

SECTION V

SOCIAL IMPACT



CHAPTER 20

SPACE HISTORY FROM THE BOTTOM UP: USING SOCIAL HISTORY TO INTERPRET THE SOCIETAL IMPACT OF SPACEFLIGHT

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The methods and concerns of social history, or what is often referred to as The “New Social History,”¹ came to dominate the study of U.S. history during the 1960s and 1970s. To this day, practitioners in the field continue to shape the history curricula at major universities and the content of leading professional journals. Despite the popularity of social history, it has had almost no influence on the practice of space history. Social historians have ignored spaceflight as a topic of study and space historians have looked infrequently to social history for ideas and inspiration. Perhaps the reason for this divide rests on how each field addresses a fundamental methodological question, namely: What activities, events, and individuals are worthy of inclusion in the historical record? Whereas social historians see matters of historical importance in the lives and experiences of ordinary people, space historians, following a tradition established by nineteenth-century Scottish historian Thomas Carlyle, tend to look to the other end of the social ladder for material and inspiration—to the actions and accomplishments of cultural elites.²

Although ordinary people remain bit players in space history, the field has not been a staid backwater of historical analysis. With the emergence in the past two decades of what former NASA chief historian Roger Launius has labeled the

1. The description of the field as “new” is to distinguish it from an older body of social history, often derided as “pots and pans history,” that chronicled domestic practices and local cultural life without paying attention to larger socioeconomic issues, such as the influence of race and gender on the organization of work and social life. Alice Kessler-Harris, “Social History,” in *The New American History*, Eric Foner, ed. (Philadelphia: Temple University Press, 1990), pp. 163–165.

2. For Carlyle’s 1840 lectures on “great man” history, see Thomas Carlyle, with introduction by Michael K. Goldberg, *On Heroes and Hero Worship and the Heroic in History* (Berkeley, CA: University of California Press, 1993).

“New Aerospace History,”³ space historians have moved away from hagiographic approaches that uncritically relate tales of inspirational individuals, revolutionary technologies, and momentous political decisions. The New Aerospace History includes an impressive range of topics, from studies that explore the role of spaceflight in American culture to those that illuminate the broader political, diplomatic, and cultural context in which political leaders have made major decisions regarding federal space policy. The field, nonetheless, remains focused on elites and artifacts.⁴

The central question of this conference—the impact of spaceflight on society—is itself an indication of the gulf separating space history from both social history and mainstream historical practice. The concept of societal impact is problematic to the extent that it is based on an assumption that the influence of spaceflight on society is more worthy of analysis than other conceptualizations of the relationship, such as the influence of society on spaceflight or the mutual shaping of spaceflight and society. By framing the conference with a unidirectional model of historical change (from government to society; from technology to social change), the conference organizers (among whom I was one) unwittingly encouraged presenters to focus on the production end of spaceflight (the accomplishments and products of government space activities) and to ignore the individuals and social groups who ostensibly were “impacted” by space activities. As presented in the program for this conference, society appears as a monolithic, homogenous blob that reacts as a singular entity to new capabilities and ideas generated from federal space activities. Society does not

3. Roger D. Launius, “The Historical Dimension of Space Exploration: Reflections and Possibilities,” *Space Policy* 16 (2000): pp. 23–38. The ideas in this paper fit squarely in the realm of the New Aerospace History. Launius, as well as Margaret A. Weitekamp and Asif A. Siddiqi, have noted the absence of social history ideas in the history of spaceflight and have suggested interesting avenues for filling the gap in the literature. This paper differs from those of Siddiqi, Launius, and Weitekamp primarily in that it focuses almost exclusively on social history and extends the discussion on avenues for future research. Margaret A. Weitekamp, “Critical Theory as a Toolbox: Suggestions for Space History’s Relationship to the History Subdisciplines,” in *Critical Issues in the History of Spaceflight*, Steven J. Dick and Roger D. Launius, eds. (Washington, DC: NASA SP-2006-4702, 2006), pp. 549–572; and Asif A. Siddiqi, “American Space History: Legacies, Questions, and Opportunities for Future Research,” in Dick and Launius, eds., *Critical Issues*, pp. 433–480.

4. Historians who consider the role of spaceflight in popular culture—a topic of recent and growing interest—tend to focus more on the spectacle of space technology and its presentation (in museums, movies, books, television, etc.) than on the spectators. The emphasis on ideas and meaning is welcome, but to the extent that such works substitute the perspectives of spaceflight elites and the culture industry for broader popular sentiments, they serve as a crutch that allows yet another generation of historians to avoid the difficult work of explaining how spaceflight has influenced the material conditions of everyday life. For examples, see the essays in the culture and ideology sections of this volume.

act but is acted upon.⁵ In this context, conference presenters made strong assertions about the influence of space on society with very little, if any, evidence about changes in the lives of ordinary people to support those assertions.

By bringing ordinary people and social groups into our analysis, we can avoid reifying the concept of society and relegating masses of people to passive subjects of historical forces. To assess the role of spaceflight in society, we need to know the extent to which such activities altered work patterns, social practices, value systems, and how people relate to one another. We also need to know whether and how ordinary people resisted, reshaped, and adapted to changes brought on or supported in some way by space-related activities.

This paper suggests possibilities for examining the history of spaceflight through the lens of social history, focusing primarily on the relationship between the national space program and conceptions of status, race, and gender in the context of work, the community, and education. The most basic step for incorporating the concerns of social history into the history of spaceflight is to recognize as viable subjects for historical analysis all individuals and social groups involved in space endeavors regardless of their social standing.⁶ Adopting a social history perspective also requires dispensing with the notion of one-way impacts and instead understanding the space program as a site of human activity in which individuals, social networks, communities, and institutions are all participants in the process of change and in the attribution of meaning to historical changes. A third concept to borrow from social history is the notion that individual and group identities—how we see ourselves

5. Several schools of thought within the historical profession, from both social history and the history of technology, call into question the conceptual foundation of this conference. To historians of technology, for example, the conference theme may appear to have been conceived without consideration of longstanding discussions about technological determinism, the social shaping of technology, and the uneven benefits of new technologies. For a brief introduction to these streams of research, see Donald MacKenzie, *Knowing Machines: Essays on Technical Change* (Cambridge, MA: MIT Press, 1996); Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1983); Merritt Roe Smith and Leo Marx, eds., *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge, MA: MIT Press, 1994); and Wiebe E. Bijker, Thomas P. Hughes, and Trevor J. Pinch, eds., *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge, MA: MIT Press, 1987). Given that historical changes are typically the result of multiple forces, attempting to single out the contributions of spaceflight/NASA to specific changes (whether they are technological, social, political, or economic) may be an exercise in futility. A more coherent and balanced approach would be to reverse the search process—to start with specific changes and then attempt to identify contributing factors, focusing on the relative significance of spaceflight in comparison to the other factors.

