

## Director's Matters

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Guest column by **Louis J. Lanzerotti**, editor of *Space Weather* (published by AGU), distinguished professor at the New Jersey Institute of Technology, and AIP Governing Board chair; and **Gregory A. Good**, director, Center for History of Physics.

### Telstar and 50 years of connectivity



This morning, without a second thought, people around the world checked their email on some smart phone, or watched a live TV broadcast on some news channel from someplace where the Sun sets when it is rising here. Our daily lives and worldwide commerce depend on and are utterly shaped by hundreds of satellites.

Couldn't we always see hurricanes from above? Couldn't we always conduct business around the clock? Didn't we always have GPS direction guidance? Couldn't we always measure radiation and electromagnetic fields in space and anticipate the possible effects of solar events on our lives and our technologies? Satellites enhance the near-space senses of the human race, and they link us ever more inextricably together.

Fifty years ago, on July 10, 1962, the United States launched Telstar, the first active-communications satellite. Last month a celebration of the anniversary brought together a number of scientists, engineers, and others involved in this achievement at Alcatel-Lucent Bell Laboratories. (See the [synopsis video](#) on YouTube.) One of the authors of this article, Louis Lanzerotti, joined Bell Laboratories in 1965 because he was attracted by the opportunity to analyze Telstar data and to work on the design and implementation of a Bell Laboratories radiation detection instrument. This device would be incorporated in the first NASA test communications satellite at geosynchronous orbit, ATS-1, launched in December 1966.



Telstar's [anniversary celebration](#) belonged at Bell Labs, which was central in the conception, design, build, launch, and follow-up of the project. Telstar was funded by the AT&T Company and built by Bell Laboratories; AT&T reimbursed NASA for the launch costs. Telstar used the latest transistors (all discrete components!) and maser amplifiers, a new technology. Telstar received signals, amplified them, and retransmitted them.

The first public images transmitted across the Atlantic in 1962 were of the Statue of Liberty and the Eiffel Tower, followed by part of a Philadelphia Phillies vs Chicago Cubs baseball game. Telstar had started a new age of communications. By 1965, half a dozen similar satellites were actively relaying signals. More Telstars were orbited in the 1980s, 1990s, and on. The die was already cast for CNN and ESPN!

Telstar also, however, carried solid-state detectors with different levels of shielding for detecting electrons of different energies in orbit. These were designed and included to specifically study the effects of the space environment on transistors. Unknown to the Bell scientists and engineers who built Telstar, the United States launched one of its last near-space nuclear tests on July 9, the day before the satellite's launch. Project Starfish Prime exploded a hydrogen bomb 250 miles (400 km) above Earth's surface, a thousand times more powerful than the bomb used at Hiroshima. The blast created an electromagnetic pulse much larger than expected, damaging electrical and communications infrastructure in both Hawaii and New Zealand. It also produced an artificial radiation belt approximately 100 times the natural Van Allen Belt intensities and soon degraded the electronics on Telstar, leading ultimately to its failure in February 1963. Its life spanned a mere six months. Nevertheless, the takeaways endure and led the way to modern communications.

One Bell researcher who attended the 50th anniversary of Telstar, physicist Walter Brown, led the efforts at Bell Labs to “harden” the transistors and other electronics that were used in Telstar. As a result, Brown was well positioned to study the lifetime of high-energy electrons produced by Starfish Prime. His results are still used today. Ironically, the confluence of Starfish Prime and the various satellites led to important conclusions regarding radiation in low-Earth orbit. [Seven oral history interviews](#) in AIP's Niels Bohr Library & Archives discuss Telstar and Starfish Prime.

Lest one think that satellites are now safer because we ban nuclear tests in space, the story of Telstar 401 provides a cautionary tale. Telstar 401 launched in 1993. In 1997 it was destroyed by a magnetic storm, a space weather event caused by a coronal mass ejection from the Sun. Knowledge of such events is still critical background to the design of satellites and other electrical and communications infrastructure here on Earth.

## Physics Resources Matters

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Curious about the future of space exploration?

Unlike the previous Mars rovers which used solar cells, *Curiosity* is powered by electricity generated from the decay of non-weapons-grade nuclear fuel in the form of [Plutonium-238](#). As reported in an earlier issue of [AIP Matters](#), the United States has nearly depleted our supply of Pu-238 for use in future missions. Without a source of fuel for spacecraft, NASA is in a difficult position to fully embrace moving forward with future missions which need this fuel.

