

## Commentary

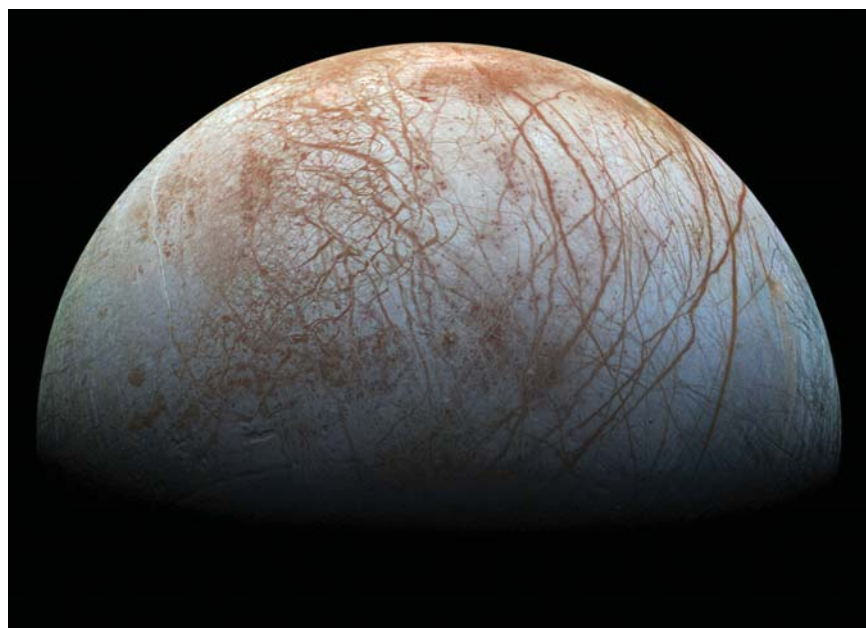
# Beyond the decadal surveys: Establishing policy for US space science

Even though the US government's fiscal year 2020 budget is subject to a continuing resolution through at least late November that keeps federal spending at FY 2019 levels, the annual budget process is well underway. Federal agencies are putting the finishing touches on their FY 2021 requests, which then go through negotiation with the Office of Management and Budget (OMB) before delivery to Congress in February.

Many in the space science community are aware of the budget process. However, having spent roughly a decade working in space policy, primarily in planetary science, I have often encountered a disconnect between space scientists' understanding of how policy is formed and of the activities that affect budgets in their field.

Since 2005 Congress has instructed NASA to use the decadal surveys from the National Academies of Sciences, Engineering, and Medicine in determining what missions it selects. Many in the space science community assume that the surveys are binding. In fact, Congress and the executive branch view the decadal surveys as a particularly useful tool for two reasons: First, they are a tangible indication that the space science community is cohesive; second, the community has done the work to enumerate its priorities by vetting options, eliminating those of lesser science value, and prioritizing those viewed as central to progress. There are, however, additional factors affecting the decision-making process.

The relationship between federal agencies and the OMB can seem fairly opaque. I have often heard frustrations—even from individuals high in NASA's chain of command—about the onerous and seemingly arbitrary funding limits imposed by the small group of OMB bureaucrats. Those frustrations are not always unwarranted, but I have found that the motivations behind the office's deci-



**JUPITER'S MOON EUROPA** has received attention in recent federal budgeting. A series of flybys has received the go-ahead for its next step. But a mission to place a lander on Europa's surface has been scrubbed, in part because its major champion in Congress, Representative John Culberson (R-TX), lost his seat. (NASA/JPL-Caltech/SETI Institute.)

sions, at least toward space science, can often be misconstrued. Part of the executive branch, the OMB is charged with ensuring that the entire federal budget request complies with the president's policy directives. In most administrations, the OMB works closely with the Office of Science and Technology Policy to establish policies and budget priorities for science, though that isn't always the case and generally reflects the administration's views on science as a means to further its broader policy goals.

A surprisingly small number of individuals at the OMB are involved in space science: the director of the OMB and the associate director for natural resource programs, both of whom are political appointees; the deputy associate director for the energy, science, and water division; and the fewer than 10 individuals

who make up the division's science and space branch. Space science is, for the most part, handled by just a few career civil servants.

I've not come across anyone in Congress or the executive branch who simply did not want to fund space-science missions. I have, however, encountered government officials who are vividly frustrated with cost overruns, and I have found that bureaucrats tend to value flexibility. The folks I met at the OMB and on Capitol Hill were sensitive to unforeseen occurrences or prescriptive options that placed undue limits on future actions, particularly if they interfered with agreed-on courses of action or involved a time frame beyond which policies—or politicians—might experience turnover.