6. Peter N. Stearns, "Social History Present and Future," *Journal of Social History* 37/1 (Fall 2003): pp. 9–19.

and how others see us—are social creations that vary across time and place.⁷ With these basic concepts and the literature of social history as a foundation, this paper raises questions for further exploration regarding the role of the space program in creating the conditions for social and economic mobility and providing a forum for the negotiation of social norms and conceptions of race, gender, and status for the millions of Americans who benefited from NASA's educational programs, lived in close proximity to NASA Centers, or worked directly for the Agency or one of its contractors over the past 50 years.

WHAT IS SOCIAL HISTORY AND HOW MIGHT IT CONTRIBUTE TO SPACE HISTORY?

Social history was a product of the 1960s, but not the 1960s the space community knows as the Apollo Era. Tensions over civil rights, gender relations, and an unpopular war in Vietnam inspired historians that entered the profession in the tumultuous decade to focus attention on groups that previously had been on the sidelines of American history, including women, the poor and working classes, and ethnic and racial minorities. Studies of migration, social movements, women, labor, and slavery dominated the field in these early years. As social history expanded, its practitioners borrowed methodologies from other academic disciplines. One group turned to quantitative methods to interpret changes in the material conditions of daily life, while others laid a foundation for cultural history by employing ethnographic techniques to explore the belief systems, rituals, language, and symbolic behavior of discrete communities. The field also broadened its topical scope and provided new insights on a variety of themes in American and world history, including immigration, social movements, demographic changes, education, leisure, ritual, social networks, sexuality, globalization, and consumerism.⁸

Social history has also influenced or bolstered similar trends in other history subdisciplines, including military history, urban history, the history of technology, Holocaust studies, and environmental history. Social history's greatest contribution to the study of history has been its challenge to the assumption that formal politics, wars, and great men alone shape history and are the only subjects worthy of study. From the start, social history was based on the premise that everyday people are worthy subjects of analysis, not for sentimental reasons but because their actions, behaviors, ideas, and experiences contribute to historical change and offer a broader perspective on the past.

7. Barbara Jeanne Fields, "Ideology and Race in American History," in *Region, Race, and Reconstruction: Essays in Honor of C. Vann Woodward*, J. Morgan Kousser and James M. McPherson, eds. (New York: Oxford University Press, 1982); Joan W. Scott, "Gender: A Useful Category of Historical Analysis," *American Historical Review* 91/5 (December 1986): pp. 1053–1075; David R. Roediger, *The Wages of Whiteness: Race and the Making of the American Working Class* (New York: Verso, 1991); and Roger Horowitz, ed., *Boys and Their Toys? Masculinity, Class, and Technology in America* (New York: Routledge, 2001).

8. For a brief overview of the field, see Kessler-Harris, "Social History," pp. 163–184.

The willingness of social historians to experiment with a wide range of methodologies has complemented the field's topical diversity. Over the years, social historians have borrowed freely from other academic disciplines, including anthropology, economics, sociology, psychology, philosophy, and literary studies. Grand narratives of societal change sit comfortably alongside quantitative studies of slavery's effects and thick descriptions of local cultures on the shelves of social historians. While this interdisciplinarity has at times factionalized the field, it is indicative of a pluralist ethos that puts resolving questions about historical change over narrow methodological commitments.⁹

The two greatest weaknesses of social history have been the tendency of some writers to exaggerate the influence of the oppressed on historical change and the unwillingness of a large portion of the field to grapple with politics and political institutions.¹⁰ The tendency to portray minority groups as more influential in social and political change came in response to earlier histories that completely ignored the contributions of such social groups or portrayed them merely as victims. Although individual authors may still exhibit a bias one way or the other, the field as a whole has come to recognize the importance of capturing the contributions of all relevant social actors to political and social change.¹¹ Despite a widely held assumption that social history is allergic to politics, furthermore, the earliest practitioners in the field never intended to abandon formal politics and political institutions completely. Some topics in social history have proven resistant to the incorporation of discussion of politics, but many of the most influential studies have explained changes in the lives of ordinary people within the context of larger political and socioeconomic trends. The best scholarship of the past 20 years, while not always identified explicitly as social history, has explored societal transformations through grand narratives that integrate politics, economics, demographics, and the experiences of ordinary people.¹²

9. Stearns, "Social History Present and Future," pp. 9–12.

10. Ibid., p. 13; Jürgen Kocka, "Losses, Gains and Opportunities: Social History Today," *Journal of Social History* 37/1 (Fall 2003); pp. 21–28; and Nicole Eustace, "When Fish Walk on Land: Social History in a Postmodern World," *Journal of Social History* 37/1 (Fall 2003); pp. 77–91.

11. Social history works that explore groups other than the disenfranchised include Nancy MacLean, *Behind the Mask of Chivalry: The Making of the Second Ku Klux Klan* (New York: Oxford University Press, 1994); James Oakes, *The Ruling Race: A History of American Slaveholders* (New York: Alfred A. Knopf, 1982); and Elaine Tyler May, *Homeward Bound: American Families in the Cold War Era* (New York: Basic Books, Inc., 1988). Among one of the most profound explorations of relationships between social groups is Eugene D. Genovese, *Roll, Jordan, Roll: The World the Slaves Made* (New York: Random House, 1972).

