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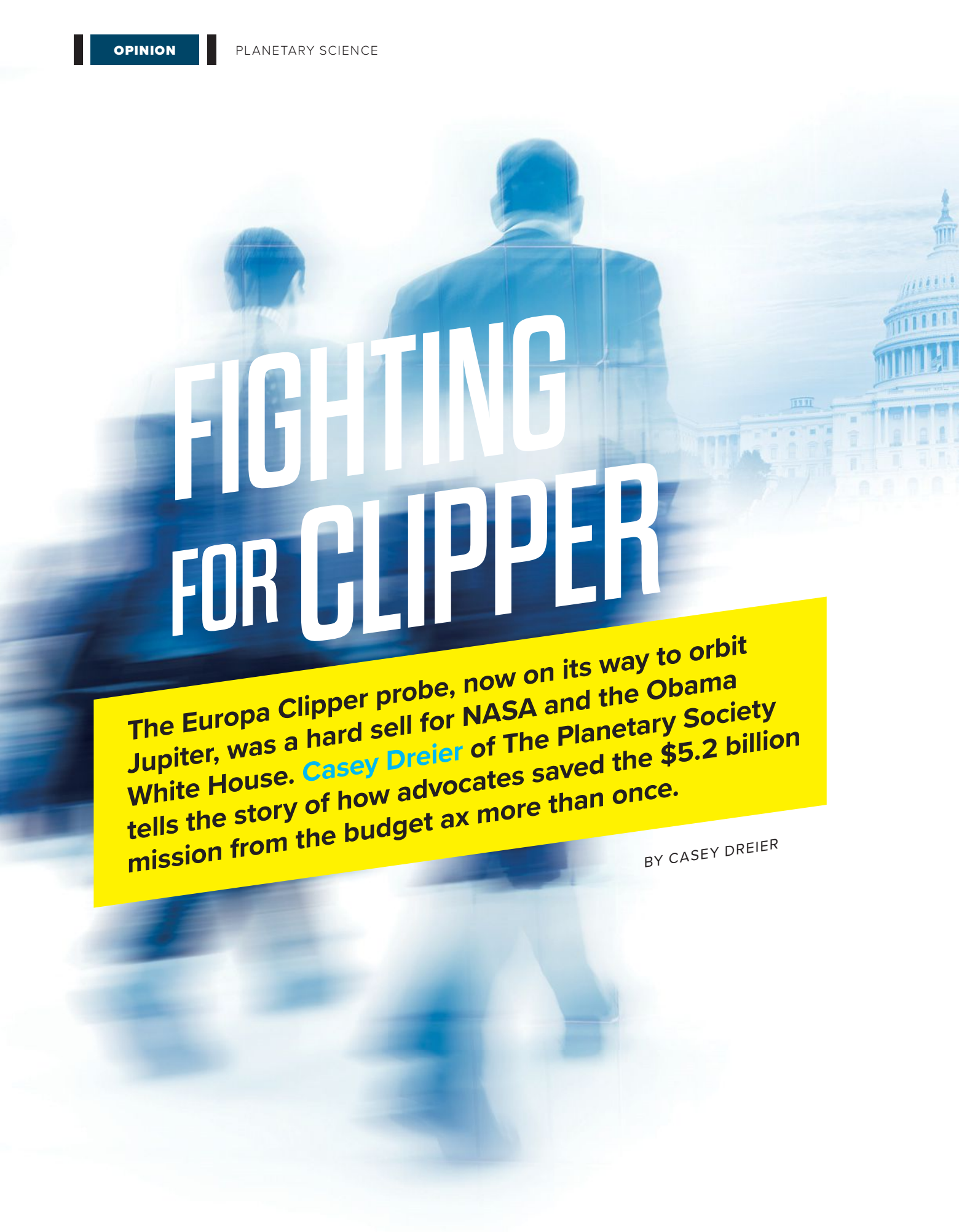
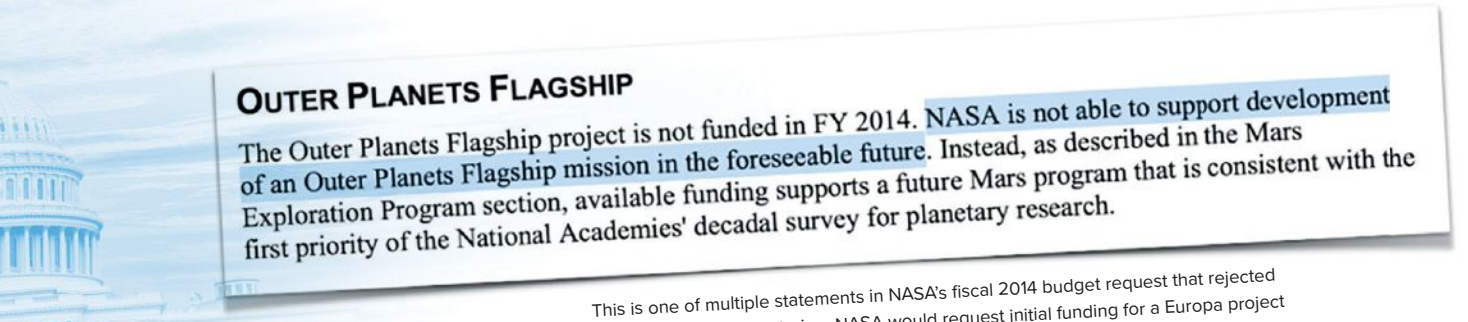


