. Freund, “President’s Report,” *Records of the Academy (American Academy of Arts and Sciences)*, 1964/1965, 7.
 7. Stevenson, op. cit., p. 141.
 8. Earl P. Stevenson, “Report of the Committee on Space,” *Records of the Academy (American Academy of Arts and Sciences)*, 1965/1966, 22.
 9. “Introduction,” in Raymond A. Bauer with Richard S. Rosenbloom and Laure Sharp and the Assistance of Others, *Second-Order Consequences. A Methodological Essay on the Impact of Technology* (Cambridge, MA: MIT Press, 1969), p. 2. Among other efforts were Lincoln P. Bloomfield, ed., *Outer Space: Prospects for Man and Society* (Englewood Cliffs, NJ.: The American Assembly, 1962) and Lillian Levy, ed., *Space: Its Impact on Man and Society* (New York, NY: W.W. Norton & Co., 1965). Levy was a journalist who joined the NASA Office of Public Affairs.
 10. Mary A. Holman, *The Political Economy of the Space Program* (Palo Alto: Pacific Books, 1974), pp. 171-74. See also, T. Stephen Cheston, “Space Social Science,” in Johnson Space Center’s *Space*



Bruce Mazlish circa 1974 (Courtesy Calvin Campbell/MIT)

These contracts reflected the goal of NASA Administrator James E. Webb to harness and maximize the results of space spending to benefit all aspects of American society, including regional economic development and education. Webb's interest, however, was not universally shared within NASA, whose managers and engineers saw these goals as unnecessary externalities deflecting them from spaceflight.¹¹

The first major study was a one-year project completed by the Brookings Institute in November 1960. To gather information, Brookings organized a two-day conference that included one historian, Melvin Kranzberg, a leading force in the creation of the history of technology as an academic discipline and a strong advocate of institutionalizing history in NASA.¹² In the summer of 1962, NASA funded an eight-week summer study of fifteen areas of space research at the State University of Iowa. If order of appearance indicated priority, then the lowest area was the social implications of the space program.¹³

These previous studies were more predictions, estimates, and recommendations than actual research.¹⁴ The Brookings report called on NASA to establish an in-house capability of at least three senior social scientists. Their responsibilities would range from selecting research priorities and assessing ongoing projects to distributing the findings and assisting in their application at NASA. The report stated "one of the most pressing and continuing research challenges" would be to "develop effective methods to detect incipient implications of space activities and to insure that their consequences are understood."¹⁵ What made the AAAS project different were its underlying goals and three publications. While the primary goal "briefly stated, is to examine the impact of space science and technology on American life," there was another motive:

Educators' Handbook, OMB/NASA Report Number S677. January 1983, <http://www1.jsc.nasa.gov/er/seh/social.html> (downloaded August 2, 2007).

11. W. Henry Lambright, *Powering Apollo. James E. Webb of NASA* (Baltimore, MD: Johns Hopkins University Press, 1995), pp. 99-100.
12. Donald N. Michael, "Proposed studies on the implications of peaceful space activities for human affairs" (Washington, DC: Brookings Institution, 1960), viii. Reprinted as a Report of the Committee on Science and Astronautics of the U.S. House of Representatives, 87th Congress, 1st Session, March 24, 1961. For Kranzberg's role, see Roger D. Launius, "NASA History and the Challenge of Keeping the Contemporary Past," *Public Historian* 21, 3 (Summer 1999), pp. 63-64.
13. "Some Social Implications of the Space Program," in National Academy of Sciences-National Research Council, *A Review of Space Research* (Washington, DC: National Academy of Sciences, 1962), 16-1-32.
14. Committee on Space Efforts and Society, "Space Efforts and Society: A Statement of Mission and Work," (Boston: AAAS, January 1963), reprinted in Raymond A. Bauer with Richard S. Rosenbloom and Laure Sharp and the assistance of others, *Second-Order Consequences. A Methodological Essay on the Impact of Technology* (Cambridge, MA: MIT Press, 1969), p. 211.
15. Michael, op. cit., pp. 3-4.

to encourage an enterprise of the size and importance of NASA to incorporate in it a mechanism that would enable it to guide its actions with respect to optimizing its second-order social effects. To this end, our program has been designed to demonstrate that effective and meaningful behavioral science research could be done in this complex area.¹⁶

The chair of the AAAS committee was Earl P. Stevenson, the recently retired president and chairman of Arthur D. Little, but he played only a nominal role.¹⁷ The real driving force was Raymond A. Bauer. Bauer (1916–1977), described by the *New York Times* as “a pioneer in the application of behavioral sciences,” was a prolific and widely enquiring social psychologist at the Harvard Graduate School of Business Administration who wrote and edited over 20 books, ranging from interviews with Soviet refugees in the 1950s to analyses of advertising in the 1970s.¹⁸

Bauer’s interest in the space program began with a 1960 survey of the opinions of business executives about the space program and collaboration with the Brookings report.¹⁹ In a 1964 talk, his interest grew because

The point to be made is that the space program because of its highly visible nature, and the developing concern for its second-order consequences, has played a unique and valuable role that has turned our attention to problems we ought to have been studying in any event. It seems to me highly probable that just as the program of space exploration is the leading edge of the advance of much of the new technology (or at least serves as the symbol of this advance), in the same way it may serve a very valuable catalytic function in getting us to run our affairs better.²⁰