12. Pathbreaking works that explain changes in daily life within the context of larger political and socioeconomic trends include Alice Kessler-Harris, *Out to Work: A History of Wage-Earning Women in the United States* (New York: Oxford University Press, 1982); Kenneth T. Jackson, *Crabgrass Frontier: The Suburbanization of the United States* (New York: Oxford University Press, 1985); May, *Homeward Bound*; Lizabeth Cohen, *Making a New Deal: Industrial Workers in Chicago, 1919–1939* (Cambridge, U.K.: Cambridge University Press, 1990); William Cronon, *Nature's Metropolis, Chicago and the Great West* (New York: W. W. Norton and Company, 1991); and Stephen Kotkin, *Magnetic Mountain: Stalinism as a Civilization* (Berkeley, CA: University of California Press, 1995).

To reiterate, the best of social history is driven by the central concerns of historical practice: understanding causation, change, and continuity, and providing a basis for comparison of similarities and differences across cultures and societies. Social history is also malleable and expansive. Rather than a rigid commitment to a single methodology or theory, social history has been receptive to new approaches. Social history is also expansive in the sense that it attempts to understand the contributions of all relevant actors to the process of historical change, and its practitioners have always had a hunger for new topics (except those related to space history, of course). As with the New Aerospace History, furthermore, the best social history studies are situated within a larger historical and political context.

Rather than a side note in space history, the social history of NASA can be understood as a central element of U.S. history if we discuss it in the context of the federal government's expanded role in science, education, and technological development in the twentieth century, and with reference to the individuals, communities, and social groups that defined their own existence and their ambitions in the shadow of the space program. The mundane aspects of NASA's existence, including its relationship with employees, contractors, grantees, and the communities in which it has facilities, become more central to twentieth-century history when we recognize that they embody the tensions of a capitalist state attempting to retain its superiority over an anti-capitalist foe through technological advance.¹³ Discussing NASA as an arm of an expanded cold war state, rather than as it has defined itself—by its civilian spaceflight mission—allows us to deal more coherently with the Agency's role in society.

With these ideas in mind, this essay will now suggest ways for incorporating the concerns of social history into the history of spaceflight in three contexts: the context of work at the NASA Centers and among space contractors; the context of NASA's educational programs; and the context of the relationship between the Centers and the communities in which they are located.

WORK

Although the topic of work has received a great deal of attention among social historians, studies that explore the labor process in the aerospace industry and the lives of aerospace workers are sparse. We have some sense of the perspectives of aerospace workers through Sylvia Fries's study of Apollo Era engineers, and Howard McCurdy's *Inside NASA* surveys NASA's changing "confederation of cultures" throughout the decades.¹⁴ Some of the Center histories touch upon the social

13. On the political context of the space race, see Walter A. McDougall, . . . *the Heavens and the Earth: A Political History of the Space Age* (New York: Basic Books, 1985).

14. Howard E. McCurdy, *Inside NASA: High Technology and Organizational Change in the U.S. Space Program* (Baltimore, MD: Johns Hopkins University Press, 1993); and Sylvia Fries, *NASA Engineers and the Age of Apollo* (Washington, DC: NASA SP 4104, 1992).

lives of NASA workers and episodes of conflict between workers and managers,¹⁵ but our overall historical knowledge of the experiences of government and space industry workers remains shallow. No significant works in the field of space history explore the daily lives and work environment of the construction workers who built the Centers; the engineers, machinists, and production workers who created the technologies of exploration; the workers involved in assuring safe and continuous space operations; or the individuals at the lowest rungs of the employment ladder.

David Onkst's dissertation, which focuses on the work lives of Grumman engineers, stands alone in dealing with questions of race, ethnicity, and workplace relations in the aerospace industry. It raises a few basic questions that deserve emphasis and should be explored in other settings. For example, what motivated workers involved in the space race? Were they motivated by national objectives, simple financial gain, personal pride, or a commitment to their peers? Onkst finds that the desire to do a good job and to attract positive recognition for themselves, their work unit, and their company, rather than patriotism or competition with the Soviet Union, served as the central motivation for Grumman aerospace engineers.¹⁶

From this starting point, we can ask a whole new set of questions. How did the workplace culture and the approach of managers influence the motivations of workers and how they perceived their contributions to the space race? Were relations between workers and managers paternalistic, fraternal, or conflict-ridden? Did employees and managers share a common perspective on the quality of workplace conditions and the performance of work units? A few Center histories discuss labor conflict at NASA, but mostly in the context of the Apollo era. We have little sense of how management–employee relations have played out over time and among different segments of the workplace.¹⁷

15. Mack R. Herring, *Way Station to Space: A History of the John C. Stennis Space Center* (Washington, DC: NASA SP-4310, 1997), pp. 56–62; and Andrew J. Dunar and Stephen P. Waring, *Power to Explore: A History of Marshall Space Flight Center, 1960–1990* (Washington, DC: NASA SP-4313, 1999), pp. 142–178.

16. David H. Onkst, "The Triumph and the Decline of the 'Squares': Grumman Engineers and Workers in the Apollo Era," working paper for presentation to the Historical Seminar on Contemporary Science and Technology at the National Air and Space Museum, 15 February 2001, in author's possession.

17. Benson and Faherty's brief treatment of conflicts at Cape Canaveral in the 1950s and 1960s between the government and its employees, between craft workers and contractors, and between union and nonunion employees, suggests that a rich labor history of KSC workers remains to be told. Although President Kennedy took measures to prevent the rampant work stoppages that plagued government missile sites in the late 1950s and early 1960s from continuing in the 1960s and infecting the civilian space program, NASA's relations with the construction trade unions remained contentious throughout the building of KSC. Charles D. Benson and William Barnaby Faherty, *Moonport: A History of Apollo Launch Facilities and Operations* (Washington, DC: NASA SP-4204, 1978), pp. 299–308. See also William Barnaby Faherty, *Florida's Space Coast: The Impact of NASA on the Sunshine State* (Gainesville, FL: University Press of Florida, 2002).

Despite the weakness of unions in the space industry, they were not entirely absent. Grumman was somewhat unique in that it successfully prevented unionization through a combination of good compensation and paternalistic labor practices.¹⁸ What techniques and incentives did NASA and other space industry employers use to reduce the attractiveness of unionization? How did unionized corners of the space program differ from nonunionized corners in terms of the conditions of work and the attitudes of workers and managers?