FIGHTING FOR CLIPPER

The Europa Clipper probe, now on its way to orbit Jupiter, was a hard sell for NASA and the Obama White House. Casey Dreier of The Planetary Society tells the story of how advocates saved the $5.2 billion mission from the budget ax more than once.

BY CASEY DREIER



OUTER PLANETS FLAGSHIP

The Outer Planets Flagship project is not funded in FY 2014. NASA is not able to support development of an Outer Planets Flagship mission in the foreseeable future. Instead, as described in the Mars Exploration Program section, available funding supports a future Mars program that is consistent with the first priority of the National Academies' decadal survey for planetary research.

This is one of multiple statements in NASA's fiscal 2014 budget request that rejected funding for a Europa mission. NASA would request initial funding for a Europa project the following year.

NASA FY 2014 Congressional Budget Justification

The President's Budget Request for NASA is normally a positive document, a statement of ambition outlining all the exciting projects the space agency intends to accomplish. It's a statement of ideals as much as it is a blueprint for spending (Congress, after all, ultimately decides how to dole out the funding). It's striking, therefore, when a formal budget request states what NASA will not do. Such was the case in 2013, when the presidential administration declared that a mission to the ocean world of Europa was impossible multiple times throughout the document. "The budget does not, and cannot at this time, accommodate any mission to orbit or land on Jupiter's moon Europa," is one example. End of story.

Eleven years later, Europa Clipper is en route to Jupiter. The story, clearly, was not over. The astonishing reversal of fortunes that occurred over the subsequent years is a testament to the power of public advocacy, patience and achieving strategic alignment within NASA and Congress.

Any narrative of how Europa's fortunes changed rightly highlights then-Rep. John Culberson (R-TX), the project's strongest supporter. As chair of the House Appropriations' powerful Commerce, Justice, Science, and Related Agencies subcommittee, he directed hundreds of millions of dollars to the mission and wrote its implementation into U.S. law.

But focusing solely on Culberson misses an important component of Europa Clipper's ultimate success: citizen advocacy. The Planetary Society spent years organizing effective citizen engagement with elected officials in support of Europa and robotic planetary exploration. This, in turn, helped establish a foundation of bipartisan political support for the mission throughout Congress, which ensured the project continued after Culberson lost his reelection campaign in 2018.