Restarting domestic production of Pu-238 has been a priority for the planetary science community, including AIP and a few of our Member Societies. AAS and AGU have been particularly involved. Recently, Congress took the first steps needed to fund a Pu-238 domestic production program by providing NASA with a portion of the funding. We continue to urge Congress to give domestic production of Pu-238 full funding through DOE and NASA. A supply of fuel is needed if we want more "*Curiosity*" in the future.



Gale crater vista; courtesy of NASA. See the first images from *Curiosity* at the [NASA/JPL photo journal](#).

## AIP helps establish the STI Expert Partnership

On July 25th, AIP and several other scientific societies signed a Memorandum of Understanding (MOU) with the US Department of State to establish the Science, Technology, and Innovation (STI) Expert Partnership. The signing took place at a widely attended science diaspora networking reception and ceremony held at the National Academy of Sciences.



The MOU established the STI Expert Partnership "to help advance the US Department of State's science diplomacy initiative, which is designed to build US relationships abroad in the fields of science, technology, and innovation." The STI Expert Partnership "seeks to promote economic prosperity, democratic governance, and social development through increased scientific and technological programming worldwide." The partnership "will expand and multiply the reach of US scientific experts, who are travelling abroad, by identifying new or strengthening existing public diplomacy opportunities for them to engage foreign audiences around the world as STI experts."



Catherine O'Riordan signs the STI Expert Partnership MOU on behalf of AIP.

The shared goals of the partnership include addressing global science and engineering challenges; educating and engaging foreign publics; strengthening international scientific and technological collaboration; enhancing science, technology, engineering, and math capacity in developing nations; and elevating the status of women in science and technology through equal opportunities.

AIP Government Relations staff served as a liaison between AIP management and the State Department and also attended the associated conference on global diaspora networks. Catherine O'Riordan, vice president of AIP Physics Resources, signed the document on behalf of AIP.

## Around AIP

### CESSE welcomed to home of the Kentucky Derby



The town renowned for "sluggers" and horse racing hosted the [annual meeting of the Council of Engineering and Scientific Society Executives](#) (CESSE) last month, from July 24–26. More than a dozen AIP employees were in attendance in Louisville, KY, and many either made presentations or helped to run the conference.

In the session on legislation and the impacts of the "open science" publishing movement, CEO Fred Dylla gave an update on public-access policy for scholarly publications, including an overview of the recent Finch Report. In the Public Affairs track, News and Media Service's Jenny Lee offered animation ideas and inexpensive video-making tools for press officers working far from the research they are promoting. And in a session looking at new publishing models, Director of Publishing Operations Lisa McLaughlin explored different options publishers have for managing print (including outsourcing print and related sales and support functions) in an era when increasing numbers of readers get their journal articles online. The slides for Dylla's, Lee's, and McLaughlin's talks can be viewed "[On the Circuit](#)," at the bottom of the AIP News page. Also, special mention is due AIP Publisher Robert Harington for his work as chair of the CESSE Publications track.

Conference attendees report useful interactions with colleagues from other scientific societies, and you won't hear many complaints about the social components. The last night of the meeting featured a 1970s-themed banquet with a live disco band, mirror balls, massive 'fros, and sequined bellbottoms! Next year, the meeting will take place in Providence, RI.

## Member Society Spotlight

AAPM meets in Charlotte



Dose reduction in computed tomography, imaging of therapy response, and patient safety in radiation therapy were just three hot topics discussed at **AAPM's Annual Meeting**, which took place July 29–August 2 in Charlotte,

NC. Read more at [AAPM's virtual press room](#).

Remembering Jarus W. Quinn

The AIP community joins OSA in remembering the life of Jarus W. Quinn, executive director of The Optical Society from 1969–1994. See the [OSA website](#) to learn more about the life and contributions of Dr. Quinn.

## Coming Up

Monday, August 20

- *Journal of Chemical Physics* reception at the American Chemical Society meeting (Philadelphia, PA)

August 27–August 28

- 2013 InterMag and MMM Program and Steering Committee meetings (College Park, MD)

Through August 29

- ACP annual school supplies drive

Thursday, August 30

- ACP brown-bag lunch talk, 12–1 pm (College Park, MD)  
"What Nuclear History Can Tell Us About the Future of Scientific Secrecy," given by Alex

Wellerstein, associate historian, Center for History of Physics