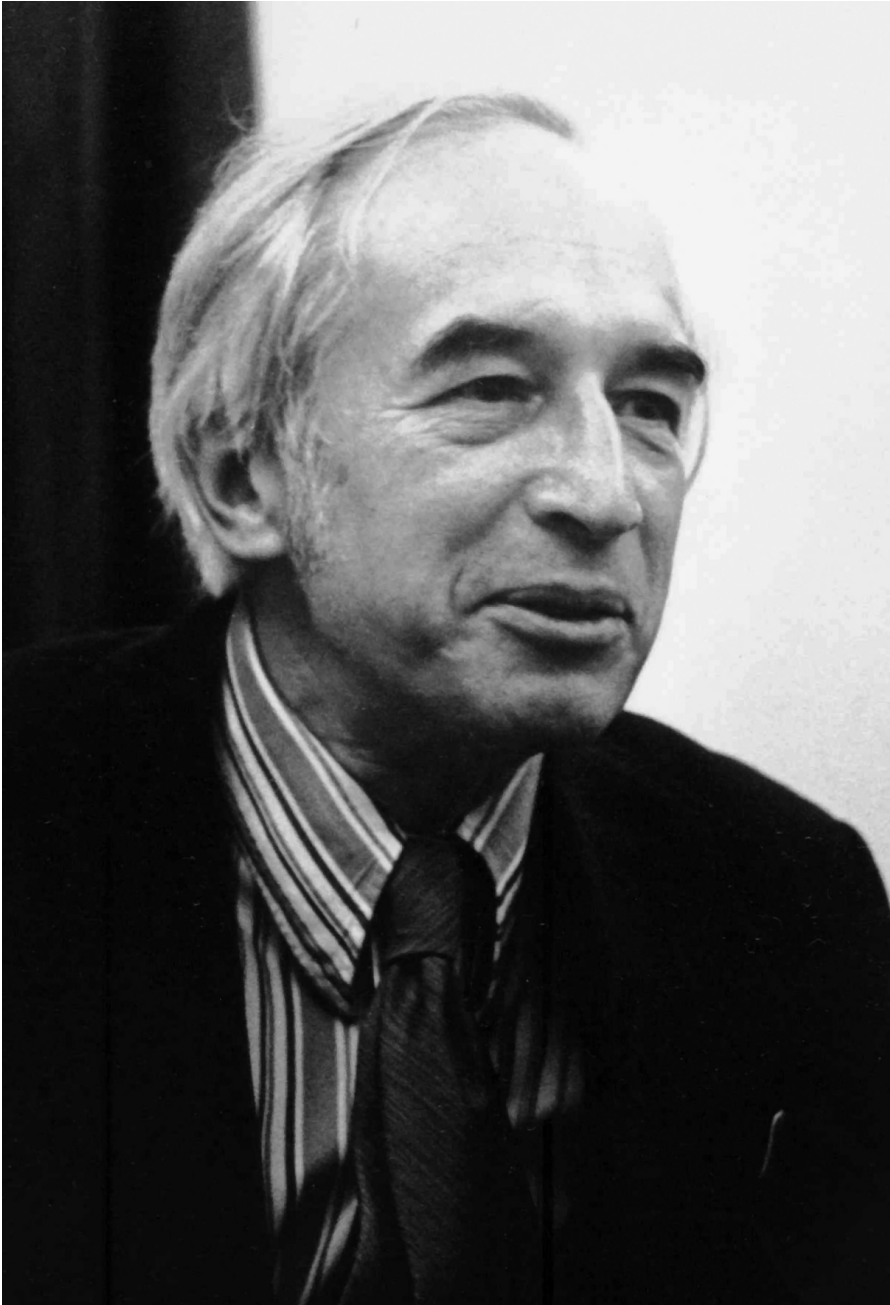
16. “Report of the Committee on Space,” *Records of the Academy (American Academy of Arts and Sciences)*, 1963/1964, 149, 155.

17. “Earl P. Stevenson, 84; Ex-Director and Head Of Arthur Little, Inc.,” *New York Times*, July 5, 1978, B2.

18. “Raymond Bauer, 60; Business Professor Taught at Harvard,” *New York Times*, July 11, 1977, 22; see also Ithiel de Sola Pool, “In Memoriam,” *PS* 10, 4 (Autumn, 1977), 516–518, and Florence Bartoshesky, “Raymond A. Bauer: A list of his works,” *Accounting, Organizations and Society* 6, 3 (1981), 263–270.

19. Raymond A. Bauer, “Executives Probe Space,” *Harvard Business Review* 38 (Sep–Oct 1960), 6–14.

20. “Space Programs: The Joint Responsibility of Business and Government,” 27, April 9, 1964. Box 5, file 42, Series II–B. HBS Research and Writing Records – Writings, 1941–1978. Raymond A. Bauer Papers, Harvard Business School Archives, Baker Library, Harvard Business School.



Raymond A. Bauer (Courtesy Harvard College Library)

In the summer of 1962, the committee held a summer conference to determine the most significant areas of study, which the AAAS and NASA then approved. Throughout the contract, the AAAS remained in “continuous conferring” with NASA.²¹ In March 1963, the committee dissolved itself, and in April the AAAS Council created a smaller Committee on Space to supervise a study group that would conduct and organize the actual research.²² The members were almost all from the Boston area with Harvard and MIT faculty monopolizing the committee and study group.

The committee discovered an unexpected challenge in convincing academics to conduct space-oriented research. Its 1962 request to sociologists for research proposals to “apply social science insight and imagination to the problem of massive technological innovation and the space program” received a poor response. Describing projects in language and concepts familiar to potential researchers seemed a necessary step.²³ The problem was not just faculty: four years later, Administrator Webb would turn “almost bitter about the response of the nation’s university presidents” to NASA’s Sustaining University Program, his effort to remake higher education into a more service-oriented, interdisciplinary enterprise.²⁴

By 1965, the Committee considered its work “substantially completed.” Another goal—stimulating research—had been accomplished with the Harvard Business School studying “technology transfer” and the National Planning Association developing “indicators of trends in social and political change” or “social indicators.”²⁵ Publication, however, lagged.