Given recent budget cuts to NASA's Planetary Science Division that threaten the next generation of solar system exploration missions, the experience with Europa Clipper presents an instructive lesson for the present crisis. It also reminds us that these missions don't just happen. They are the result of decades of dedicated advocacy within and outside of NASA by both space professionals and enthusiastic citizens.

The astronomer Galileo discovered Europa in 1610, but it wasn't until the Voyager flybys of Jupiter in 1979 that the moon emerged as a complex, intriguing ice world. NASA's Galileo mission to Jupiter — itself a survivor of a political near-death experience in the early 1980s — made a number of close observations of Europa in the 1990s, gathering data that strongly suggested the presence of a subsurface global ocean. Further observations and analyses demonstrated that Europa likely has all the ingredients necessary for life as we know it: water, energy, key chemicals and stability over time. It is the most promising location for a second genesis of life in our solar system.

In response, the U.S. planetary science community named Europa its top non-Mars, large mission priority in its once-per-decade report to NASA in 2002. These decadal surveys managed by the National Academies of Sciences, Engineering, and Medicine carry significant weight. Congress has mandated that NASA take their recommendations into consideration when planning its science programs. Unfortunately, funding for a mission failed to materialize in the 2000s due to the cost of building a spacecraft hardy enough to endure the extreme radiation that bathes Europa.

Casey Dreier is chief of space policy at The Planetary Society.

RELATED READING:

Q&A with Clipper mission design manager Stefano Campagnola

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"Missions don't just happen. They are the result of decades of dedicated advocacy within and outside of NASA by both space professionals and enthusiastic citizens."

NASA itself was struggling to recover from the Columbia shuttle disaster by pivoting billions of dollars toward a human return to the moon and finishing the International Space Station. Mars was considered the top planetary priority at the time, and a Europa mission stalled at the planning stage.

The 2011 Planetary Science Decadal Survey once again prioritized a mission to Europa. The following year, NASA's Jet Propulsion Laboratory proposed a novel mission concept based on Cassini's tour of the Saturnian moons: The spacecraft would orbit Jupiter, not Europa, but fly by the moon nearly 50 times. This would return nearly all of the data of a dedicated orbiter while minimizing the spacecraft's radiation exposure. It provided a substantial reduction in cost and complexity.

Europa now had an executable mission architecture with strong scientific backing, but the timing could not have been worse. The U.S. was struggling to emerge from the Great Recession; a divided Congress had forced across-the-board cuts to government spending, hitting NASA hard; the latest Mars rover had gone significantly over budget; and the James Webb Space Telescope had just survived cancellation after having more than doubled in cost. The administration was in no mood to start a new, multibillion dollar flagship mission to Europa. Agency priorities shifted away from the solar system. In 2012, the administration proposed hundreds of millions of dollars of cuts to NASA's Planetary Science Division, with no growth projected for years.

The Planetary Society was founded for moments such as these. We owe our existence to a prior era of shortsighted budget cutting of space science. Planetary scientists Carl Sagan and Bruce Murray, along with engineer Lou Friedman, founded the organization in 1980 as NASA was pivoting away from solar system missions. As an independent, member-supported nonprofit, our very existence is proof that members of the public care about scientific exploration. From the very beginning, we have organized our members to take political action in support of space science.

