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Sic Transit Gloria Mundi

As I write this column in early January, I have just stepped down from full-time teaching (a professor emeritus now), but old habits die hard. So here is a quiz:

Which James Bond movie featured the Arecibo Observatory?

- a) *Goldfinger* (1964)
- b) *The Man With the Golden Gun* (1974)
- c) *GoldenEye* (1995)
- d) None of the above.

Even though the world's largest radio observatory (until China built a bigger one in 2016) had been completed by 1963, the year before *Goldfinger* was released, it was only in 1995 that one saw Arecibo as the backdrop of a fight scene in *GoldenEye*, with Pierce Brosnan reprising the role of James Bond [1]–[3]. Alas, the iconic radio telescope was decommissioned [4], [5] in 2020 (incidentally, the same year when the original 007, Sean Connery, passed away).

Arecibo, a national research center supported by the National Science Foundation (NSF), focused on [6] “radio astronomy, planetary radar and upper atmospheric sciences...Arecibo Observatory’s principal astronomical research instrument is a 305-m fixed spherical

radio/radar telescope, one of the world’s largest radio telescope[s]. Its frequency capabilities range from 50 MHz to 11 GHz. Transmitters include an S-band (2,380-MHz) radar system for planetary studies and a 430-MHz radar system for atmospheric science studies, and a heating facility for ionospheric research.” Since a free-standing reflector antenna of that size would have been impractical, the dish [5], “made of nearly 40,000 perforated aluminum panels, each about 2 m by 1 m, sat in a natural sinkhole in the Puerto Rican jungle. Suspended like a bridge 137 m above a canopy of trees was a platform where antennas, reflectors, receivers, platform motors, and other instrumentation sat.”

The Arecibo Observatory was a workhorse of radio astronomy for more than half a century. Its observations led to the 1993 Nobel Prize for Physics being awarded to Russell Hulse and Joseph Taylor Jr. for their discovery of a new type of pulsar [5]. It also played a key role in the search for extraterrestrial intelligence (SETI) and was used for the SETI@home project [5], “which launched in 1999 and used processing power on personal computers around the world while the machines were asleep to analyze data from Arecibo’s SETI search.”

The NSF decided to decommission the celebrated telescope in late 2020 after it sustained irreparable mechanical damage. Here is a quick recap of the disaster [4]: “[T]he Arecibo dish was designed to reflect incoming radio radiation to collectors that hung from a massive, 900-ton instrument package that was suspended above it. The suspension system was supported by three reinforced concrete towers that held cables that were anchored farther from the dish, looped over the towers, and then continued on to the platform itself. Failure of these cables eventually led to the platform dropping into the dish below it.”

In 1974, Frank Drake and the late Carl Sagan used the Arecibo radar transmitter to send a message toward globular cluster M13 [5]. “Encoded in that beamed ‘Arecibo Message’—a message to another intelligent civilization, if they intercepted it—were graphics of DNA, a sampling of biochemicals of Earth-based life, the solar system, a stick-figure human, and a drawing of the telescope” [5]. *The Economist* poignantly noted [3]: “[A]s the vegetation beneath the dish rises through its remains, and the site falls into picturesque ruin, the sketch of its cross-section encoded in that message from the 1970s will continue on its way. It

is already 46 light-years from Earth. Its pixels now constitute the farthest-flung memorial to a human achievement anywhere in the universe. And they always will.”

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- [1] A. Kooser. “Famous Arecibo telescope that starred in a James Bond movie to be demolished.” CNET. <https://www.cnet.com/news/famous-arecibo-telescope-that-starred-in-james-bond-film-goldeneye-to-be-demolished/> (accessed Jan. 7, 2021).
- [2] E. Mee. “Huge telescope scaled by James Bond and used to search for alien life collapses.” Sky-News. <https://news.sky.com/story/huge-telescope-scaled-by-james-bond-and-used-to-search-for-alien-life-collapses-12148599> (accessed Jan. 7, 2021).
- [3] “Si monumentum requiris respicite.” The Economist. <https://www.economist.com/science-and-technology/2020/11/25/with-the-death-of-arecibo-an-era-ends-for-radio-astronomy> (accessed on Jan. 7, 2021).
- [4] J. Timmer. “NSF had a drone watching as Arecibo’s cables snapped.” Ars Technica. <https://arstechnica.com/science/2020/12/nsf-had-a-drone-watching-as-arecibos-cables-snapped/> (accessed Jan. 7, 2021).
- [5] L. Kruesi. “How the Arecibo Observatory created a scientific legacy for Puerto Rico.” PhysicsWorld. https://physicsworld.com/a/how-the-arecibo-observatory-created-a-scientific-legacy-for-puerto-rico/?utm_medium=email&utm_source=iop&utm_term=&utm_campaign=20386-48597&utm_content=Title%3A%20How%20the%20Arecibo%20Observatory%20created%20a%20scientific%20legacy%20for%20Puerto%20Rico%20-%20%20explore%20more&Campaign+Owner= (accessed Jan. 8, 2021).
- [6] “Arecibo observatory.” NSF. https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5652&org=MPS&from=home (accessed Jan. 8, 2021).



