

BOOKS

An Inflection Point for Space

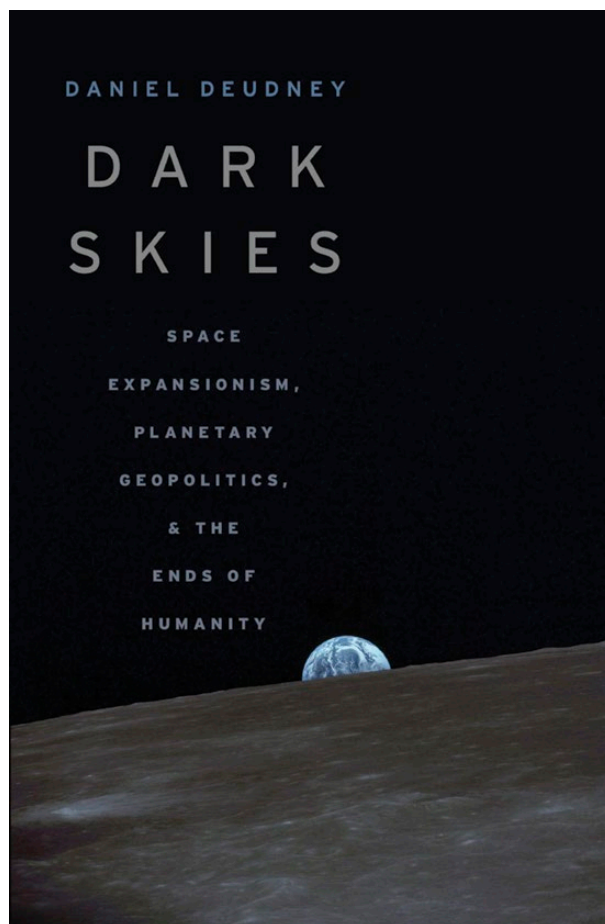
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In December 2021, China accused SpaceX, the private aerospace company founded by Elon Musk, of flying two of its Starlink satellites unacceptably close to China's space station in July and October of that year. Musk's Starlink program, along with a similar initiative by Amazon founder Jeff Bezos, plans to launch thousands of satellites over the next few years to create "megaconstellations" (as these satellite networks are called) to provide space-based broadband. It is just one of many ambitious projects to expand human activities in space.

What could go wrong?

For one, the potential for collisions and confrontations will grow exponentially. No universally agreed and enforced traffic rules or best practices exist for space operators, nor do widely accessible and up-to-date data on space traffic exist, nor are there clear methods for assigning liability that could motivate more careful behavior in space.

One month after the second Starlink close call, Russia prompted international outrage by test-attacking one of its own disused satellites in low Earth orbit, creating at least 1,500 pieces of debris that will threaten spacecraft for years to come. It is becoming difficult to say which is



Dark Skies: Space Expansionism, Planetary Geopolitics, and the Ends of Humanity

By Daniel Deudney. New York, NY: Oxford University Press, 2020, 464 pp.

more dangerous to international well-being, corporate or military quests for untrammelled advantage in space.

Daniel Deudney finished writing his magisterial book, *Dark Skies*, before these recent events, but he clearly saw them coming. With

impressive erudition, acuity, and occasionally poetic expression, Deudney, a professor of political science and international relations at Johns Hopkins University, fully assesses "the overall consequences of both accomplished and anticipated space projects." The intensity and accuracy of his assessment rectify the imbalanced credulity of most treatments of the human space enterprise.

Noting that most of the players are interested in space for power, prestige, money, and—less often—for scientific understanding, Deudney learnedly describes the many visions that have animated space expansionists. Some of them hope that projecting into space will help correct problems humanity has made on Earth; others see space as a way to escape those problems. But few space expansionists recognize the extent to which terrestrial well-being depends

on establishing and enforcing rules to make activity in space sustainable and secure. If accidents or conflicts produce cascading amounts of space debris and collisions, there will be no salvation in and through space—only a repeat of the problems that bedevil Earth now.