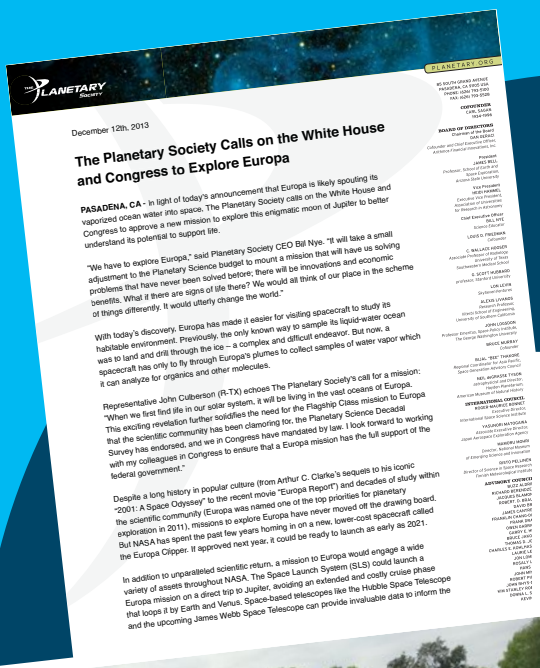
Beginning in January 2013 and continuing for the following three years, The Planetary Society focused its advocacy efforts on restoring planetary science funding to enable a mission to Europa. We published Europa-themed issues of The Planetary Report and countless articles, op-eds and held popular Reddit AMAs. Our then-president, planetary scientist Jim Bell, testified on the topic before Congress. We held numerous standing-room-only events on Capitol Hill with elected officials and staff. We met with members of Congress of both parties, regularly, for years. We worked closely with professional scientific organizations such as the American Astronomical Society and the American Geophysical Union to ensure broad and consistent messaging. We released open letters to President Barack Obama that received millions of views. Our CEO Bill Nye even discussed a Europa mission with Obama directly during a ride on Marine One before an Earth Day event in 2015.

In addition, The Planetary Society helped establish the first congressional caucus devoted to planetary science in U.S. history. The Planetary Science Caucus was initially co-chaired by Culberson and Democratic Rep. Derek Kilmer of Washington. Since then, the Planetary Science Caucus has always been led by bipartisan co-chairs and included members of both parties from House and Senate chambers.

In addition to the in-person events and outreach, Planetary Society members sent nearly 385,000 messages to their representatives in Congress and the

Europa Clipper's launch last month aboard a SpaceX Falcon Heavy came 45 years after NASA's Voyager probes returned the first images of the icy Jovian moon. Clipper is scheduled to arrive in orbit around Jupiter in 2030.

Aerospace America/John Tylko



December 12th, 2013

The Planetary Society Calls on the White House and Congress to Explore Europa

PASADENA, CA - In light of today's announcement that Europa is likely spouting its vaporized ocean water into space, The Planetary Society calls on the White House and Congress to approve a new mission to explore this enigmatic moon of Jupiter to better understand its potential to support life.

"We have to explore Europa," said Planetary Society CEO Bill Nye. "It will take a small adjustment to the Planetary Science budget to mount a mission that will have us solving problems that have never been solved before; there will be innovations and economic benefits. What if there are signs of life there? We would all think of our place in the scheme of things differently. It would utterly change the world."

With today's discovery, Europa has made it easier for visiting spacecraft to study its habitable environment. Previously, the only known way to sample its liquid-water ocean was to land and drill through the ice – a complex and difficult endeavor. But now, a spacecraft has only to fly through Europa's plumes to collect samples of water vapor which it can analyze for organics and other molecules.

Representative John Culberson (R-TX) echoes The Planetary Society's call for a mission: "When we first find life in our solar system, it will be living in the vast oceans of Europa. This exciting revelation further solidifies the need for the Flagship Class mission to Europa that the scientific community has been clamoring for, the Planetary Science Decadal Survey has endorsed, and we in Congress have mandated by law. I look forward to working with my colleagues in Congress to ensure that a Europa mission has the full support of the federal government."

Despite a long history in popular culture (from Arthur C. Clarke's sequels to his iconic "2001: A Space Odyssey" to the recent movie "Europa Report") and decades of study within the scientific community (Europa was named one of the top priorities for planetary exploration in 2011), missions to explore Europa have never moved off the drawing board. But NASA has spent the past few years homing in on a new, lower-cost spacecraft called the Europa Clipper. If approved next year, it could be ready to launch as early as 2021.

