
*The Ethics of Human
Spaceflight—Laurie Zoloth*



Left: Meriwether Lewis. This 1816 aquatint is by William Strickland. Image courtesy of the National Portrait Gallery. Image NPG.76.22.

Right: William Clark. This 1832 oil painting is by George Catlin. Image courtesy of the National Portrait Gallery. Image NPG.71.36.

There is a letter from Meriwether Lewis, struggling with the technology of the new collapsible iron-framed boat he has engineered for his great journey west into the Louisiana Territory. In this, we hear a story so familiar that it startles us. He is about to embark into a land so unknown that the maps are blank beneath his hands. He is inventing a technology that he and his mentor and master engineer President Thomas Jefferson have sketched out on an oak table at Monticello, and he is jerry-rigging, piece by piece, wood for iron. He is looking to hire on men for the journey who will be bold, physically able, and yet composed enough to live together in a small boat in terrifying danger. It is a ship that will fail him utterly in the middle of the journey. In the letter, he anguishes about funding for the project, about the time it is taking to make the boat, and about the way the trip must be timed precisely or postponed for another year. Congress is uneasy about the expenditures, and he must balance his work and his mission—commerce, science, exploration, and foreign policy.

“I visit him every day and endeavor by every means in my power to hasten completion of the work . . .” he says of the ship-builder, and, of the river, its level dropping, he promises “this may impede my progress, but shall not prevent my proceeding, being determined to go forward”¹

Jefferson replies, assuring him of the need for the mission, grounding his encouragement in the hopes that both the academic

1. See, for example, Stephen E. Ambrose, *Undaunted Courage: Meriwether Lewis, Thomas Jefferson, and the Opening of the American West* (New York: Simon and Schuster, 1996), p. 86.

science discovered and the social, agricultural, and entrepreneurial use of the new land justifies the difficulties. He writes of something more—of the intrinsic nature of the quest itself and of the obligations to the frontier borne by societies that encounter it. And while there was much to say then—and much criticism was given by contemporaries like Adams and others—there is still much to say now about the ethics of such an encounter. The arguments, the promises, and the vision that animated that journey are familiar because they are the substance of the vision that has animated much of NASA's efforts.

In this reflection, taken at the fortieth anniversary of NASA's years of space exploration and the 198th anniversary of the summer that Lewis and Clark set out, I want to consider exploration of this sort as a complex moral gesture. In this, I hope to both celebrate forty years of space exploration and to mark the way ahead. Taking this particular gesture against all other possible tasks reflects not only on who we are, and who we intend to become, but also on what we hold in common, as humans, and as Americans.

Like all exploration, space travel is far more than an extended journey; it challenges us to stand like the diarist Lewis before an unknown continent and an unknown territory. That it was profoundly inhabited, alive with others is a part of the paradox that faced him, and of course might well face us, as he could not know, and we cannot know. In this, the journal raises three core philosophical questions: first, of the nature of the human self, and how we are shaped by such an enterprise; second, of the technical process and rules of the task itself; and third,

of the consequences of our moral actions on the world that we enter, and, by mere entrance, alter forever.

This chapter intends to lay out some essential ethics questions that might frame the next step of space exploration. In this, I undertake two sorts of tasks. The first is to respond to the core ethic question: Is it ethical to travel in space? The second, assuming for the moment that I can convince you that the first premise can be justified, is to comment on what ethical challenges will face us there.

It is appropriate to have a philosopher comment on this at the fortieth anniversary celebration, since it was also in 1962 that the National Academy of Science first convened a panel of philosophers to comment on space travel. They asked at that time whether it was indeed a worthwhile pursuit to travel in space and what might be expected of such an effort. What is at stake in any such boundary crossing is how the changing of essential human perimeters changes our own moral status. Will such boundary crossing worsen our human condition, or will it enhance it? In this way, the geopolitical quest is then linked to the quest for ontology, Pisarro hunting for the fountain of youth, for gold, and for territory.