Earth improvers want to put assets in space to help people surveil the globe for environmental or military threats, or both. They see in space the possibility of benignly countering these threats, including deliberately

minimizing the warming effects of greenhouse gas emissions through geoengineering. They imagine energy collection and metal mining from space to attenuate shortages on Earth. “If there are limits to growth on Earth,” Deudney summarizes, “then moving into space and tapping its unlimited resources allows growth to proceed without limits.” The more militant advocates seek domination (in the name of national self-defense) through space-based reconnaissance platforms, surveillance and communication systems, and offensive and defensive weapons.

Earth escapists, on the other hand, seem most excited about building off-planet colonies or civilizations, often imagined on Mars. Some escapists see this as “a vital step toward the immortality of the human species and Earth-originated life,” writes Deudney: “the indispensable stairway to heaven.”

Yet for all the enthusiasm of space expansionists, their projects have proceeded slowly since the 1950s. Deudney thinks humanity has now arrived at an inflection point when projection into space will take off. The United States, China, and Russia, among other nations, see space as a route to military victory—or at least a way to prevent their adversaries from achieving it—while billionaire entrepreneurs see space as the next internet, providing first-mover opportunities for riches.

Is this sudden flowering of space programs good news? The space expansionists certainly think so. But, Deudney notes, “it is remarkable—and disturbing—how little critical scrutiny these projects and their rationales have received.”

Freeman Dyson issued what should be the obvious warning: “When mankind moves out from the Earth into space, we carry our problems with us.” The United States and China—competing for wealth,

power, and deference on Earth—are projecting their competition into space. Russia, now a rogue actor on the international stage after its invasion of Ukraine, is threatening to trash space if its interests are not respected.

That military action in and through space poses an obvious threat should not be surprising. The largest space expenditures and activities to date have been military, starting with the US-Soviet nuclear arms race and progressing to today’s all-purpose surveillance, warning, command, control, and communication satellites of the major powers. A Pentagon official recently told me that US-China attacks on each other’s space assets during an initially conventional war are the most likely catalysts for nuclear war.

“Because important parts of the planet’s information infrastructure are located in orbital space,” Deudney warns, “potential space wars will be occurring not at some distant frontier but in what amounts to the utility room of our crowded planetary apartment building.” But strangely, “the question of whether large-scale violence is likely to accompany movement into solar space has not been given much consideration by those who view this expansion as the ultimate goal of the space enterprise.”

This critique applies to the intellectual visionaries of space expansionism as well as the commanders of today’s space forces in the United States, Russia, and China. Each national space command fails to explain how it will prevent its competitors from taking countermeasures to deny them dominance. Each country fails to adequately recognize that some form of rules, limits, or confidence-building measures will be needed to prevent lose-lose instabilities in the systems.

The nonmilitary expansionist

project of building space colonies also deserves more scrutiny. If humans continuously “wreck the immensely diverse and vastly ancient ecosystems on Earth,” Deudney asks, “is it really plausible to think that humanity can ex nihilo create and sustain flourishing habitats on Mars”? If a fundamental driver of environmental despoilation is the tendency of political-economic units to “externalize” these costs, what reason is there to think today’s entrepreneurs and governments will also not externalize the risks their activities in space pose to that environment and to others who might wish to utilize it?

Nor are economic inequalities likely to be attenuated. Given the track records of the countries and individuals leading the projection of business and military competition into space, there is little reason to think that space-based economic activity such as mineral mining would temper the inequality, dislocations, and other ills that afflict human societies today.

Despite this powerful critique of many space activities to date, Deudney is not thoroughly opposed to human projects in space. *Dark Skies* promotes an “Earth-centered pro-space agenda focused on nuclear security and environmental protection. This agenda aims to protect the Earth rather than expand into space.” Deudney writes that “for the foreseeable future, our best strategy is to stay home; bring our planet into better order; survival-steer through the nuclear, climate, cyber, bio, and nano revolutions; and leave distant generations a firm base to grapple with problems and possibilities we can only dimly imagine.”