Did workers throughout NASA and the space industry share the sentiments of one Grumman employee who described the company as a “classless work environment?”¹⁹ Benson and Faherty similarly described the atmosphere at the Kennedy Space Center (KSC) as devoid of “snobbishness.”²⁰ What did “classless” mean in the high-tech workplace of the 1960s? Did differences exist across the Centers? Was the sense of classlessness greater at KSC than at the Jet Propulsion Lab (JPL), for example? My sense is that despite such claims, the notion of meritocracy was undergoing a transformation in the post-WWII period. Scientific and technical knowledge replaced pedigree and other forms of knowledge as markers of status.²¹ In this context, how did such meritocratic ideals shape how workers viewed themselves and others? Was a “classless environment” fostered, intentionally or unconsciously, to mute very real differences in power and status? If so, why was a putatively egalitarian rather than a strictly hierarchical atmosphere seemingly more appropriate for the aerospace workplace?

The contention that the technologies and organization of work structure both the workplace and broader social relations has its roots in nineteenth-century philosophy and remains influential in some corners of the historical profession today. In the context of NASA and the space industry, a softer version of the argument is worth considering—that certain production regimes privilege certain types of social

18. Onkst, “The Triumph and the Decline,” pp. 23–28.

19. *Ibid.*, p. 18.

20. Benson and Faherty, *Moonport*, p. 316.

21. On the increased influence of the scientific community and its postwar efforts to strengthen the association between social privilege and scientific and technical knowledge, see Daniel J. Kevles, *The Physicists: The History of a Scientific Community in Modern America* (Cambridge, MA: Harvard University Press, 1971; reprint 1995); Patrick McGrath, *Scientists, Business, and the State, 1890–1960* (Chapel Hill, NC: University of North Carolina Press, 2002); H. L. Nieburg, *In the Name of Science* (Chicago: Quadrangle, 1966; revised edition 1970); and Nicholas Lemann, *The Big Test: The Secret History of the American Meritocracy* (New York: Farrar, Straus and Giroux, 2000).

relations and behaviors within the workplace.²² How did the format of the space complex—batch production, heavy design and testing elements, heavily reliance on networks of contractors and subcontractors, heavy government oversight, etc.—influence relationships between managers and workers?²³ How did employees get around the imperfections and limitations of formalized management and reporting systems? What informal practices facilitated the completion of projects?

According to the historian of technology Eugene Ferguson, engineering education became based more on mathematical modeling in the 1950s and engineering schools stopped teaching design.²⁴ Did trained engineers from the best universities need to go through a process of re-education to learn how to use slide rules when they entered the aerospace workplace, or did the new methods of the engineering schools come to dominate? To what extent did different educational experiences generate conflicts between older and newer generations of engineers? Sylvia Fries's discussion of the reaction of Apollo engineers confirms both the dominance of computing over time and the concerns of older engineers with what might have been lost with the turn to computers.²⁵ In terms of what was lost, Ferguson suggests that the Space Shuttle *Challenger* explosion and the problems the Agency faced with the Hubble space telescope were products of the engineering profession's turn away from older

22. See, for example, Harry Braverman, *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century* (New York: Monthly Review Press, 1974); Allen J. Scott and Michael Storper, *Production, Work, Territory: The Geographical Anatomy of Industrial Capitalism* (Boston: Allen & Unwin, 1986); Nelson Lichtenstein, "Auto Worker Militancy and the Structure of Factory Life, 1937–1955," *Journal of American History* 67/2 (1980): pp. 335–353; Simon Marcson, ed., *Automation, Alienation, and Anomie* (New York: Harper & Row, 1970); and Shoshana Zuboff, *In the Age of the Smart Machine: The Future of Work and Power* (New York: Basic Books, 1988).

23. On the history of batch production and other flexible production formats, see Philip Scranton, *Endless Novelty: Specialty Production and American Industrialization, 1865–1925* (Princeton, NJ: Princeton University Press, 1997); Philip Scranton, *Proprietary Capitalism: The Textile Manufacture at Philadelphia, 1800–1885* (New York: Cambridge University Press, 1983); Philip Scranton, *Figured Tapestry: Production, Markets and Power in Philadelphia Textiles, 1855–1941* (New York: Cambridge University Press, 1989).

24. Eugene S. Ferguson, *Engineering and the Mind's Eye* (Cambridge, MA: The MIT Press, 1992), pp. 153–194.

25. Sylvia Fries, *NASA Engineers and the Age of Apollo* (Washington, DC: NASA SP 4104, 1992), pp. 154–159.

practices, such as visualization and “bottom-up design.”²⁶ Although determining the veracity of such claims should be left to technical experts, historians can contribute to such debates by explaining how changes in techniques and knowledge have shaped relations across generations of NASA engineers.

How did conceptions of status and hierarchy relate to the opportunities for economic mobility that existed in the space complex? Social historians have long been interested in documenting both the reality and the ideology of economic mobility in the United States.²⁷ To what extent did space work create a stepping-stone into the middle class? How important was economic mobility to workers in the space complex? For people who did move from lesser circumstances, what did their newfound status and wealth mean for them? What were the visible signs of their economic mobility? How did they relate to those who had come from better financial circumstances? Did the economically mobile retain ties to their friends and family who were not so fortunate? Finally, to what extent did conceptions of economic mobility, class, and social status change over time among space workers?²⁸

Social historians and labor historians have also studied the lives of workers outside of the workplace.²⁹ Iconic images of risk-taking astronauts and “geeky”

26. Bottom-up design involves the design, testing, and modification of components before stabilizing the design of a technological system. In top-down design (also known as concurrency), all components of a system are designed at once and then tested as an integrated system, which makes identifying problematic components more difficult and fixing them more costly and time-consuming. Ferguson's critique of NASA was based, in part, on the ideas of Richard Feynman. Eugene S. Ferguson, *Engineering and the Mind's Eye* (Cambridge, MA: The MIT Press, 1992), pp. 186–189; and Richard P. Feynman, *What Do You Care What Other People Think?* (New York: W.W. Norton, 1988).

27. Stephan Thernstrom, *Poverty and Progress: Social Mobility in a Nineteenth Century City* (Cambridge, MA: Harvard University Press, 1964); and John Bodnar, *The Transplanted: A History of Immigrants in Urban America* (Bloomington, IN: Indiana University Press, 1985).