What follows are a series of ethical claims that link the problem of discovery in the larger world and the attendant ethical dilemmas of our explorations, as well as how this exploration alters our concepts of life on Earth. In this, the role of the ethicist is to function as both a skeptic and a stranger, aware of the optimism of science and the pessimism of philosophy.

1. First premises and original claims: Why is it ethical to explore space?

The answer to the question—why space travel—is first ontological. What does the ethical gesture make of us as a society and a species?

A. Moral agency: A critical ethical task will be the transmission of why we have undertaken the work and what it makes of us to do so.

How is space travel a moral activity? Like every gesture we make in the world, the activities themselves will change how we think about ourselves. However, is this itself suggestive of a hubric sense of ourselves? Does the very placing of ourselves at the center of the narrative begin the consideration of the task unjustly? In 1971, Lewis White Beck considered space exploration in his presidential address to the American Philosophical Association. Beck had a skeptical view at first of space travel. For Beck, the problem was our ability to justly and patiently sustain exploration that creates the essential ethical challenges. “[Space travel] is so far beyond human reach that it is not worthwhile discussing at a sober philosophical cocktail party The technology required presents no insurmountable obstacles; what stands in the way of using it is human unimaginative and impatience, and the instability of human civilization.”²

But Beck was incorrect in this assessment. At the fortieth year of our reach, we have a Space Station despite all odds and

2. Lewis White Beck, “Extraterrestrial Intelligent Life,” presidential address delivered before the American Philosophical Association in New York City, 28 December 1971.

instabilities—in fact, a station that represents an elegance and cooperation remarkable in the face of other conflicts, a victory of international imagination. Choosing space travel is a choice for a variety of social practices—it will require us to think about essential questions, and they are framing questions, not only in science, but classically, in ethics. Questions such as:

Are we overreaching our boundaries and human limits?

We will always tell the truth?

What does it mean to be free?

How can we face death nobly?

Will we use resources fairly?

Can we be trustworthy?

What do we owe to one another?

What do we owe to the future we cannot know?

For such questions, surely not new ones, Greek philosophers, such as Aristotle suggested the need to develop habits of character—excellences. One way to think of the answers is to name the virtues called out by such questions: humility, veracity, courage, justice, and fidelity, which I suggest might be the ethical principles of space exploration.

We are shaped not only by such principles but also by narratives and historical arguments, and it is interesting that the problems of space and our relationship to it marked the earliest debates in philosophy, about the relationship of the human to the universe. One of the key arguments begins in the Greek consideration of how we should regard space; are we alone? Lucretius begins by noting that Earth has no privileged position

in the universe, and that, in fact, other places might support life.³ There might be innumerable, plural worlds, which have inhabitants—some like us and some unlike. The argument for our uniqueness is an argument about both limits and nature; are we unique? Are other worlds possible, and what does this make of our self-understandings?

In the Middle Ages, and through the eighteenth century, it was commonplace to understand the universe as an infinitely plural one—the universe was full of life, and humans were not alone. The entire thrust of emerging science, most especially Darwin's work, was a part of this understanding of the relationship of organism, contingency, and environment. Beck's claim is that space travel interests us because it offers a second chance at coming to an unblemished, uncorrupted world, an idea that animated much of eighteenth-century travel as well. The possibility of the great new chance, of new social possibilities for a new land, is a central part of the American vision that allowed Lewis, Clark, and others their optimistic spirit.

B. Is space travel just?

Let us concede that space travel is in fact ethical and perhaps ontologically necessary. But a central question of ethics is not only whether the act is good for us as humans, or is an intrinsic good, but whether space travel is just in both premise

3. See, for example, Whitney J. Oates, ed. *The Stoic and Epicurean Philosophers: The Complete Extant Writings of Epicurus, Epictetus, Lucretius, and Marcus Aurelius* (New York: Random House, 1940), pp. 111–114.

and process. Is space travel worth what it will cost in fiscal and human terms? This ethical problem is the first one about which most Americans and our international partners are concerned. It is the same one that John Adams argued with Jefferson about: Is exploration an unjust and wasteful use of scarce resources, better spent on urgent tasks at home? How can we launch our intricately designed nineteenth-century boats or our twenty-first-century beautiful starships over a landscape of despair, illness, poverty, the closing of hospitals, the need for new elementary schools, over the tensions of war?

