

OPINION

Dark Matter, Black Holes and the First Stars

By Lawrence M. Krauss

Almost 20 years ago, Congress cancelled what was then the most ambitious scientific project ever launched: the Superconducting Super Collider. The particle collider, the world's largest, would have resolved questions ranging from the origin of all mass to the nature of fundamental forces. But cost overruns and management issues gave a Democratic Congress an excuse to kill the program during hard economic times. A similar situation has now arisen—and it's threatening to ground the nearly completed James Webb Space Telescope.

Coming in \$1.6 billion over its recently updated cost estimate of approximately \$5 billion, the James Webb is the successor to the phenomenally successful Hubble Space Telescope. It would allow researchers to peer back to the period of "first light," when the first stars and galaxies formed in the universe. It would also provide new insight into exotica from the first giant black holes to the mysterious dark matter and dark energy that dominate the universe.

Some \$3 billion has already been spent on the project. Yet the House Appropriations Committee has recommended termi-

nating it entirely because it is over budget and has had management issues that have led, among other things, to significant delays.

The cancellation of the James Webb Space Telescope would likely herald the beginning of the end of U.S. leadership in space science—much as cancelling the Superconducting Super Collider in 1993 moved the center of gravity in particle physics definitively to Europe.

The telescope was designed to pick up where the Hubble Space Telescope, which revolutionized astronomy, left off by taking us back to the very beginnings of visible structure in the universe. It was meant to be the centerpiece of astronomy for the next two decades. Without it, the tantalizing hints that Hubble has been able to glean about our beginnings will remain just that for perhaps a generation.

If it were simply a matter of the U.S. taking another step away from the head of the pack in the field, the proposed cancellation of the James Webb would be a disappointment, but not a tragedy. Yet the cancellation of such a major international science project—one for which much of the sophisticated and expensive infrastructure has already been completed—makes it unlikely

that a comparable opportunity will arise in the foreseeable future.

The idea of shuttering the James Webb project is not happening in a vacuum: It is part of an overall reduction in support for NASA. The move comes on the heels of the end of the Space

**The James Webb
Space Telescope is
vital for science
and should not face
the budget axe.**

Shuttle program, which meant the end of the immediate future of NASA-developed human space transport in this country. Yet when one compares the total cost of the James Webb—likely to be around \$7 billion, spent over more than a decade—with the \$200 billion price of the Shuttle program and the \$100 billion spent on the International Space Station, the telescope's price seems reasonable. Not only is it the cheapest of the bunch, but it's the item with the greatest potential to push forward the frontiers of knowledge.

The repercussions of losing the James Webb go beyond sci-

entific discovery. It's hard to think of a single NASA project, including the Mars Rovers that have been slowly marching across the Martian surface for years, that has captured the imagination of the public, particularly children, more than the images of the cosmos provided by the Hubble Space Telescope. Whenever I lecture and show a Hubble photo, I can be guaranteed to provoke excitement and awe. One can only imagine what kind of inspiration the next generation will miss without the James Webb in the sky.

The universe is more remarkable than anything our imaginations could have conjured, which is why science is more exciting than science fiction. Each time we learn something new and fundamental about the universe we learn something new and exciting about our own origins. So it's tragic and frustrating that this vital new probe of the cosmos may soon be shut down as a misplaced target of the congressional budget-cutting frenzy.

Mr. Krauss is a professor and director of the Origins Project at Arizona State University. His most recent book, "Quantum Man: Richard Feynman's Life in Science," was published in March by Norton/Atlas.