Four volumes were planned; MIT Press published only three. The fourth, apparently a summary of committee activities, never appeared due to “insurmountable” problems of “choice and format.”²⁶ The three published volumes were: 1) Bruce Mazlish, ed. *The Railroad and the Space Program. An*

21. “Introduction,” in Raymond A. Bauer with Richard S. Rosenbloom and Laure Sharp and the assistance of others, *Second-Order Consequences. A Methodological Essay on the Impact of Technology* (Cambridge, MA: MIT Press, 1969), p. 9.

22. Earl P. Stevenson, “Report of the Committee on Space,” *Records of the Academy (American Academy of Arts and Sciences)*, 1963/1964, 141–142.

23. “The Profession: Reports and Opinion,” *American Sociological Review* 27, 4. (August 1962), 595; Committee on Space Efforts and Society, “Space Efforts and Society: A Statement of Mission and Work,” (Boston, MA: AAAS, January 1963), reprinted in Bauer et al., op. cit., p. 212).

24. W. Henry Lambright, op. cit., pp. 136–139.

25. Earl P. Stevenson, “Report of the Committee on Space,” *Records of the Academy (American Academy of Arts and Sciences)*, 1964/1965, 18.

26. Earl P. Stevenson, “Report of the Committee on Space,” *Records of the Academy (American Academy of Arts and Sciences)*, 1965/1966, 22; Raymond A. Bauer, “Preface,” in Raymond A. Bauer with Richard S. Rosenbloom and Laure Sharp and the assistance of others, *Second-Order Consequences. A Methodological Essay on the Impact of Technology* (Cambridge, MA: MIT Press, 1969), p. ix. This may explain the change of editor, too.

Exploration in Historical Analogy (1965); 2) Raymond A. Bauer, ed., *Social Indicators* (1966); and 3) Raymond A. Bauer with Richard S. Rosenbloom and Laure Sharp—and the Assistance of Others, *Second-Order Consequences. A Methodological Essay on the Impact of Technology* (1969).²⁷

The Committee on Space divided its mandate into three categories: 1) Studies on the Anticipation of the Effects of Space Efforts; 2) Studies on the Detection of Such Effects; and 3) Studies on the Evaluation and Feedback of Information about Effects.²⁸

Although its goal “should be to develop devices for anticipating, detecting, evaluating and acting (on)” the inevitable consequences of technical change, the committee claimed limits of time and money necessitated a focus on the first two kinds of devices.²⁹ Deciding that the development of the railroad provided the most fruitful historical approach to analyzing “what the social consequences of the space program *might* be,” the committee commissioned eight papers under the guidance of Bruce Mazlish, a study group member, in anticipation that “In all of these studies an effort will be made to move from the impact of the railroad in the specific area under consideration to an analogy with the possible space impact today in similar areas.”³⁰ In this, the Committee on Space would be disappointed.

STUDIES ON THE ANTICIPATION OF THE EFFECTS OF SPACE EFFORTS

For an effort whose first product was historical analogies, historians were curiously absent. The Committee on Space had two social psychologists and a political scientist, among others, but no historians. According to Bruce Mazlish, no historians attended the 1962 summer workshop, nor did the members of the Committee play an active role in choosing the historians or integrating their efforts into the larger project.³¹ History seems to have been an afterthought that was added

27. This volume was originally intended to be edited by Robert N. Rapaport, and entitled *Social Change: Space Impact on Communities and Social Groups*. The different title may have been an attempt to appeal a larger audience (Raymond A. Bauer, op. cit., p. 19).

28. Earl P. Stevenson, “Report of the Committee on Space,” *Records of the Academy (American Academy of Arts and Sciences)*, 1963/1964, 150.

29. Committee on Space Efforts and Society, “Space Efforts and Society: A Statement of Mission and Work,” (Boston: AAAS, January 1963), reprinted in Raymond A. Bauer with Richard S. Rosenbloom and Laure Sharp and the assistance of others, *Second-Order Consequences. A Methodological Essay on the Impact of Technology* (Cambridge: MIT Press, 1969), p. 193.

30. Earl P. Stevenson, “Report of the Committee on Space,” *Records of the Academy (American Academy of Arts and Sciences)*, 1963/1964, 150–51. Emphasis in original.

31. Mazlish interview; July 11, 2007. Only recently did the AAAS hire its first archivist; consequently, its records are not accessible.

because of its potential value or possibly because the committee realized that the historians could provide a product for NASA faster than the social scientists.

Mazlish became involved because he was a Fellow at the AAAS, where he would eventually meet Bauer. A professor at MIT since 1955, Mazlish had an interest in methodological problems and helped found the journal *History and Theory* in 1960. Bauer asked Mazlish to develop the theme of historical analogies.³² Mazlish found the authors, including some of the foremost historians of technology, business, and economics. In an interesting action—or inaction—the writers did not meet to discuss their work due to limited funding.³³

The papers represented the usual range of collected works: some taken from previous writings, some transitional new work, and some interesting expostulations. However, the AAAS's hope for major analogous comparisons was not realized. The papers instead focused on the railroad with a few paragraphs at most about the space program bolted on the end, which, as reviewer Kenneth Boulding noted, “remind me, I am afraid irresistibly, of the libations to Marxism-Leninism which usually accompany quite sensible Russian works.”³⁴