MEETINGS & SYMPOSIA (continued from page 50)

ANTENNA MEASUREMENT TECHNIQUES ASSOCIATION ANNUAL MEETING AND SYMPOSIUM (AMTA 2020)

24–29 October 2021, Daytona Beach, Florida, United States. (Abstracts: 23 April 2021.) Submission of abstracts: Please refer to the website <http://www.amta2021.org> for details. Contacts: C.J. Reddy, AMTA technical coordinator, email: technical-coordinator@amta.org. Dave Pinell, chair, STAR Dynamics, email: host@amta.org. Ed Urbanik, vice chair, ARA, email: vice-chair@amta.org. <http://www.amta2021.org>.

AOC 58th INTERNATIONAL SYMPOSIUM AND CONVENTION

30 November–2 December 2021, Washington, D.C., United States. Amy Belicev, Association of Old Crows, 1555 King Street, Suite 500, Alexandria, VA 22314, United States. +1 703 549 1600; email: belicev@crows.org. <http://www.crows.org>.

2021 IEEE INTERNATIONAL SYMPOSIUM ON ANTENNAS AND PROPAGATION & USNC-URSI RADIO SCIENCE MEETING

4–10 December 2021, Singapore. (Papers: 15 May 2021.) Contacts: Zhi Ning Chen, general chair, email: eleczn@nus.edu.sg. Zhongxiang Shen, general cochair, email: exxshen@ntu.edu.sg. Xianming Qing, general cochair, email: qingxm@i2r.a-star.edu.sg. Yunjia Zeng, student paper competition chair: email: zeng_yunjia@i2r.a-star.edu.sg. www.2021apsursi.org.

2022 USNC-URSI NATIONAL RADIO SCIENCE MEETING (NRSM 2022)

5–8 January 2022, Boulder, Colorado, United States. (Papers and Abstracts including Papers for Student Paper Compe-

tion: 26 September 2021). Contacts: Sembiam R. Rengarajan, technical program, Department of Electrical and Computer Engineering, California State University, Northridge, CA 91330-8346, United States. +1 818 677 3571, email: srengarajan@csun.edu. Conference Logistics: Christina Patarino, CCEP, CU Conference Services, University of Colorado Boulder, 454 UCB, Boulder, CO 80309, United States. +1 303 492 5151, fax: +1 303 492 5959, email: christina.patarino@colorado.edu. <http://www.nrsmboulder.org>.

23rd INTERNATIONAL CONFERENCE ON THE COMPUTATION OF ELECTROMAGNETIC FIELDS (COMPUMAG 2021)

16–20 January 2022, Cancun, Mexico. (Two-Page Digest Papers: 16 June 2021; 4-Page Full Paper for *IEEE Transactions on Magnetics*: 31 January 2022.) Contacts: Conference information: email: secretariat@compumag2021.com; Editorial matters: email: editorial@compumag2021.com; Venue, travel, hotels, visa, tours: email: local@compumag2021.com. <http://www.compumag2021.com>.

THIRD URSI ATLANTIC RADIO SCIENCE CONFERENCE (URSI AT-RASC 2022)

28 May–4 June 2022, Gran Canaria, Canary Islands. Contact: URSI Secretariat, c/o INTEC-Ghent University, Technologiepark-Zwijnaarde 15, B-9052 Gent, Belgium. +32 9 264 33 20, email: at-rasc@ursi.org. <http://www.atrasc.com/>.