For space travel to be just, argue the Europeans, it must attend to principles of justice, which include the principles of vulnerability and of solidarity.⁴ Since such principles include attention to the situation of the disempowered in human societies, and the need to maintain a democratic discourse about resources held in common, and since the assumption is that societies must find purpose in bearing the burden of the vulnerable, ethical space exploration ought to have applications from the science developed therein to human health and social welfare.⁵

Space travel can be justified as fair if direct benefits can be accrued by its undertaking. To a great extent, this can be said to be the case. First, the experience of microgravity has been found to create effects similar to aging in humans. Studies of the molec-

4. European Principles of Bioethics, 2000.

5. A. J. W. Taylor, "Behavioural Science and Outer Space Research," Aerospace Medical Association, Washington, DC, 1989; Jeffrey Davis, "Medical Issues for a Mission to Mars," *Aviation, Space, and Environmental Medicine*, vol. 70, No. 2, February 1999; O. P. Kozerenko, et al. "Some Problems of Group Interaction in Prolonged Space Flights," *HPEE*, April 1999, vol. 4, No. 1, pp. 123–127; Nick Kanos, et al. "Psychosocial Issues in Space: Results from the Shuttle/MIR," *Gravitational and Space Biology Bulletin*, 13 (2) June 2001, p. 35–45.

ular biology of bone loss are an example of this genre of work. Research from the first forty years of space travel is beginning to allow innovative medical research on osteoporosis. Second, gravity is a critical factor in development, sensorial and neurological orientation, and balance. Study of perception, hearing, balance, as well as studies about how neurological development proceeds in microgravity, is also ongoing. Such health-related research clearly will be a strong part of NASA's future duty. Cross-over and dual-use medical research is also at stake, with proposals that would allow the development of electronic-sensing devices. But much of what is valid about basic research is premised on what we cannot know. Support for any genre of research is predicated on this understanding. While it is the case that every protocol that calls for the use of animals as research subjects, for example, insists on a social justification as a part of NASA policy, and, while the intent of research is the betterment of the human (and animal) condition, and the relief of suffering, the reality is that, in true science, we cannot know the results or count on their application prior to the research itself.⁶ Healthcare is only one sort of science that would justify the efforts in space as ethical in this way. Other areas clearly include research on climate change and other Earth science research only accessible from the vantage of space.

6. See, for example, the NASA Ames Standard Animal Policy forms for research protocols, as available on the Internet.

A second major justification for space exploration as a just endeavor is, I would argue, that it makes human society more likely to be free and at peace with one another. The science and engineering that is required and is intrinsic to space travel lends itself well to international cooperation. While it has not been the case necessarily in the past, the future of space exploration is profoundly international in character and is one of the few places where the human species has the opportunity to see itself as a collective community, as Earthlings. Such an interpretation allows a precondition for solidarity. Whether we act on this or whether we do not will be key in the determination of the justice of space travel.

However, the claim that space science is a diversion rests on an idea about science research as entirely instrumental. In this view, science is a zero-sum game, and, if we fund research on space, we will not be funding research on cancer or malaria. This is, I believe, a false distinction. Human subjects are shaped by the interrogation itself, and it is not entirely certain who or what we would be if we turned from the task. We must, in fact, do as we have always done—both the work of discovery, basic science, and the necessary work of compassion. It is the future that asks this of us; it is our children who will ask for the next step. We are needed in advance, by the work of basic science, as much as we may need what will be the insights of basic science to survive. Forty years ago, it was President Kennedy who urged the nation toward space travel, yet the most critical words from Kennedy were not about the Moon. They were about obligation and how obligation creates the American self, about obligations and not

entitlements, asking us “what you can do for your country.” In the era of a larger vision, we might expand this to “ask what you can do for your world.”