The volume's greatest contribution is Mazlish's article on historical analogy, a piece that stands by itself as a major theoretical analysis of that widely used, easily abused, and poorly understood activity. According to Mazlish, analogies often evolve into myths, which not only provide “needed emotional continuity and support, but pass readily into models” that can mislead as easily as lead. A possibly insurmountable problem was “historically conditioned awareness.” How could researchers base analogies on events that occurred only once (like the 17th century discovery of microscopic life) and changed perceptions forever (like the railroad altering people's concepts of time and space in a way that reduced the novelty of future advances)?³⁵

Faced with these challenges, Mazlish stated, “I am tempted to state categorically that, *for purposes of scientific knowledge*, only a historical analogy that 1) allows for progressive trends, and 2) rises above the comparison or resemblance of two simple elements can be of any real value.” More realistically, the best research should treat the space program, like the railroad as “a complex *social invention*” in a specific (and evolving) environment.³⁶ Any serious historical analogy had to be based on detailed, informed empirical studies; focus on the complex relationships within the larger system, and not simply comparing two

32. Ibid. No AAAS records have yet been found of the workshop.

33. Ibid.

34. Kenneth E. Boulding, “Space, Technology, and Society: From Puff-Puff to Whoosh,” *Science*, (February 25, 1966): 979.

35. Mazlish, “Historical Analogy,” pp. 9-10.

36. Ibid, p. 11. Emphasis in original.

isolated elements; and, use as large a “fair sampling” as possible to ensure study of the right elements.³⁷

Mazlish concluded with five generalizations:

1. Beware simplistic conclusions. “All social inventions are part and parcel of a complex—and have complex results. Thus, they must be studied in multivariate fashion.”
2. There are usually alternate technological approaches to attain economic goals.
3. “All social inventions will aid some areas and developments, but will blight others.”
4. “All social inventions develop in stages and have different effects during different parts of their development.”
5. “All social inventions take place within a national ‘style,’ which strongly affects both their emergence and their impact.”³⁸

These generalizations have held up well, though often are not heeded. Simplistic comparisons abound today, especially in the political arena. Particularly neglected in both historical and contemporary analyses is “asset and liability bookkeeping,” including paths not taken. Economic historians have proved best at constructing such alternative realities.

Building on an excellent overview of the early decades of American railroad technology, Thomas P. Hughes provided more comparative analysis than the other papers, including a compelling definition that encompassed the railroad, space program, and many other areas: “Wherever and whenever nature in her nonanimal manifestations frustrates man in the pursuit of his objectives, there exists a technological frontier.”³⁹

Space exploration surely satisfies the “most extreme result of technological frontier penetration is the creation of a man-made environment and the rendering of nature imperceptible.”⁴⁰ But nature in the form of a hostile environment is not imperceptible; rather, it is held at bay to the point that robotic probes can be sent on decades-long missions.

Hughes noted that one challenge of engineers is to compromise *economically* with nature, to solve problems in ways that are technologically but also financially feasible.⁴¹ The importance of economics in shaping the trajectory

37. Ibid, pp.18–20. The preferred word for multi-causal, complex explanations was “multivariate,” showing historians can be as trendy as any other group.

38. Ibid, pp. 34–35.

39. Thomas P. Hughes, “A Technological Frontier: The Railway,” in Bruce Mazlish, ed. *The Railroad and the Space Program. An Exploration in Historical Analogy* (Cambridge, MA: MIT Press, 1965), p. 53.

40. Ibid.

41. Ibid, p. 55.

of space exploration and exploitation remains a significant, underappreciated topic. The political economy of space remains based on the fact that the high cost of reaching Earth orbit and working in space continues to limit the players in space to those who have deep pockets—primarily national governments and large corporations (themselves often dependent upon government orders).

An aspect of the political economy of railroads Mazlish noted was that over 120 British Members of Parliament served on railroad boards in 1872. Any study of the American political economy of space today would have to include fundraising and other favors for the senators and representatives on the congressional committees overseeing NASA, the military, and, as former Representative Randy Cunningham demonstrated, the intelligence community.⁴²

For Hughes, historical awareness can sensitize the observer to future probabilities and suggest questions. Perhaps most importantly, what fields will languish as a result of resources expended on space? Will the institutionalization and reification of this knowledge create a momentum that will transfer into other areas? What style will characterize engineers and scientists who have learned to operate in space?⁴³ Four decades of experience should enable us to now answer these questions.

Economic historians Robert Fogel and Paul Cootner emphasized the need to compare the costs of alternate approaches to accomplish similar work and the fact that the full impact of the railroad took decades to emerge.⁴⁴ Drawing on his 1964 *Railroads and American Economic Growth*, Fogel considered the main question from an investment perspective: “Will the increase in national income made possible by the space program exceed the increase in income that would be obtained if the same resources were invested in other activities?”⁴⁵

Viewing the railroad’s main effects as reducing transportation costs of processes and activities already underway, Fogel suggested that the space program would not revolutionize transport, generate transcendent inventions, or expand access to knowledge. Instead, he postulated that the space program’s most radical and important contributions may come from the knowledge gained from exploration, exploration impossible without access to space. Unlike the railroad, where transportation alternatives existed, rockets provided entrance

42. Mazlish, “Historical Analogy,” p. 31.

43. Hughes, op. cit., p. 72.

44. Paul H. Cootner, “The Economic Impact of the Railroad Innovation,” in Bruce Mazlish, ed. *The Railroad and the Space Program. An Exploration in Historical Analogy* (Cambridge, MA: MIT Press, 1965), pp. 112, 118.