28. The theme of economic and social mobility resonates throughout the memoir of Homer Hickam, a former NASA aerospace engineer. The memoir, of course, formed the basis of the popular movie, *October Sky*. Homer Hickam, *Rocket Boys* (New York: Random House, 1998).

29. Historians first began to study leisure as an offshoot of labor history in the 1960s. From studies of working-class cultural traditions, the field expanded to include a diversity of topics, including the role of mass entertainment in the lives of immigrants, the dating and social rituals of working women, African American travel experiences in the Jim Crow era, and the relationship between sports and social identity. See, for example, E. P. Thompson, *The Making of the English Working Class* (New York: Pantheon, 1964); Keith Thomas, “Work and Leisure in Pre-industrial Society,” *Past and Present*, no. 29 (December 1964): pp. 50–66; Roy Rosenzweig, *Eight Hours for What We Will: Workers and Leisure in an Industrial City, 1870–1920* (New York: Cambridge University Press, 1983); Kathy Peiss, *Cheap Amusements: Working Women and Leisure in Turn-of-the-Century New York* (Philadelphia: Temple University Press, 1986); Cohen, *Making a New Deal*; Eliot Gorn, *The Manly Art: Bare-Knuckle Prize Fighting in America* (Ithaca, NY: Cornell University Press, 1986); Gail Bederman, *Manliness and Civilization: A Cultural History of Gender and Race in the United States, 1880–1917* (Chicago: Chicago University Press, 1995); and Cotton Seiler, “So That We as a Race Might Have Something Authentic to Travel By: African American Automobility and Cold-War Liberalism,” *American Quarterly* 58/4 (December 2006): pp. 1091–1117.

engineers notwithstanding,³⁰ we know little about the social lives of the men and women who built and operated the equipment that made spaceflight possible. Few historians who have studied the NASA Centers have provided insight into the social lives of NASA contractors and employees, perhaps considering it a pedestrian topic or fearing intruding too much into the personal lives of individual workers. How did space workers deal with the stresses of work?³¹ Did managers and workers socialize? Was it common for engineers and scientists to intermingle? Did occupational categories factor into socializing? How important were bars or sports in social life? What role did formal and informal rituals play in work and social life? To what extent were sexually integrated or sexually segregated activities important to the social lives of workers? Were class, status, and gender differences muted or accentuated by such activities? How have formal NASA social events differed from informal gatherings among employees? What were the unarticulated rules of engaging in such activities? What were the implications of socializing for workplace camaraderie? Did such activities create a sense of common purposes and positive sentiments toward NASA? Did they serve as a safety valve? Did they help to homogenize social, political, or ethical values?

Historians have begun to explore questions about women and gender in the context of the space program. Yet, as Margaret Weitekamp notes in her excellent essay in the *Critical Issues* volume, much of this literature falls in the realm of compensatory history, adding the stories of women to the historical record rather than contextualizing their stories. Weitekamp's analysis and proscriptions for dealing with gender stand on their own as essential reading for anyone interested in the topic.³² The point that the literature to date on women focuses almost entirely on

30. Roger D. Launius, "Heroes in a Vacuum: The Apollo Astronaut as Cultural Icon," AIAA 2005-702, paper delivered at the 43rd AIAA Aerospace Sciences Meeting and Exhibit, 10-13 January 2005, Reno, Nevada; and M. G. Lord, *Astro Turf: The Private Life of Rocket Science* (New York: Walker & Company, 2005).

31. Bowles provides a few pages on the topic of social outlets at Plum Brook, which included playing music, formal social functions, dances, athletics, games, and practical jokes, some of which were loaded with gendered assumptions. Mark D. Bowles, *Science in Flux: NASA's Nuclear Program at Plum Brook Station, 1955-2005* (Washington, DC: NASA SP-4317, 2006), pp. 188-192. Benson and Faherty discuss the stresses of male engineers at KSC during the Moon race. Although KSC employees enjoyed opportunities for recreation along the Banana River and the waters of the Atlantic Ocean, work life was so consuming that the stresses of work commonly spilled over into the home. The children of space workers, according to a Titusville physician, had unusually high rates of ulcers. Benson and Faherty, *Moonport*, pp. 314-316.

32. Weitekamp, "Critical Theory as a Toolbox," pp. 549-572.

women astronauts deserves emphasis.³³ With the exception of a couple of studies that deal with women engineers, women workers and gender conceptions in the context of work have been ignored almost completely. Sylvia Fries's study of engineers during the Apollo era includes mention of women engineers, as does Sheryll Goecke Powers's short monograph on *Women in Flight Research at Dryden*. From these two works we get a sense of the hurdles that women scientists and engineers faced, as well as the nature of their work and changing opportunities for women within NASA over time.³⁴

M. G. Lord's memoir, *Astro Turf*, is exemplary in its treatment of historically situated gender constructions and could be applied to an analysis of masculinity at the Centers, as Weitekamp suggests. Following Lord's lead, historians could explore changes over time in gender conceptions, as well as differences across the Centers. Conceptions of gender, including topics such as manliness, domesticity, motherhood, and sexuality, deserve a great deal more discussion within the context of the workplace of the NASA Centers and the space industry.³⁵ But we must not allow the discussion of gender and gender conceptions to remain isolated to those at the top of the work pyramid. Women in nonprofessional roles, including secretaries and support staff, deserve to be explored as legitimate historical subjects, as do the men at the lowest rungs of the work hierarchy, such as entry-level technicians and janitors.³⁶

The story of race is similar to that of gender in the sense that we have some sense of the experiences of black astronauts³⁷ and a few of the histories of NASA Centers located in the south mention racial issues, primarily in the context of the civil rights movement and from a broad, top-down perspective. Dunar and Waring's history of Marshall Space Flight Center and Steven Moss's excellent master's thesis on NASA's implementation of federal civil rights policy in the South indicate that the

33. Margaret A. Weitekamp, *Right Stuff, Wrong Sex: America's First Women in Space Program* (Baltimore, MD: Johns Hopkins University Press, 2004); Joseph D. Atkinson, Jr., and Jay M. Shafritz, *The Real Stuff: A History of NASA's Astronaut Recruitment Program* (New York: Praeger, 1985); and Stephanie Nolen, *Promised the Moon: The Untold Story of the First Women in the Space Race* (New York: Four Walls Eight Windows, 2002).

