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REPORT IN BRIEF

Sharing the Adventure with the Public: The Value and Excitement of "Grand Questions" of Space Science and Exploration

Summary of a Workshop

Space Studies Board · Division on Engineering & Physical Sciences · November 2011

On November 8-10, 2010, the National Research Council's Space Studies Board (SSB) held a public workshop on how NASA and its associated science and exploration communities communicate with the public about major NASA activities and programs. The concept for, and planning of, the workshop developed over a period of two years. In conjunction with the SSB, the workshop planning committee identified five "Grand Questions" in space science and exploration around which the event was organized. The following are some of the highlights taken from the published summary of the workshop, which concluded with sessions on communicating space research and exploration to the public.

Workshop Structure and Background

The overall goal of the workshop was to encourage dialogue between scientists and professional communicators, who served as speakers and panelists in the various sessions. The workshop began with a keynote address from Miles O'Brien, who was the science and space reporter for CNN for 17 years and now is a science correspondent for PBS' NewsHour and Spaceflightnow.com. Many of the "lessons learned" that were discussed at the workshop were not limited to the space program but are of relevance to the broader science and engineering community.

The Grand Questions

Answering Grand Questions

Grand Questions can guide future space science and exploration initiatives and inspire interest in these efforts. But according to Roger Bonnet, Executive Director of the International Space Science Institute in Switzerland and the former Director of Science for the European Space Agency, society will only answer the Grand Questions through continuous progress in our understanding of the fundamental laws of nature. Grand Questions can show the public the value of rigorous scientific reasoning, which can lead both to additional discoveries and to skepticism. "Discoveries and skepticism," however, "are an integral part of scientific progress," Bonnet concluded.

Understanding the Universe: How Did It Begin and How Is It Evolving?

Roger Blandford, who chaired the recently released NRC Decadal Survey on astronomy and astrophysics (New Worlds, New Horizons in Astronomy and Astrophysics), described his perspective on the universe: "Earth is just one of the larger pieces of debris orbiting a rather modest star, one in a few hundred billion such stars in the inner suburbs of an unpretentious spiral galaxy, … one in a few hundred billion galaxies in the observable universe." What we know about the universe today is that it is 13.7 billion years old, it is flat and the proportions are dark energy (70%), dark matter (25%) and matter (5%). Looking out from Earth into the universe is a look back in time. "When did the first stars, galaxies and black holes form? When was our cosmic dawn? When did the dark ages preceding this end?" These answers, he said, will likely come from ground and space-based telescopes operating in the infrared, x-ray, optical and radio bands.

Are We Alone?

Sara Seager, Professor of Planetary Science and Physics at MIT, talked about the challenge of finding Earth-like planets elsewhere in the universe. "Any kind of planet you can imagine exists somewhere," she said. The search for Earth-size planets is the task of NASA's new Kepler space telescope. It will tell us "how common are other Earths." Though Kepler is finding Earth-size planets, direct imaging is necessary to find Earth-like planets ("Earth twins"). Scientists will not be able to directly image a planet the size of Earth with good spatial resolution for the next 100 years; she compared it to trying to see a firefly next to a search light at the distance of the west coast to the east coast of the United States.

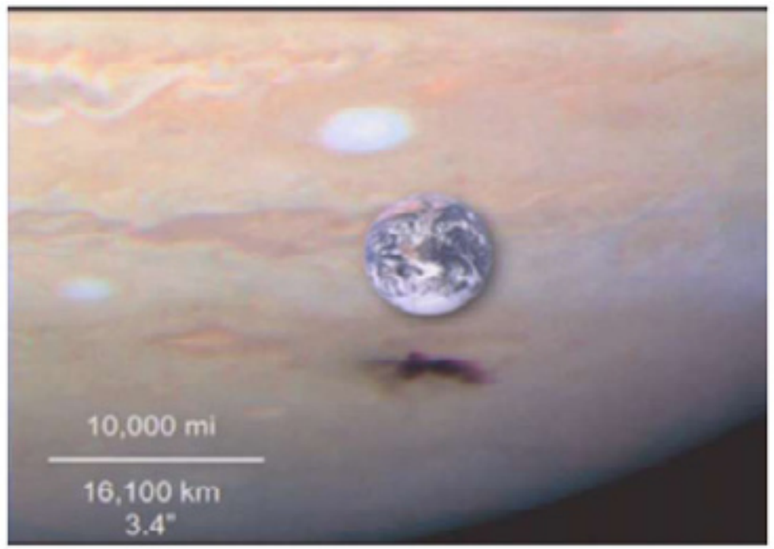

Figure 8 Image of a recent collision between Jupiter and a comet or asteroid, taken by Hammel using the Hubble Space Telescope, and an image of Earth for comparison.