45. Robert William Fogel, “Railroads as an Analogy to the Space Effort: Some Economic Aspects,” in Bruce Mazlish, ed. *The Railroad and the Space Program. An Exploration in Historical Analogy* (Cambridge, MA: MIT Press, 1965), p. 74. Fogel’s book was both groundbreaking, leading to a Nobel prize in economics for Fogel in 1993, and a counterargument to Walt W. Rostow’s influential concept of stages of economic takeoff, *The Stages of Economic Growth: A Non-Communist Manifesto* (Cambridge, MA: Cambridge University Press, 1960).

to a world hitherto unavailable.⁴⁶ This was the most succinct, accurate, and ignored prediction made in the book.

That prediction more than compensated for another prediction. In an excellent example of extrapolating from expectations, Fogel assumed the forthcoming arrival of the supersonic transport would negate any advantage of the rocket for point-to-point transportation on Earth as the maximum time saved by rocket would be five hours.⁴⁷

The Committee on Space had noted “one of the most widely discussed second-order consequences of the space program is the diffusion of space-generated technology into the civilian economy,” a consequence space supporters promoted optimistically.⁴⁸ Significantly, Fogel decisively dismissed what would be called spinoff in the case of the railroad. NASA ignored Fogel’s unwanted conclusion: Tracking and promoting technology transfer absorbed approximately half of the \$35 million NASA spent on impact studies in its first decade. Indeed, NASA has long proclaimed and promoted the value of spinoffs.⁴⁹

In a stepping stone to his magisterial *The Visible Hand*, Alfred Chandler, together with Stephen Salsbury, offered very general hypotheses about innovative inventions encouraging new methods of management and administration, needs that emerge as the invention evolves instead of being immediately obvious. Often, operational crises—usually in the form of deadly visible disasters—produce the political attention (including from the press, public, and politicians) needed to introduce large and complex organizations to manage these large and complex technologies.

As the history of space programs amply illustrate, management has been as challenging as the actual technologies with visible disasters often producing major administrative changes. The continuing focus on management indicates the space program is still a major work in progress.

From a NASA perspective, Thomas Cochran wrote the most disappointing paper, not even adding a speculative paragraph at the end. From a railroad perspective, however, Cochran served up a stimulating view of the demographic, institutional, and social-psychological impacts of the railroad.

In an article that local and state governments seeking to attract businesses should ponder, Robert Brandfon examined what happened when a powerful railroad monopoly, the Illinois Central, entered a poor state, Mississippi, with goals quite different than those held by politicians and citizens. For Brandfon, the key analogy was with NASA’s then new Mississippi Test Facility (now the

46. Fogel, p. 106.

47. *Ibid.*, p. 104.

48. Earl P. Stevenson, “Report of the Committee on Space,” *Records of the Academy (American Academy of Arts and Sciences)*, 1963/1964, 153.

49. See for example Marjolijn Biejlefeld and Robert Burke, *It Came From Outer Space. Everyday Products and Ideas from the Space Program* (Westport, CT: Greenwood Press, 2003).

Stennis Space Center). Would NASA act as a colonialist or contributor to the state? How would it handle race relations, an explosive issue in the mid-1960s? Would NASA improve education so locals could be hired, or would NASA import the skilled workforce from outside the state?⁵⁰

Based on his significant 1964 *The Machine in the Garden*, Leo Marx examined why so little was known about the impact of technological progress upon the collective consciousness. Commenting on Marx, Mazlish noted, “in some ways the most difficult to trace and establish, the railroad’s impact on the imagination seems almost to be the most fundamental.” Just as the iron horse altered conceptions of the pastoral landscape, “one of the most significant impacts” of the space program could be new perceptions of Earth and space.⁵¹ The rise of the environmental movement has affirmed this impact.

Reception to *Railroad* was positive. Academic book reviews admired this “thought-provoking and intriguing book,” though some considered the analogy “tremulous.”⁵² For Bauer and the Committee on Space, the value of *Railroad* was demonstrating that, after a century of writing, the scope and nature of the technology-society relationship had not been fully evaluated and that causation and change were more complex than assumed. By implication if not analogy, the space program would prove equally academically challenging.⁵³

Unfortunately, the book’s impact was restricted. In a serious blow to its diffusion, MIT Press never issued a paperback version, the fate of many collected works. Consequently, the influence of *Railroad*, especially on graduate students, remained limited.

A 1979 NASA-sponsored study on the space program from the perspectives of the social sciences and humanities placed *Railroad* under the category of “Impact Analysis,” which was “an intellectual invention of the late 1960s and early 1970s and evolved as part of the burgeoning academic study of technology in its social context.”⁵⁴ The main directions of the social study of technology as well as the AAAS project, however, moved away from *Railroad*.

50. Robert L. Brandfon, “Political Impact: A Case Study of a Railroad Monopoly in Mississippi,” in Bruce Mazlish, ed. *The Railroad and the Space Program. An Exploration in Historical Analogy* (Cambridge, MA: MIT Press, 1965), p. 200.

51. Mazlish, “Historical Analogy,” pp. 33, 41.

52. John F. Stover, “The Railroad and the Space Program,” *American Historical Review* 72, 1 (October 1966) 280-281; Julius Rubin, “The Railroad and the Space Program,” *Business History Review* 41, 3 (Autumn 1967): 334.

53. Raymond A. Bauer, “Detection and Anticipation of Impact: The Nature of the Task,” in Raymond A. Bauer, ed., *Social Indicators* (Cambridge, MA: MIT Press, 1966), p. 20.

54. T. Stephen Cheston, “Space Social Science: Suggested Paths to an Emerging Discipline,” *Space Humanization Series* 1 (1979): 1.