34. Sylvia Fries, *NASA Engineers and the Age of Apollo*; and Sheryll Goecke Powers, *Women in Flight Research at NASA Dryden Flight Research Center from 1946 to 1995*, Monograph in Aerospace History No. 6 (Washington, DC: National Aeronautics and Space Administration, 1997).

35. Weitekamp, "Critical Theory," p. 569; and Lord, *Astro Turf*.

36. For historical work dealing with gender in the workplace, see Horowitz, ed., *Boys and Their Toys?*; Ava Baron, ed., *Word Engendered: Toward a New History of American Labor* (Ithaca, NY: Cornell University Press, 1991); Arwen Mohun, *Steam Laundries: Gender, Technology, and Work in the United States and Great Britain, 1880-1940* (Baltimore, MD: John Hopkins University Press, 1999).

37. See, for example, Joseph D. Atkinson, Jr., and Jay M. Shafritz, *The Real Stuff: A History of NASA's Astronaut Recruitment Program* (New York: Praeger, 1985); J. Alfred Phelps, *They Had a Dream: The Story of African-American Astronauts* (Novato, CA: Presidio, 1994); and James Haskins and Kathleen Benson, *Space Challenger: The Story of Guion Bluford* (Minneapolis, MN: Carolrhoda Books, 1984).

Agency as a whole took a strong stance on equal rights—promoting desegregation among contractors, universities, and local businesses near the centers—but NASA fell short of its goals in recruiting black engineers and skilled workers.³⁸

Without taking anything away from these studies, the literature to date falls short in several respects. First, it focuses exclusively on the South. The struggle for equality and improved work opportunities for African Americans was not confined to the South. Second, it tells little of the post-1960s story. The struggle to integrate the workplace did not end with the first Apollo lunar landing, nor did our habit of seeing ourselves and one another through a racial lens. Third, these studies leave the perspectives and actions of African American workers out of the story entirely. As David Onkst's excellent dissertation chapter on race relations at Grumman on Long Island shows, African American workers and civil rights groups that supported them engaged in a wide variety of confrontational tactics to secure promotions and better-paying jobs. African Americans were not merely passive recipients of the actions of well-intentioned employers.³⁹

Onkst's dissertation points to numerous opportunities for exploring race throughout NASA and among its contractors. In addition to further exploration of conditions in the South, historians might wish to look at changes in job opportunities and conceptions of race across all of the Centers and beyond the 1960s. If the history is not readily apparent, we might wish to search for instances of conflict in lawsuits, complaints from workers filed with the Equal Employment Opportunity Commission, and Congressional hearings. Onkst points out the startling figure of 125,000 cases in the EEOC's case backlog in the 1970s.⁴⁰

In addition to cases of conflict, we need to gain a better sense of the less contentious ways in which minorities created advancement opportunities for themselves and in which the Agency aided their advancement. We know little about how formal groups (i.e., Hispanics in Government, Blacks in Government) and informal social networks have operated to provide career advancement opportunities, a sense of community, and have aided the quest for full workplace equality.

38. Andrew J. Dunar and Stephen P. Waring, *Power to Explore: A History of Marshall Space Flight Center, 1960–1990* (Washington, DC: NASA SP-4313, 1999), pp. 115–135; and Steven L. Moss, "NASA and Racial Equality in the South, 1961–1968," M.S. thesis, Texas Tech University, 1997.

39. David H. Onkst, "David and Goliath? Race Relations at Grumman," working paper, 31 January 2005, in author's possession.

40. *Ibid.*, p. 101.

LOCAL COMMUNITIES

Despite numerous studies of NASA Centers and some solid quantitative data on the local economic impact of NASA Centers,⁴¹ our knowledge of the role of the Centers, their employees, and NASA contractors in those communities remains shallow.⁴² Studies of the Centers focus primarily on activities within their gates. Some do not deal with the surrounding community at all,⁴³ while others deal with it only in a cursory fashion, focusing primarily on quantifiable demographic and economic changes.⁴⁴ One study discusses the NASA's relationship with the local community from the perspective of the Agency—as a problem to be managed rather than a subject to be explored.⁴⁵ Yet a few valiant attempts to explain the role of NASA Centers in generating and resolving local conflicts, and to characterize the contributions of NASA Centers to local communities, raise possibilities for writing the history of NASA from a local or multi-local perspective.

Despite the general lack of interest in understanding the local context of NASA Centers, at least two histories have explored specific conflicts between the NASA Centers and their communities. In *Science in Flux*, Mark Bowles skillfully examines the conflict between the government and local farmers over the World War II War Department's forcible acquisition of the land that would eventually become Plum Brook. Bowles also remains sensitive to the viewpoints of members

41. See, for example, Annie Mary Hartsfield, Mary Alice Griffin, and Charles M. Grigg, *NASA Impact on Brevard County* (Tallahassee, FL: Florida State University, 1966); and Richard J. Keegan, "Economic and Social Impact of the National Space Program," a report of the Stanford-Sloan Program, Graduate School of Business, Stanford University, 1971.

42. Studies that document the social, economic, and demographic patterns of geographically defined areas have been a staple of social history and other related fields, such as sociology and the history of technology, for decades. Works that deal with industrialization and social change provide a foundation for examining the role of NASA and the space community in the socioeconomic transformation of towns and regions. See, for example, Anthony F. C. Wallace, *Rockdale: The Growth of an American Village in the Early Industrial Revolution* (New York: Norton, 1978); Judith A. McGaw, *Most Wonderful Machine: Mechanization and Social Change in Berkshire Paper Making, 1801–1885* (Princeton: Princeton University Press, 1987); David F. Crew, *Town in the Ruhr: A Social History of Bochum, 1860–1914* (New York: Columbia University Press, 1979); John Demos, *A Little Commonwealth: Family Life in Plymouth Colony* (New York: Oxford University Press, 1970); and Philip J. Greven, Jr., *Four Generations: Population, Land, and Family in Colonial Andover, Massachusetts* (Ithaca, NY: Cornell University Press, 1970).