3. Second premise: *The ethical problems of process can be met fairly. Is the process and method of space travel ethical? Is it safe?*

a. *“Nothing will ever be attempted if all possible objections must first be overcome.” (Samuel Johnson)*⁷

Hence, if my arguments are correct, space travel is not only ethical, but narrative in character. We send a person to space to bear both the narratives of historical stories and data from the experiments we envision back to us—we expect that the person will also be changed. But this creates ethical problems. First, how will the process of travel shape the person, and how much risk can we expect the person to bear? Let me say that in the consideration of the ethical issues encountered by the process of space travel itself, we are reminded that the nature of experimental science itself—and space exploration is, among other things, a vast human clinical experiment—is a process fraught with human frailty, loss, risk, and error. We forget this at our own peril.

A key consideration will be how we understand the role of the crew and our corresponding obligations to the crew. Are they

7. Gwin J. Kolb, ed. *Rasselas and Other Tales*, vol. XVI of the Yale Edition of the Works of Samuel Johnson (New Haven: Yale University Press, 1990).

understood, principally as human subject in a difficult experiment, as primary investigators in charge of experiments in harsh conditions, as public servants akin to other public servants, with a limited number of workplace rights, but a higher level of duties and risk, as, say, firemen, as soldiers with a duty to explore and defend themselves? Each decision on the role of the crew allows for a different understanding of our duties and their correlative rights to our resources. Space travel, even to Mars, will necessitate an intensity of isolation in a small room, in conditions of weightlessness, for years. The crew will need different relationships to one another and to the machines that they will depend on. Because it is a genre of human experimentation, it must be preceded by animal experimentation, necessitating the humane use of animals in research. Microgravity presents unique and challenging conditions for animal welfare, requiring the coordination, expertise, and consistency of national oversight committees directed entirely toward this effort. NASA is committed to such oversight by a system of well-established mechanisms to review animal and human protocols, Institution Review Boards, and a Flight Animal Care and Use Committee established for this purpose. The IRB and the ACUC are guided in all of their functions by a clear and consistent advocacy for research animals and for the scientific enterprise itself. A clear focus on the issues of spaceflight allows the development of a mature expertise in the development, design, oversight, and reflection upon the science.

But the classic problems of clinical medicine only begin the ethical dilemmas that surround the process of spaceflight. The machine-human interface needed in space creates interesting and

intriguing ethical issues, and the issues that surround the convergence of technologies in nanocomputers, genetics, and artificial intelligence are profound. First, if nanocomputers can be developed, it would be useful to have ways to monitor the crew without undue constraint. If internal monitors are used, how much would we accept monitoring and regulation of crew behavior? Should we allow the monitoring of blood sugar or serotonin? Should the nanochips be set to release medication to lower blood pressure, to alleviate stress? Should sleep perimeters be regulated and sleep enforced by biochemical regulations?

If a machine makes decisions about flight plan or choices about emergency strategic options which could be programmed with accuracy, should the machine be overridden and in what circumstances? When should human judgment guide the mission, and when should computers be allowed to make critical choices? Should we, in the future, select for genetic phenotypes more precisely than is already the case—for, of course, it is accepted that physical traits will be at stake in how crews are selected. Should screening include genetic testing, and should it inform our decisions about leadership? In the future, should we seek to genetically modify humans to make it safer for them to undergo microgravity, in the way medications are used to mitigate the experience, allowing for slower rates of bone loss, for example?

For all such decisions about medical conditions, is informed consent adequate, or is the yearning for the chance at being on the crew so powerful that true informed consent is meaningless, since refusal might well mean losing one's place on the mission? Is the risk of space travel simply an unacceptable risk?

That space travel is dangerous is not unique to other tasks in science. If we understand the crew not as research subjects but as Principle Investigators on a complex science mission, then it is not unlike the risks undertaken by the explorers of Antarctica or volcanologists. Here again we find the historical precedent useful in the careful reflection on that exploration which was a fiercely competitive race to the Pole—not unlike the conditions faced by crews in space. We know the paradox of these conditions.