STUDIES ON THE DETECTION OF SUCH EFFECTS

The second research area focused on three questions:

1. Can effects which have been guessed at or discerned be measured with accuracy?
2. Can procedures be devised for locating effects which have not been thought of?
3. Is it possible to segregate effects of the space program from study of the effects of other factors in our society?⁵⁵

Under the direction of Robert N. Rapoport, an anthropologist and sociologist at Northwestern University, the Committee on Space commissioned papers in 1964 to look at the impact of NASA installations on local communities; of NASA on functional groups like businessmen, students, and engineers; of NASA needs on education and labor; and of the process of technology utilization.

Second-Order Consequences appeared in 1969. Congressman Emilio Q. Daddario (D-CT) introduced the studies as “an important initial contribution to the development of technology assessment” and predicted analyzing secondary consequences would “become an integral part of the research-development-application sequence.”⁵⁶

Unlike the other books, *Second-Order Consequences* received poor reviews and vanished into obscurity. The criticism addressed “simply trite and fragmentary” findings, “the unsystematic attack on substantive phenomena, and the lack of a broad theoretical orientation,” but also reflected the more skeptical academic and political environment of the late 1960s. Had the researchers been captured by their client, producing supportive reports that did not question NASA goals or costs? Why were the results so passive instead of identifying “the need for action”?⁵⁷

55. Earl P. Stevenson, “Report of the Committee on Space,” *Records of the Academy (American Academy of Arts and Sciences)*, 1963/1964, 151-152.

56. Emilio Q. Daddario “Foreward,” in Raymond A. Bauer with Richard S. Rosenbloom and Laure Sharp and the assistance of others, *Second-Order Consequences. A Methodological Essay on the Impact of Technology* (Cambridge MA: MIT Press, 1969), p. vi. Daddario’s interest was more than perfunctory: he later served as director of the congressional Office of Technology Assessment and president of the American Association for the Advancement of Science.

57. Ilkka Heiskanen, “Second Order Consequences,” *Administrative Science Quarterly*, 16, 2. (June 1971): 232; see also, William D. Nordhaus, “Economics of Technological Change,” *Journal of Economic Literature* 8, 3 (September 1970), 864-867.

STUDIES ON THE EVALUATION AND FEEDBACK OF INFORMATION ABOUT EFFECTS

The third area, social trends, was the heart of the AAAS project. Social indicators was such a new area of study that it suffered “not only a general lack of consensus as to what should be measured, but also disagreement on goals, purposes, and the nature of our society.” The Committee on Space sought “to see if it could raise the quality of such evaluations by examining carefully the bases for making such evaluations—the social indicators used in measuring trends.”⁵⁸ Bauer and his colleagues were among the leaders in recognizing the importance and potential of, as a 1962 President’s Science Advisory Committee stated, systematically collecting behavioral data and providing advice to the government.⁵⁹

Social Indicators was written not just to determine how to measure specific impacts of the space program but to propose a total information system that would provide “the earliest possible detection or anticipation of impacts that bear on the primary mission” of “NASA or some similar institution.”⁶⁰ Contributor Bertram M. Gross claimed the book was “the first occasion on which the entire field has been surveyed and a comprehensive set of proposals, based upon careful analysis, has been developed.”⁶¹

Appearing in 1966 to favorable reviews, *Social Indicators* was the most influential of the three volumes. Political scientist Ithiel de Sola Pool, who worked with Bauer and later organized a retrospective technology analysis of the telephone, stated that the AAAS project pushed the idea of social indicators into “the mainstream of American social thought.”⁶² Perhaps a more objective indicator of the book’s value is the fact that, four decades after its appearance, MIT Press still sells *Social Indicators*. The concept has taken root and flourished: a search of Google Scholar for “social indicators” returns roughly 36,000 hits compared with 47,000 for “economic indicators.”⁶³ Several internationally prominent composite indicators, such as Transparency International, are as much social as economic.

58. Earl P. Stevenson, “Report of the Committee on Space,” *Records of the Academy (American Academy of Arts and Sciences)*, 1963/1964, 154–155.

59. Life Sciences Panel of the President’s Science Advisory Committee, *Strengthening the behavioral sciences; statement by the Behavioral Sciences Subpanel* (Washington, DC: The White House, 1962), pp. 13–19.

60. Raymond A. Bauer, “Detection and Anticipation of Impact: The Nature of the Task,” op. cit., pp. 10–11, 63. Emphasis in original.

61. Bertram M. Gross, in Bauer, *Social Indicators*, op. cit., “Preface,” p. xv.

62. Ithiel de Sola Pool, “In Memoriam,” *PS* 10, 4 (Autumn, 1977): 517. See also Ithiel de Sola Pool, ed., *The Social Impact of the Telephone* (Cambridge, MA: MIT Press, 1977).

63. Accessed at <http://scholar.google.com/scholar?hl=en&lr=&q=%22economic+indicators%22&btnG=Search> (downloaded August 7, 2007).

Less successful were efforts to employ the concept bureaucratically. Bauer and others, including Minnesota Senator Fritz Mondale, employed *Social Indicators* to promote action by the federal government, including the establishment of a Council of Social Advisors similar to the Council of Economic Advisors and more advice to Congress.⁶⁴ While such a council did not appear, a bipartisan Congress established the Office of Technology Assessment (OTA) in 1972. OTA lasted until 1995, when terminated by the new Republican Congress.