Understanding the Solar System: How Did It Begin and How Is It Evolving?

Heidi Hammel, Senior Research Scientist and Co-Director of the Space Science Institute (former), described our solar system as a "work in progress." Comets crashing into other bodies move water around in the solar system, she explained, and there is water on several solar system bodies. NASA's Phoenix lander exposed ice on Mars, there is water on the Moon, scientists believe there is a liquid water ocean under the icy crust of Jupiter's moon Europa, and Saturn's moon Enceladus has water "spewing out of … stripes in its southern hemisphere." She stressed that the point she was trying to make was that there are no "static" planets, they are all changing all the time, including Earth.

The Earth: Will It Remain a Hospitable Home for Humanity in the Future?

Molly Macauley, Senior Fellow, Resources for the Future, emphasized the importance of global resource management. For example, there are still discrepancies in the fundamental measure of acreage of forests around the world despite the global Earth observation capacity because "not all countries choose to make known very good measures of forests." She said some people argue that "we have better maps of Mars and the Moon than we do global forest areas." Roger Bonnet, who also spoke in the first session, mentioned the "critical role" that space plays: Spacecraft are needed to monitor Earth. He referred to the GRACE mission, which measures the shape of the Earth and aids in tracking water flow.

What Could the Future Hold for Humans in Space?

Betsy Cantwell—Director for Mission Development, Engineering Directorate, Lawrence Livermore National Laboratory—drew parallels between the challenges facing humans exploring space and those they face here on Earth, such as climate adaptation, aging and health and resource management. She listed scientific and technological advances needed for human space exploration that could be pertinent to global issues; for example, ensuring the availability of breathing gases, water and autonomous medicine for long periods of time.

Communicating Space Research and Exploration to the Public

Inspiring Public Interest in Space Research and Exploration: Communication Challenges and Opportunities

Joan Vernikos, President of Thirdage LLC, former director of life sciences for NASA, pointed out that, in order to communicate, one must inspire. Storytelling, she said, especially telling "your" story, is an effective way to inspire others as a scientist. Excitement and passion are what capture people's attention, and they want to know about the journey and the failures. People identify with failures because everyone is trying to solve problems, whether it is Sudoku, crossword puzzles or the Grand Questions of science, she said.

Linda Billings, research professor at George Washington University's School of Public and Media Affairs and a principal investigator with NASA's astrobiology program, noted that it is critical to connect with communities by understanding their cultural environments and interests. There "is no monolithic public" for space exploration—but many publics.

Communicating Pathways to the Public: Reading, Watching, Interacting

Christie Nicholson, journalist and online contributor for Scientific American, explained that, today, every person can connect with the public in myriad ways that have almost no cost, so people can tell their own stories. The ability to post comments on a website is as expected as a doorway into a room, she said. How do you engage with the public under those circumstances? People love to tell stories, she said. We need a narrative, characters, drama and visual communication whether in print, on the radio or in whatever medium is used. That will not change. What is changing is that the communication is across platforms—video, audio, text and graphics.

Nicholson urged scientists not to use social media only because everyone else is using them, but because there is some message they want to get across. Each person needs to decide what they need and use it that way, but what it can provide is visibility and promotion, community and networking, monitoring conferences (like this workshop), testing the waters for different ideas, keeping a finger on the pulse of what is happening and improving writing skills, especially brevity. "Get your message first," she explained, "and [choose] your tool second."

Summarizing at the end of the Workshop, Charles Kennel, SSB chair, concluded that the scientists had described a revolution over the past 50 years in our thoughts and perceptions of the universe, while the communicators explored the revolution that occurred in just 20 years in how people communicate. He noted that the changes in communication have "the potential, combined with science, … to produce a second Enlightenment" in this century.

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Copies of this report are available free of charge from http://www.nap.edu.

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