In an article in *Discover* magazine, the diary of Frederick Cook, Arctic explorer in the nineteenth century, is quoted: “We are as tired of each other’s company as we are of the cold monotony of the black night . . . physically, mentally, and perhaps morally, then, we are depressed, and, from my past experience, I know this depression will increase.”⁸ *Discover* magazine makes the case that the journey is most imperiled by the conditions of enclosure and boredom. Yet the intensity did not always breed despair in the eighteenth century—in many diaries, interestingly enough, the opposite is the case. The closeness and intensity created intensely loyal moral communities, ones where comrades never abandoned the ill, and where, in Meriwether Lewis’ case, the very conditions of the trip, dangerous, challenging, kept him from the suicidal despair that awaited him in the ordinary life when he returned. But in space, the one constant of human

8. Quoted in William Speed Weed, “Can We Go to Mars Without Going Crazy?” *Discover*, May 2001, p. 36.

existence—gravity—will be absent, and for this we have no long-term data. Radiation, fire risk, and the possibility that bacteria and virus grow differently or faster in space are part of the unknowable risks that will be faced. Systems will fail as surely as Meriwether Lewis' collapsible boat failed to float. Finally, like the explorers of that century, the crews in space will be isolated from our world—in contact, after a lag, via virtual connection, but unable to affect events. They will be faced with a wide range of choices about how to negotiate human relationships.

Ethical issues may well arise, as they did for the Arctic explorators when a member became catastrophically ill. Unlike the recent cases of contemporary Antarctic missions, there will be no option for return or for more than simple medical and surgical interventions. Critical illness, accidents, or death may well occur. The usual understanding of bioethics regards the medical subject of research or in clinical medicine as a moral agent with full autonomy. But the conditions of space travel render this concept absurd—there surely will be no completely autonomous decision-making in the space capsules. Each action will deeply and mortally affect the lives of the others.

For such a dilemma, normative guidelines need to be created based on an open, reflective process, one that invites democratic reflection on the events of the journey with a full account of the risks. Lewis and Clark returned home to crowds of citizens along the Mississippi. In fact, their progress was reported as front-page news. This was not only true for the U.S. citizens, but for the Indian nations they passed through—hundreds witnessed the journey. This open, frank, and disclosive model—

the deep sense in the nineteenth century that the quest belonged to each citizen and that the government was each community—marked their journey. It is a model for us.

b. The ethics of encounter.

Of all the ethical considerations that characterized exploration in the eighteenth and nineteenth centuries, the leading one was clearly how to encounter the others that inhabited the terrain—the “empty space” of the Americas, Africa, and Southeast Asia. In the encounter with the native populations, the explorers had to first decide the moral status of these peoples and whether these people had the same sensibilities, duties, and rights as Europeans. Locke, Hobbes, and others sought to understand whether conscience was a feature of native persons.⁹ But the encounter itself was fraught with inequalities. As Jared Diamond notes, the Europeans had access to weaponry, technology, food sources, and healthcare stability (relative to the bacterial and virally naïve populations of the Americas).¹⁰ Encounters across serious differences with life forms we cannot know will be a sterling ethical challenge, both ethically and philosophically. We cannot anticipate the range of possibilities, and much of the speculation is outside the range of ethics and into the range of science-fictional scenarios, which have done a credible job in this realm.

9. John Locke, *The Second Treatise on Government* (Prometheus Books, 1992).

10. Jared Diamond, *Germs, Guns, and Steel: The Fates of Human Societies* (New York: W. W. Norton and Company, 1997).

c. *The ethics of absence.*

A final ethical challenge will be the converse of the issues above. What if we encounter nothing we can detect, merely a vast loneliness, a lack, an absence? This silence will carry its own theological and ethical consequence. Will this be warrant for our species? For how long? What of the idea that we merely are deceived in our perception, that, for example, RNA-based life forms or extremophiles we cannot detect surround us?¹¹

2. *Final considerations about the consequences of our action—Is the telos of space travel ethical?*