To do this will require self-restraint—not something billionaires or governments are known for. As with air traffic rules for planes, emission controls on cars, and

other national and international regulations, humanity will need restraints to make expansion into space sustainable over generations. These restraints must be negotiated—or otherwise enforced—by competing political and economic entities. It is difficult to be optimistic.

Nevertheless, Deudney makes recommendations that deserve serious consideration. They include both giving up current space projects that he deems unfeasible or dangerous, and advancing programs that he believes will benefit life on Earth.

For starters, Deudney recommends the “complete dismantlement of ballistic missiles for the delivery of nuclear weapons”—a laudable goal, even if he ignores that increasingly these missiles are designed to carry conventional rather than nuclear warheads. He also advocates for the prevention of “development and deployment of orbiting weapons designed to attack objects in orbital space.” These objectives would extend the logic and accomplishments of nuclear arms control, which Deudney considers “the most successful actual space program in terms of contributing to the reduction of catastrophic and existential risks.” Here I think he is half right: arms control is necessary to make adversaries more transparent and predictable to each other, to reduce or limit destabilizing technologies and strategies, and to create incentives to spare noncombatants. What is missing, though, is an appreciation for how nuclear deterrence also may have reduced conflict among major powers. Nuclear deterrence is precarious, but when it works, it is an exceptionally powerful restraint.

Another recommendation is to relinquish “the construction of large infrastructures in Earth orbital space.” According to Deudney, there is no reason to think they would solve terrestrial energy and environmental

problems in economically viable ways. And it is naïve to think that infrastructure of the scale necessary to solve such problems would be deployed in space and secured over time, he argues, without a “highly hierarchical world state that would itself be a catastrophic outcome of historically unprecedented magnitude.”

Deudney is also opposed to colonizing Mars and other celestial bodies. “The best way to think about a colony on Mars,” Deudney writes, “is the way we think about the first cancer cell that appears in a human body.... Its peril lies in what it will become once it has started its path of growth.” Deudney does not adequately spell it out, but he seems to assume that as space colonies grew into their own identities, they and their Earthly antecedent would fall into conflict. The history of human colonialism does not set a precedent for propitious and peaceful space expansionism.

Turning to positive recommendations, Deudney urges enhanced use of orbital platforms to observe, monitor, and better diagnose and treat the sources of natural and anthropogenic threats on Earth. Similarly, he urges more cooperative scientific endeavors throughout the solar system—not to facilitate colonization, but to generate the knowledge, insight, fascination, and existential perspective that add value to life on Earth.

Another globally cooperative space program would be to divert potentially dangerous asteroids from hitting Earth. Deudney envisions that the big space powers could conduct a joint venture to monitor and develop capacities to divert asteroids—verifiably agreeing not to unilaterally build or deploy such capabilities, which could be dangerously useful in Earth conflicts. Such a cooperative pursuit

of planetary defense could temper interstate rivalry while mitigating a general threat to the human species.

More ambitiously, Deudney wants to preserve and strengthen the provisions of the 1967 Outer Space Treaty. The treaty’s spirit of sustaining the space environment for the benefit of all nations over time remains vital even as it is increasingly threatened by activities and technologies that its drafters could not envision. Geopolitics is now multipolar, not bipolar. Commercial actors can now develop and deploy assets in space, once the exclusive domain of just a few governments. Some of these new actors are less respectful of the needs for caution, restraint, rules, and international cooperation than the originators of the Outer Space Treaty. It will take sustained political effort by major powers, medium powers, international civil society, and competing corporations to update the terms of sustainable human activity in space.

To make expansion into space a boon for human development, sustainability, and peace is an extremely tall order: humans don’t have precedents for the necessary political-economic conditions. It takes a scholar with Deudney’s extensive knowledge of history and technology to warn of the dangers and recommend a better approach to achieving humanity’s ambitions in space, which I can only hope will be widely read. Deudney reminds me of Cassandra in Greek mythology: she was not wrong, she was ignored.

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