Such considerations certainly affected the 2012 decision to end NASA's Mars

Astrobiology Explorer-Cacher (MAX-C) rover project. Although it was included in the 2013–22 planetary science decadal survey and aligned with the Obama administration’s goal of increasing participation in international space science, MAX-C came on the heels of cost overruns on the *Curiosity* rover and the *James Webb Space Telescope* (JWST) and was intended as the first of three large-scale missions to return samples from the surface of Mars.

OMB leadership and staff sought to avoid having NASA embark on a new large-scale project while still covering cost overruns for the JWST. They were also concerned that agreeing to fund three large missions over a decade or more posed too tight a constraint on other projects during that period. In the end, the OMB would not allow NASA to start the MAX-C project, and NASA’s potential participation in the European Space Agency’s ExoMars program was reduced to providing a communications instrument on ESA’s *Trace Gas Orbiter*.

As with the OMB, the number of people in Congress involved in space science is limited. Between the two authorization subcommittees—the space and aeronautics subcommittee of the House Committee on Science, Space, and Technology and the aviation and space subcommittee of the Senate Committee on Commerce, Science, and Transportation—fewer than 30 members of Congress deal directly with space science policy. On each chamber’s Commerce, Justice, Science, and Related Agencies (CJS) appropriations subcommittee, the number is similar. The chairs of those congressional committees and subcommittees wield significant power; they control the agenda of their respective groups and direct a majority of the staffs, generally 7–10 for committees and 2–6 for subcommittees, with a smaller contingent reporting to the ranking member. Regardless of the support an issue may have, the chair determines whether legislation on it will move forward.

In the 2017–18 Congress, House CJS chair John Culberson (R-TX) provided funding for two projects that NASA had not included in its budget requests: a multiple flyby and a lander mission to the Jovian moon Europa. The planetary decadal survey listed the flyby as the

second priority among large-scale projects behind a mission to Mars and recommended further study for the lander mission. Nevertheless, Culberson was able to appropriate more than \$1.2 billion over six years for the two.

When Culberson lost his seat in the 2018 election, the Europa missions lost a powerful advocate. His support had been particularly idiosyncratic in that the missions had no direct ties to his district; he simply believed that the science was of benefit to the nation. The multiple-flyby mission, now called Europa Clipper, survived due in part to its being included as a second-tier option in the decadal survey and in part to its being far enough along in its development cycle that NASA had “confirmed” it, meaning that officials had signed an agreement with Congress establishing the mission’s cost, schedule, and technical milestones.

The lander project was less fortunate. Without support from its influential patron or the decadal survey, the project is in limbo, with enough funding to continue low-level studies but not enough to begin building the spacecraft. Robust policies tend to benefit from strong coalitions of stakeholders with varying interests, and the lander’s supporters may have been overly reliant on a single individual.

None of the handful of people in Congress or at the OMB who deal with space science—or even with NASA—do so exclusively. They view NASA as part of a portfolio of responsibilities they must balance, and they receive finite resources to do so. They invariably require justification for budget requests. On many occasions I have encountered individuals or groups asking Congress to increase NASA’s budget by some percentage or dollar amount, or by “adding a penny of every dollar of tax revenue” to the space agency’s top line. The inevitable response from congressional or OMB staff is, “For what purpose?” They are not asking for grand philosophical answers or “imagine what we could do” rhetoric. They are looking for hard analysis on the projected cost of a program or mission, for evidence of agreement on its necessity from the relevant expert community, and for justification for choosing that investment over others. Pie-in-the-sky wish lists or attempts to bypass a consensus-

building process leave government stakeholders without justification to present to their constituencies for expending tax dollars.

Another disconnect between science communities and policy is temporal. The federal government operates on a different time scale than the “march of science.” The current and next fiscal years are the glaring priorities, and anything beyond a two-year time frame is an abstraction. That is a function of the political cycle, and it can be maddening to scientists with projects that can last a decade or more. Such is the price of relying on taxpayer funding in a representational democracy.

In years to come, space science will encounter growing budget competition from expenses related to climate change, an aging population, growing national debt levels, deteriorating infrastructure, and other issues that will increasingly demand government attention. Rather than trying to impart to lawmakers and bureaucrats the values important to the space science community, perhaps the community will be better served by evaluating the pressures to which policymakers respond and finding ways to describe how space science already contributes to congressional, executive, and broader national objectives, such as economic growth, international relations, education, workforce sustainability, and national security.

Each decadal survey includes sections describing the scientific field’s contributions to the nation, but the information is often qualitative rather than quantitative. Detailed workforce information, economic impact analyses, student and graduate data, and other, non-science information that chronicles the many ways in which space science supports broader priorities could be included not only in decadal surveys but also in mission descriptions and other public documents. Scientists should also communicate regularly with their political representatives to discuss the value of their work. As a Senate committee staffer once told me, “If you show up in my office the day your budget is cut, you’re a year too late.”

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