We are bound to think of how the moral gesture of space travel affects ourselves; however, taking the idea of plural possible universes seriously means taking not only our right seriously, it means foregrounding our ethical obligations seriously. We will have no way of knowing how we will contaminate other planets, but the Heisenberg principle reminds us that we will alter the other place irrevocably. In our explorations of the past, even with our best intentions, and often without careful reflection, our species has rendered the terrain uninhabitable. Even with the best of intentions, we will carry with us bacteria, DNA, trash, and our own bitter history. What we fear and what we respect will shape our interpretation of what we see. We will step on things, and we will take samples. If we wish to analyze and

11. Beck, pp. 105–107; Ernan McMullin, “Life and Intelligence Far From Earth: Formulating Theological Issues, Extraterrestrial Life and World View,” pp. 151–173; S. J. Dick, *Plurality of Worlds* (Cambridge: Cambridge University Press, 1982); *Star Trek*, the series.

understand such samples, we will take them back, or we may do so inadvertently, which may of course introduce into our world similar contaminants, yet another ethical dilemma.

In thinking about this problem, I asked my children for their thoughts, since, after all, it was more their problem than mine. My nine-year-old was careful to consider this matter, yet understood it not as a matter of interest, but of obligation. “What if,” he asked me, “we are needed? What if we are supposed to explore space for some reason that we do not know about?”

Indeed. It is a part of our hubris to imagine we are alone, but another error to imagine we might turn away from the task. Can it be said that humans have an obligation to explore, not only because of our needs, but because we might be needed?

Unlike the optimistic Jefferson, content to civilize and garden after centuries of conflict, we fear that we will spoil a fragile nature, or we will be unable to tame it. Jefferson and his generation saw what they could bring to the new terrain; they were called by what they understood as its unfinished nature. Our view of space reflects this struggle to define its ends. Is nature pristine, is it normative, good as it stands, or can it be used, understood, charted, even altered, a place to repair in the sense of making it habitable, the classic work of civilization and cultivation itself?

We carry the disturbing human tendency to contaminate to be sure, but we also carry ideas of justice, democracy, and human imagination. We can be aware of all that we bring, including a crew, how it functions, and of our commitments to diversity and freedom.

Premises and considerations for reflection:

In previous work to justify animal research in space, NASA created a policy for the ethical treatment of animals called The Sundowner Principles.¹² The underlying values that emerged from the discourse that surround the creation of these principles are useful for a consideration of what undergirds space science in general and which might guide the near future of space exploration—respect for life and welfare of subjects, the integrity of science, the search for social good, which implies a value of solidarity with the peoples of Earth, and a broad notion of public accountability for both the science and the ethical priorities in space. Such considerations ought to guide how we consider the difficult choices we must make to explore space.

The considerations:

1. Welfare and excellence of care of all of the crew and animal subjects under the control of the Agency is the first priority of each and every project design. Research subjects deserve our special consideration for two reasons: the first on the grounds of essential ecological and moral concerns, such as nonmaleficence and basic stewardship of the vulnerable, and the second on the grounds of research respect for all subjects. Nonmaleficence guides every intervention in research whenever we are asking to study the behaviors and bodies of subjects, and thus we need to care for their welfare in all respects. Since space-

12. Joseph Beiletiski and Laurie Zoloth, "The Sundowner Principles: Ethical Treatment and Ethical Norms in Animal Experimentation," speech to the American Society for Bioethics and Humanities, Philadelphia, 2000. See also Sundowner Principles, NACUC NASA protocols and forms, for example Ames Space Center.

flight creates unique and unknown stress, it is rational to ask for a higher level of scrutiny. The increased level of trust demanded means that we have a particular duty to advocate for human and animal subjects in the design and review of projects.

2. Scientific endeavors shape the perimeters of all of the work. NASA projects are guided by several rationale, but the experiment of space travel is one in which we maintain research equipoise and which crew are both explorers and research subjects in conditions that may well afford society with knowledge about physiology that creates benefits on Earth that create a competing moral appeal in the consideration of the potential for burdens in the research design.