ANALYSIS

In his introduction, Mazlish outlined five issues to address:

1. What were the theoretical problems of historical analogy?
2. What was the impact of the railroad on 19th century America?
3. Could the railroad's impact be used as a "device of anticipation" to study the impact of the space program?
4. Could this AAAS effort possibly become the prototype of future "impact" studies?
5. Could this volume serve as an example of the difficulties involved in organizing such a project?⁶⁵

As he noted, this effort was an initial exploration, designed to probe possibilities, not prove. The volume indeed provided a much richer appreciation of the theoretical challenges of creating and using historical analogy as well as the many impacts of the railroad on 19th century America. The grander goals and visions, however, remained unfulfilled. The first two issues were the province of the historian and the most successfully developed. The last three fell into the province of NASA and the AAAS as well as the historian, and they must be answered either negatively or, to use the Scottish legal concept, not proven.

What happened to the last three goals of the AAAS and *Railroad*? Or, more accurately, what did not happen? Was the problem a lack or loss of AAAS and NASA support, a lack of effort to link historians with social scientists and NASA policy-makers, or a more fundamental mismatch between historians and policymakers?

That is, were the grand AAAS expectations killed by factors beyond their control, executed poorly and thus unsuccessfully, or doomed from the

64. Talcott Parsons, "Report of the President," *Records of the Academy (American Academy of Arts and Sciences)*, (1968 - 1969), 11; Otis Dudley Duncan, "Developing Social Indicators," *Proceedings of the National Academy of Sciences* 12 (December 1974), 5096-5102; Elmer B. Staats, "Social Indicators and Congressional Needs for Information," *Annals of the American Academy of Political and Social Science* 435 (January 1978): 277-285.

65. Mazlish, op.cit., "Preface," pp. vii-xi.

beginning by the inherent inability of historians and social scientists to create information and package knowledge in a form useful to policymakers?

Did the Committee on Space ever ask itself or NASA, “What sort of product would be most useful to NASA policymakers?” *Railroad*, from a practical or theoretical policy perspective, was useless. There were no conclusions, no lessons learned, no set of bulleted issues to serve as guide points, or any other packaging of information in a useful form.

Similarly surprising was what else did not occur. The AAAS did not convene a conference of historians, social scientists, and NASA policymakers to discuss the book. Indeed, the contributors to *Railroad* never met or coordinated their efforts.⁶⁶ If initiated today, at a minimum, the contributors would hold a workshop to discuss the topic and their plans. After receiving the papers, the planners would then convene a conference with the intended audience, NASA managers, and policymakers. This process of consultation and feedback would ensure greater focus, feedback, and relevance.

To the Committee on Space, the railroad appeared the logical subject to study. As the Fogel essay suggests, would studying other historical analogies, such as exploring and colonizing hostile environments such as the oceans or Arctic have proved more fruitful?⁶⁷ Would studying frontiers—real and imagined—have provided insights valuable to NASA?⁶⁸

Did NASA ask, “What can we learn from history, and what is the best way for historians and social scientists to work together with managers and engineers?” NASA, along with the Department of Defense, is among one of the major government Agencies that uses its history. The History Office at NASA, established in 1959, not only creates and contracts histories but also serves as a source of information for NASA as well as business and the public.⁶⁹

Has NASA learned? In one sense, no. To take a recent example, the 2004 Administrator’s Symposium focused on risk and exploration. In addition to administrators, astronauts, and scientists, the speakers included explorers of the earth and sea—but not one historian or social scientist, even though the NASA History Office provided significant support.⁷⁰

66. Robert Brandfon, interview, January 25, 2008.

67. I am grateful to Peter Stearns for raising this point. See Albert A. Harrison, Yvonne A. Clearwater, and Christopher P. McKay, eds., *From Antarctica to Outer Space: Life in Isolation and Confinement* (New York, NY: Springer-Verlag, 1991) and Jack Stuster, *Bold Endeavors: Lessons from Polar and Space Exploration* (Annapolis, MD: Naval Institute Press, 1996).

68. David F. Noble, *The Religion of Technology. The Divinity of Man and the Spirit of Invention* (New York, NY: Alfred A. Knopf, 1997), 115–141; Howard E. McCurdy, *Space and the American Imagination* (Washington, DC: Smithsonian Institution Press, 1997); Carl Abbott, *Frontiers Past and Future. Science Fiction and the American West* (Lawrence, KS: University Press of Kansas, 2006)

69. Roger D. Launius, “NASA History and the Challenge of Keeping the Contemporary Past,” *Public Historian* 21, 3 (Summer 1999): 63–81.

70. Steven J. Dick and Keith L. Cowing, eds., *Risk and Exploration. Earth, Sea and the Stars*. NASA

In another sense, NASA has learned, but two highly visible disasters were needed in order for the Agency to do so. One result of the 1986 *Challenger* explosion was the superb investigation by sociologist Diane Vaughan, who pinpointed the sociocultural factors that contributed to the Shuttle's loss.⁷¹ Seventeen years later, when *Columbia* disintegrated on reentry, the investigation board had John Logsdon as a member and Dwayne Day as an investigator, while consulting with Henry Lambricht, Roger Launius, and Howard McCurdy—all outstanding scholars of the nation's space efforts.

In addition to preserving and studying the past, the NASA History Office has tried to be accessible to policymakers and managers and to produce products aimed at them. While most of these efforts are reactive (e.g., responding to questions and requests), some are proactive or more than the mere delivery of information. The History Office has held annual conferences, of which this is the third, addressing large themes and trying to reach larger audiences beyond academia.