In addition to unparalleled scientific return, a mission to Europa would engage a wide variety of assets throughout NASA. The Space Launch System (SLS) could launch a Europa mission on a direct trip to Jupiter, avoiding an extended and costly cruise phase that loops it by Earth and Venus. Space-based telescopes like the Hubble Space Telescope and the upcoming James Webb Space Telescope can provide invaluable data to inform the

Dear Representative/Senator:

For the third year in a row, the White House has proposed deep cuts to NASA's Planetary Science Division. The White House has also proposed to cut NASA's total budget. Congress has wisely rejected these cuts in previous years. Now I must ask you to do it again.

As your constituent, I strongly urge you to:

* Restore NASA's Planetary Science Division to its historical level of $1.5 billion per year so it can maintain a balanced program of exploration as described by the National Research Council's Planetary Science Decadal Survey.

* Preserve NASA's top-level budget at FY14 levels, at minimum.

* Ensure that NASA commits to a major scientific mission to Europa, a moon of Jupiter with an ocean of liquid water.

* Support the exploration of Mars by ensuring the financial health of planned robotic missions in 2016, 2020 and beyond.

Among The Planetary Society's advocacy for Europa Clipper, CEO Bill Nye in 2015 delivered thousands of hand-signed petitions to Congress. The beginning paragraphs of the message are shown at right. The Planetary Society

A little over a hundred citizens and 40 U.S. lawmakers attended The Planetary Society's 2014 event on Capital Hill, "The Lure of Europa."

Casey Dreier/Tushar Dayal

> "NASA is facing similar challenges now with its flagship priorities of Mars Sample Return and a Uranus orbiter."

White House in support of this mission — our most successful grassroots effort ever. The vast majority of our members had nothing personal to gain from this effort. They would not benefit financially, nor would they gain professional standing from the data returned. These members took political action for a project that would, at best, provide them with the sublime joy of viewing stunning pictures of an ocean world 20 years hence.

The goal of all of this work was to demonstrate to NASA and the Obama administration that A) there was broad and consistent public and scientific support for a Europa mission, that B) a broad foundation of congressional support was ready to fund it and that C) this funding would be additive and not threaten existing priorities. The final point was also the key to ensuring broad community support among scientific societies: We must always avoid the destructive trap of pitting one branch of NASA science against another when budgets get tight.

After years of relentless pressure and spurred by the discovery of potential ocean plumes emanating from Europa, the administration finally acquiesced and allowed NASA to request funding for a Europa mission "pre-formulation" in NASA's fiscal year 2015 budget — only one year after the declarative statement that no funding was possible. Even then, the request was meager, far below what was needed to launch in the 2020s.

Culberson and other congressional allies ensured NASA received hundreds of millions of dollars above the amount requested, a pattern that would persist for the following three years. The Obama White House resisted until the end, with its final budget requesting a mere $49.6 million for fiscal year 2017. It wasn't until the 2018 budget request that NASA finally asked for the funding it needed to launch Europa Clipper by the mid-2020s.

There are lessons here. Europa was a compelling mission with an easy-to-understand goal and compelling implications. This aided in public engagement and advocacy, with huge numbers engaging with elected officials to support the mission. The project had a strong formal scientific endorsement that was echoed by professional scientific societies. NASA invested in years of mission studies that resulted in a novel and executable mission architecture that was responsive to budget needs. And, ultimately, a well-timed exogenous event — the detection of potential ocean plumes on Europa — made the mission too compelling to ignore. Despite this, it required years of political engagement to convince a reluctant administration that Congress would provide funding.

NASA is facing similar challenges now with its flagship priorities of Mars Sample Return and a Uranus orbiter, but neither one fully match the set of conditions that enabled Europa Clipper. But with a sustained campaign of public and scientific engagement and advocacy, much can be overcome. The final lesson is that political fortunes (and funding) can change dramatically, regardless of what a president's budget request may so confidently state. ★