It is the science that motivates the goals of the work. Good science cannot occur if the subjects are compromised, but, if there cannot be valid scientific experiments, then a critical purpose of space travel is lost. Much of the work of space science is directed toward the creation, manipulation, and mastery of the new terrain. Every aspect of space habitat, medicine, long- and short-term effects of altered gravity, of radiation, or other challenges will need both animal testing and human crew if this project of survival and mastery of the environment is to continue. It is the science that justifies the resource expenditures and allows for the safe exploration of space to proceed in the most intelligent and thoughtful way.

3. Space science and flight is unique in many ways. One of the significant ways that it is important is that space research is large, visible, and very publicly funded. However, unlike the many other large and publicly funded projects, the public has

historically engaged as an open and enthusiastic witness of the space exploration aspects of the endeavor. Space research is not simply research on unknown environments, or unknown questions—it is exploration of unknown physical territory and, hence, draws on the oldest American imperatives. Since 1802, with the publicly funded project to explore the Louisiana Purchase, Americans have expected all such research to be democratically debated, widely published, and publicly accountable. Lewis and Clark published their letters, including letters to their families, in national newspapers, and NASA faces a level of interest and stake holding that is precisely similar and it is appropriate, however difficult, and, in this way, the crew are also public servants. Space is a part of what we hold in common, our common stock in our future, and, hence, it is fundamentally shared and a matter of public discourse.¹³ This is appropriate—it is how Americans expect exploration to be carried out in a democracy, an idea as old as the idea of democracy itself, from the Greeks—humility, veracity, courage, justice, and fidelity.

4. The discourse needs to be joined about how to make space free. By this I mean free in the oldest sense—of liberation from the narrow place of restraint and domination to the large arena of human possibilities that is bounded by a new sense of social order, by the reality of human community, and the need

13. See, for example Michael Walzer, *Spheres of Justice: A Defense of Pluralism and Equality* (Basic Books, 1990) or John Rawls, *A Theory of Justice* (Cambridge, MA: Harvard University Press, 1999).

for justice. It is the Biblical metaphor of liberation from the slavery of Pharaoh's Egypt, "the narrow place" to responsibilities of the exilic journey, and it is familiar and recurrent. Such a sense of a liberatory, possible, risky, and burdened journey mediated the consciousness of the American endeavor from the beginning of the American experiment. We were not merely restless, or curious, or grumpy, or cramped, we were out for justice, and for the New Israel, for the City on the Hill. How can space remain free in this way? It is a question at stake in the news of the week as we celebrate the fortieth anniversary of space travel—will space be linked to an arms race? Will space be for sale, open for expensive tourism? Can space exploration be a multinational project? How can we negotiate such difficult and contentious issues? Are we fully committed to a model that in foregrounding science allows for the collaboration competition at the heart of science?

5. The exploration must be protective of our planet and our universe. To be an ethical enterprise, the ecological aspects of the journey must be rendered with the utmost care. Reciprocity must undergird the scientific impulse, and humility, with the limits of our wisdom and the power of our reach, must temper all aspects of the task.

I think this is possible, which of course renders space travel a moral enterprise. It is also an "authentic creation," which, as Albert Camus believed, was our central legacy—creations are authentic if they will exist after us. How does a society look forward and assess what might be left behind? It often does so by looking historically at other points of decision, where multigenerational tasks are self-consciously begun.

Considering the debates about our moral duties toward such tasks in the first year of the second century of the common era, 2001, it is worth remembering the arguments of Rabbi Tarfon, of the beginning of the first. Tarfon is asked about the permissibility of turning away from a task that one cannot possibly hope to complete personally. Can one stop work on projects that we understand we cannot complete—intergenerational tasks, construction, world repair, or, ultimately, justice itself? He reminds us that the task is without measure, and it can never be finished, but neither can we turn away. The work is not ours to finish, but the work is not ours to ever refuse to begin.¹⁴

14. *Perkei Avot*, 2:20–2:21.