Attention to history has informed some recent and current policy. The developers of President George W. Bush's Vision for Space Exploration sought historical analysis (and analogies) of the ill-fated Space Exploration Initiative on which to base their work.⁷² In a 2007 presentation on systems of lunar governance, William S. Marshall of the Ames Research Center suggested including "the use of historical checks to prevent society from repeating its mistakes."⁷³

Judged by its ambitious objectives, the AAAS project failed. Institutionally, NASA has no Office of Impact staffed by social scientists and historians earnestly working away to chart and guide the secondary consequences of space exploration and exploitation. Predicting and shaping first-order—let alone second-order—consequences has proven far more challenging than Bauer and his colleagues anticipated, reflecting the problems of applying systems management to that unruly aggregate we call society.

Viewed by discipline, historians and social scientists continue to communicate poorly with policymakers and the public, since most neither know how or care to write or "package" (to use a more jarring but useful word) relevant history for policymakers. Institutional mechanisms for encouraging such efforts are greatly lacking, and I suspect many historians would flee if offered the chance to contribute to the shaping of policy.

Administrator's Symposium. September 26-29, 2004. Naval Postgraduate School. Monterey, California (Washington, DC: NASA, 2005).

71. Diane Vaughan, *The Challenger Launch Decision. Risky Technology, Culture, and Deviance at NASA* (Chicago: University of Chicago Press, 1996).

72. Thor Hogan, "The Space Exploration Initiative: Historical Background and Lessons Learned," Rand PM-1594-0STP (Santa Monica, CA: RAND, September 2003). This was part of Hogan's larger *Mars Wars. The Rise and Fall of the Space Exploration Initiative* (Washington, DC: NASA, August 2007).

73. Padma Tata, "Jury duty on the Moon? <http://www.newscientist.com/blog/space/> October 3, 2007 (downloaded October 8, 2007).

Nor have historians embarked on many future impact studies. Indeed, rarely do historians work in groups or with other disciplines.⁷⁴ When they do, which requires finding funding on a much larger scale than they are accustomed, the best analogy may be that of herding cats. A notable exception is the Tensions of Europe network and research collaboration funded by the European Science Foundation to encourage cooperation among European academics.⁷⁵

Yet history and historical analogies are powerful tools, especially when used well.⁷⁶ Historical understanding, analogy, and questioning can be employed profitably and wisely.⁷⁷ It behooves historians and social scientists to try to accomplish this because we know that if we don't, history will be misused to influence and justify policy. Look at the widely used example of Munich: appeasement is bad, an argument used by supporters of the Vietnam War in the 1960s and the second Iraq war in the 2000s. As Peter Stearns noted in 1981, Munich in 1938 was not Vietnam in 1968. The same is true for Iraq in 2007.⁷⁸

Good history, good analogies, and good guidance are necessary, but they are not enough. What also must be considered is if anyone is listening, not just in NASA but also in the legislative branch and wider public. Organizations like History News Service (<http://www.h-net.org/~hns/index.htm>) and History News Network (<http://hnn.us/>) provide historians with a public forum to address contemporary issues within a historical context. The problem of audience, unfortunately, is not confined to historians and social scientists.⁷⁹ We should think more about our responsibilities as public intellectuals and act accordingly.

We expect leaders and administrators to make errors. We want them, however, to make smart rather than dumb ones. Good history—accurate and aimed at policymakers—can and should help them to avoid dumb errors.

Academics tend to end papers with calls for further research. I shall continue this tradition with two recommendations. First, the history profession and NASA should examine the Department of Defense history programs and the field of military history to learn what the military and military historians are doing right

74. The situation since 1981 has not changed significantly (Peter N. Stearns, "Applied History and Social History," *Journal of Social History* 14, 4 (Summer, 1981): 533-537.

75. Accessed at <http://www.histech.nl/tensions/> (downloaded August 7, 2007).

76. For a fascinating study of how physicists used analogy, see Daniel Kennefick, *Traveling at the Speed of Thought. Einstein and the Quest for Gravitational Waves* (Princeton, NJ: Princeton University Press, 2007).

77. Richard E. Neustadt and Ernest R. May, *Thinking in Time: The Uses of History for Decision Makers* (New York, NY: Free Press, 1986).

78. Peter N. Stearns, "Applied History and Social History," *Journal of Social History* 14, 4 (Summer, 1981): 533. A less used but equally important lesson of Munich is that all the major players should be at the negotiating table. The inclusion of up-and-coming as well as established spacefaring nations in discussions about coordinating future Moon exploration is a good sign that that lesson has been learned.

79. Barbara Kline Pope, "Because Science Matters," *Science*. (June 1, 2007): 1286.

and wrong.⁸⁰ Second, over two decades have passed since Richard E. Neustadt and Ernest R. May published their important *Thinking in Time: The Uses of History for Decision Makers*. It is time to update that classic with lessons for the 21st century.

Let me end by returning to Mazlish's statement that "In short, we are really attempting to set up a new branch of comparative history: the study of comparative or analogous social inventions and their impact on society." Judged by this goal, did he succeed? After all, there is no school of history analogy. But perhaps his words should be thought of as another way of describing the history of technology and of urging historians to expand their theoretical tool chests.

80. For a sense of the extensive military programs and their challenges, see Pat Harahan and Jim Davis, "Historians and the American Military: Past Experiences and Future Expectations," *Public Historian* 5, 3 (Summer 1983): 55-64; Richard H. Kohn, "The Practice of Military History in the U.S. Government: The Department of Defense," *Journal of Military History* 61, 1 (January 1997): 121-147. For specific applications of history, see Andrew J. Bacevich, "Preserving the well-bred horse," *The National Interest* (September 22, 1994): 43-49; Conrad C. Crane, *Avoiding Vietnam: The U.S. Army's Response to Defeat in Southeast Asia* (Carlisle, PA: Army War College, 2002); Brian McAllister Linn, *The Echo of Battle. The Army's Way of War* (Cambridge, MA: Harvard University Press, 2007).