43. Alfred Rosenthal, *Venture into Space: Early Years of Goddard Space Flight Center* (Washington, DC: NASA SP-4301, 1968); Edwin P. Hartmann, *Adventures in Research: A History of Ames Research Center, 1940–1965* (Washington, DC: NASA SP-4302, 1970); and Clayton R. Koppes, *JPL and the American Space Program: A History of the Jet Propulsion Laboratory* (New Haven, CT: Yale University Press, 1982).

44. Benson and Faherty, *Moonport*, pp. 309–313; and Henry C. Dethloff, *Suddenly Tomorrow Came . . . A History of the Johnson Space Center* (Washington, DC: NASA SP-4307, 1993), pp. 257–271.

45. Mack R. Herring, *Way Station to Space: A History of the John C. Stennis Space Center* (Washington, DC: NASA SP-4310, 1997), pp. 27–137.

of the community surrounding Plum Brook who were concerned about living near a nuclear reactor in the 1960s and early 1970s. In *Power to Explore*, Dunar and Waring shed light on the relationship between the Marshall Space Flight Center and the city of Huntsville, Alabama, particularly in regard to civil rights, education, and the local economy. Despite their meticulous research and thoughtful presentation of what some might consider sensitive issues, Dunar and Waring provide only a top-level overview and leave readers with the sense that much more could be written on Marshall's place in the rise of Huntsville as one of the most important small cities in the United States.⁴⁶

Elizabeth Muenger's brief description of the changing relationship between the Ames Research Center and Silicon Valley suggests the possibility of discussing change over time in the character of the relationship between NASA Centers and their communities rather than merely providing snapshots of controversies and collaboration or listing quantitative data on changing demographics and local economic conditions. Muenger explains the shift at Ames from isolation in relation to its surrounding community to stronger public relations after the formation of NASA. Under the National Advisory Committee for Aeronautics (NACA), Ames's leader, Smith J. De France, discouraged employees from interacting in a formal capacity with members of the surrounding community and denied the broader public the privilege to attend triennial open houses. However, in the 1960s Ames became more active in promoting public education through teacher education and prize competitions, providing employment opportunities for local youth, and assisting local, small businesses.⁴⁷

One theme that comes through in some of these studies is an insider/outside divide between employees at the Centers and the local community. Although based on limited evidence, the concept of insider and outsider deserves further consideration. In reality, we know very little about how well NASA employees integrated into the communities they inhabited.⁴⁸ One would expect that they became regular members of the local community in every respect but, at least for the first waves of employees at newly built Centers after the formation of NASA, the question of initial contact is an important one. How did the entrance of highly educated outsiders into the community influence local social and political dynamics? How did local elites deal with sharing influence with newcomers, particularly newcomers who held meritocratic conceptions of status based on educational achievement? Did

46. Mark D. Bowles, *Science in Flux*, pp. 1–34; and Dunar and Waring, *Power to Explore*, pp. 116–130.

47. Elizabeth Muenger, *Searching the Horizon: A History of Ames Research Center, 1940–1976* (Washington, DC: NASA SP-4304, 1985), pp. 183–195.

48. On the movement of outsiders into new communities, see Kotkin, *Magnetic Mountain*; Bodnar, *The Transplanted*; and Clyde and Sally Griffen, *Natives and Newcomers: The Ordering of Opportunity in Mid-Nineteenth Century Poughkeepsie* (Cambridge, MA: Harvard University Press, 1978).

newcomers integrate into existing social institutions, such as churches and social clubs, or did they create their own? Did local residents warmly accept the outsiders, or did conflict exist at the local political level or interpersonal level? What was the basis of such conflicts? Class? Culture? Racial or gender attitudes? How were such conflicts muted? To what extent did outsiders adopt local attitudes? To what extent did they simply grin and bear existing social and racial relations?

Or did the Centers have a significant influence on local perspectives? Did individuals who worked at the Centers, both outsiders and locals, learn anything from working in an environment that promoted equal opportunity that they carried with them to the local community? Did, for example, work at the Centers provide a context for reconfiguring conceptions of race and gender? Did the presence of a large federal employer mute racial antipathy? Did increased social standing in the workplace, for example, translate into increased social power outside of the workplace for African Americans and women? Did NASA employees draw upon their equal status within a federal institution to reshape local institutions and conceptions of race?

Works that hail the local economic impact of NASA Centers have attempted to put a positive spin on the negative consequences of NASA's arrival in new locations. In his study of the Stennis Space Center, for example, Herring includes the perspectives of residents of Hancock County, Mississippi, who were forcibly removed from their properties to make way for the Center. Yet, he adopts the perspective of political leaders in framing the involuntary sacrifices of discontented residents as a necessary step in the path toward progress.⁴⁹ It would be nice to know how the arrival of NASA facilities altered local economic patterns in each community and what the consequences were for native residents. Who, in particular, benefited? Existing elites? The poor? The middle classes? Did the Centers in any sense facilitate the opening up of local communities to broader national or international trade or social networks? Did the local economy become dependent on government largesse or did the NASA Centers facilitate the growth of self-sustaining companies that generated wealth from commercial ventures?⁵⁰ To what extent did the children

49. Herring, *Way Station to Space*, pp. 27–137. Faherty's compact history on the impact of KSC on the Space Coast is well written, well conceived, and filled with excellent statistics and economic data, but it breezes too quickly over topics that would be of interest to social historians. Faherty, *Florida's Space Coast*.

50. In this regard, studies of the communities surrounding the NASA Centers should engage with the literature on high-tech regional development, the growth of western cities, and suburbanization. See, for example, Carl Abbott, *The Metropolitan Frontier: Cities in the Modern American West* (Tucson, AZ: University of Arizona Press, 1993); Annalee Saxenian, *Regional Advantage: Culture and Competition in Silicon Valley and Route 128* (Cambridge, MA: Harvard University Press, 1994); Richard Florida, *Cities and the Creative Class* (New York: Routledge, 2005); and Margaret Pugh O'Mara, *Cities of Knowledge: Cold War Science and the Search for the Next Silicon Valley* (Princeton, NJ: Princeton University Press, 2004).

of locals and newcomers, especially in previously isolated rural locations such as KSC and Stennis, follow similar life paths after graduating from high school? Did locals and outsiders come to share a common destiny and culture?

EDUCATION

NASA's role in the education of millions of Americans is a topic barely examined except in the context of scientific and engineering programs.⁵¹ NASA has a long history of sponsoring education programs for elementary and high school teachers and students, providing grants to universities for research and training, and serving as a site of education through internships, temporary work positions, on-the-job training, and summer fellowships for university professors. A 1988 inventory of education programs listed 59 separate elementary and secondary education programs, 37 university programs, 30 minority outreach programs, 19 employment programs, and 17 public education programs—162 in total. While the combined programs reached millions of teachers and students, most programs supported a more limited number of individuals, often under 100, and a large number, at least at that time, were run out of the Field Centers.⁵² The implications of such activities for economic mobility are significant.

Who benefited from these programs? Can we identify any common patterns in their personal backgrounds? To what extent has NASA served as a conduit for social and economic mobility? In the course of such educational programs, what values unrelated to science and engineering have NASA conveyed? To what extent, for example, have educational programs succeeded in indoctrinating students toward the goals of the space program? How have such values conflicted with or reinforced other values and goals, such as religious values or requirements for diversity? To what extent, furthermore, have educators altered the space curriculum to accommodate competing social values?

One of the early directors of NASA's Educational Programs Division claimed that many of the programs were established in response to external demands.⁵³ This statement raises interesting questions about whether NASA was pulled into

51. One important exception is Virginia Dawson's book on the Lewis Laboratory (now Glenn Research Center) in which she discusses the laboratory's role as a locus of knowledge production and education. Through their research programs, most of the NASA Centers have served an educational function. Virginia P. Dawson, *Engines and Innovation: Lewis Laboratory and American Propulsion Technology* (Washington, DC: National Aeronautics and Space Administration, 1991), pp. 65–123.

52. Education Affairs Division, Office of External Relations, "NASA and the Educational Community: An Inventory of Programs," August 1988 (Washington, DC: NASA, 1988).

53. Aaron P. Seamster, "The Nature of NASA's Educational Programs and Services Office, and its Interest in Science Education," in *Science Education in the Space Age* (Washington, DC: NASA, November 1964), Proceedings of a National Conference conducted at the NASA Western Operations Office, 1–4 June 1964, pp. 19–20.

supporting education for reasons apart from the Agency's mission, or whether internal needs, or even presumed future needs, were the primary impetus for establishing educational programs. While the Space Act contains provisions for the widest practical dissemination of information possible, and NASA has been active in promoting education, to what extent has demand for knowledge, educational materials, and educational opportunities stimulated the Agency's programs? Did the Agency ultimately benefit in cases in which the demand was largely without an identifiable NASA requirement or need? To what extent has the adoption of non-space-related responsibilities contributed to or detracted from the Agency's ability to fulfill its central mission?

Women, minorities, and economically disadvantaged youth have been a focus of many of the educational programs. The only historian that I am aware of who has ventured into this territory is Amy Slaton, who studied the history of one university, Prairie View College in Texas, which received research and graduate training funding through NASA's Historically Black Colleges and Universities program.⁵⁴ Beyond the practical benefits of such programs, both for economic mobility for participants and workforce training and recruitment for NASA, what messages did such programs send to society at large regarding the federal commitment to equality? In what sense did such programs generate loyalty to the Agency? To what extent were such programs inspired by or tailored to local needs and socioeconomic patterns? How have external factors, such as the civil rights and women's rights movements, impinged on both the focus and the content of NASA's educational programs?

CONCLUSION

By whatever name—the Space Age, the Atomic Age, the Information Age—the period from achievement of the first self-sustained nuclear chain reaction on 2 December 1942 to at least the end of the cold war in 1989 represented a cohesive era in American history. Although many in the space community believe that the Apollo 11 landing on the Moon was the single most significant event of the century, we must not forget that the technologies of space exploration—not just the space race itself—were products of the cold war. The post-atomic military imperative to quickly and efficiently deliver nuclear weapons to precise locations spurred the federal government to invest massive sums of money in nuclear technology, rocketry, computers, and materials research. While the specific technological systems that made the Mercury, Gemini, and Apollo missions possible represented spectacular

54. Amy Slaton, "NASA Funding for Historically Black Universities: Diversity in Scale and Scope," paper presented 28 April 2006 at the Fourth Laboratory History Conference at Green College, University of British Columbia, Vancouver, British Columbia.

engineering achievements, the likelihood that the space program would have existed at all without the discovery of the destructive potential of the atom or the military's cold war space requirements is low. Just as significant portions of the technologies of exploration were built upon a foundation of cold war military technologies, so, too, NASA was built largely upon a foundation of military organizations.

Rather than isolated entities, the NASA Centers represented the civilian tip of a vast, interrelated complex of facilities and bases that served the cold war national interest. Social and cultural differences undoubtedly separated the people who worked from the communities that surrounded military bases, intelligence agencies, Department of Energy production and research facilities, and the NASA Centers, as well as the networks of electronics, nuclear, defense, research and development, and aerospace contractors that supported the government programs. We have almost no basis, however, upon which to make generalizations (let alone comparisons) about the social lives and culture of the communities that were most directly shaped by the vast expansion and geographical dispersion of U.S. government activities.⁵⁵ Assumptions of cultural homogeneity should not prevent historians from studying military and space communities as unique cultural formations and considering whether the occupants of those communities represented or diverged from American cultural traditions and how they compare with other elements of American society.

Several generations from now, historians looking back at our time are likely to be just as interested in understanding how Americans of the Space/Atomic Age lived as they will be in understanding our technological achievements and changes in economic, political, and international dynamics. Robust social histories of the cold war and post-cold war may help to guard against the possibility that the cultural productions of the television and movie industry will substitute for actual knowledge of how Americans lived in this era.

55. Notwithstanding the excellent work of historians and geographers on regional transformations as a result of cold war imperatives and Elaine Tyler May's exegesis on cold war families. Abbott, *The Metropolitan Frontier*; Ann R. Markusen, Peter Hall, Sabina Deitrick, and Scott Campbell, *The Rise of the Gunbelt: The Military Remapping of Industrial America* (New York: Oxford University Press, 1991); Bruce J. Schulman, *From Cotton Belt to Sun Belt: Federal Policy, Economic Development, and the Transformation of the South, 1938–1980* (New York: Oxford University Press, 1991); and May, *Homeward Bound*.

