WEYMOUTH ASTRONOMY

Volume 12, Issue 6

Trips / Events

Ideas for trips and events always welcome!

events@weymouthastronomy.co.uk

- **18 Oct CADAS—Ask the Experts Evening**
- **7 Nov WAS—David Strange: Norman Lockyer and the NLO**
- **15 Nov CADAS—Bob Mixon—8 Great Astronomers**
- **5 Dec WAS—Andrew Coates—Looking for Life on Mars**
- **20 Dec CADAS—Christmas Social and members short talks**

Programmes for many local Societies will be available in the near future.

Check their websites for more details.

If you are interested in giving a talk or workshop, let the organisers know. They like to offer new titles in their programme line-up.

WAC Upcoming Events:

10 Nov—Impacts: Bob Mizon

8 Dec—Christmas Quiz Night

More to come in 2018

Plans for informal viewing nights will take place after the monthly meetings, weather permitting.

Sky Watcher

WAC News—

Within Reach By Michael Malone

On the passenger seat, unopened brown envelopes steam in the early evening crisp winter dark.

Sam sits behind me in the baby seat. words hop out of his mouth and spring towards me to crash against the bleak imaginings of a grown-up world.

At the traffic light he stops speaking as if the red light was meant for him. Then, "whassat daddy?"

Wonder in his voice at the silver plate that brightens the black wall of the sky.

That's the moon, wee pal, I say.

He reaches up, small fingers trying to grab.

"Daddy, gettit." **Until next month ~SK**

Solar Probe Will Approach Sun Closer Than Any Prior Spacecraft

By Randy Showstack

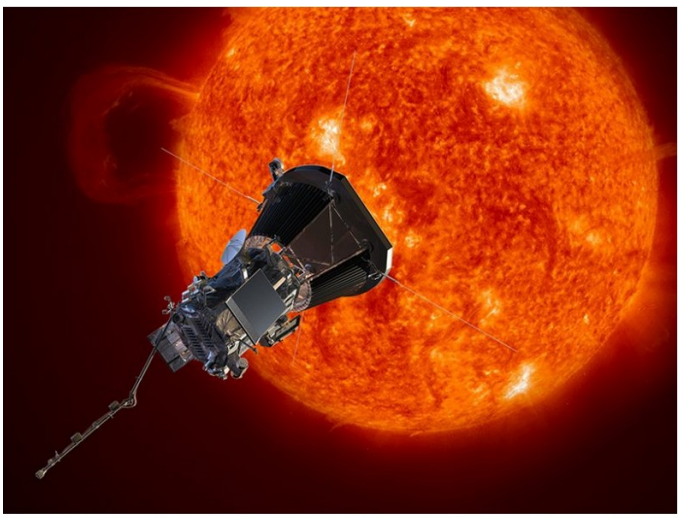
A mission to the Sun first recommended in 1958 is set to launch in 2018, 6 decades later. NASA's Parker Solar Probe, which the agency plans to send to space next summer for a nearly 7-year journey, will fly within 4 million miles (6.4 million kilometers) of the Sun's surface, more than 7 times closer than any other satellite. There, it will help scientists seek answers to fundamental questions about our star such as why its outer atmosphere, or corona, is several hundreds of times hotter than the photosphere, or the Sun's surface.

The mission "is a real voyage of discovery," said Fox. "We've been to every major planet, but we've never managed to go up into the corona. "The mission "is a real voyage of discovery," said Nicola Fox, project scientist for the probe at Johns Hopkins University's Applied Physics Laboratory (APL) in Laurel, Md. "We've been to every major planet, but we've never managed to go up into the corona." Until recently, we haven't had the technology needed for a spacecraft to fly so close to the Sun and survive, Fox noted.

Although scientists have learned a great deal about the Sun from remote sensing and from other spacecraft operating within the outward flow of energetic, charged particles from the Sun known as the solar wind, "you really need to get into [the solar atmosphere] to be able to answer the fundamental questions," said Fox, who is a member of the *Eos* Editorial Advisory Board.

In addition to probing why the corona sizzles at temperatures about 300 times higher those at the surface, the mission aims to explore "why in this region the solar wind suddenly gets so energized that it can actually break away from the pull of the Sun and move out at millions of miles an hour to bathe all of the planets," Fox added. Entering the envelope of hot plasma surrounding the star may also help researchers understand more about high-energy solar particles.

The probe is named for astrophysicist Eugene Parker, professor emeritus at the University of



Artist's rendering of the Parker Solar Probe spacecraft approaching the Sun. Credit: Johns Hopkins University Applied Physics Laboratory

Solar Probe (*more!*)

Chicago, who in 1958 wrote a paper about what is now referred to as the solar wind and whose work underpins a great deal of our knowledge about how stars interact with planets. In the decades since a committee of the National Academy of Sciences recommended the mission, improvements in thermal protection technology have made it possible to shield the spacecraft and its suite of instruments from the intense radiation and heat from the Sun.

On 21 September, scientists lowered an 11.43-centimeter-thick carbon composite heat shield onto the probe to test its alignment and ensure that it will shade the craft and keep the instruments safe in the harsh environment. Those instruments will study the Sun's electric and magnetic fields, plasma, and energetic particles and image the solar wind. "Everything lives in the shadow" created by the heat shield that will always be oriented to face toward the Sun, said James Kinnison of APL, a mission system engineer for the space probe who also spoke with *Eos* in the clean room. With the heat shield forming a cone-shaped shadow, "all the electronics stay at normal temperature [and] nothing gets really hot as long as the heat shield is pointed toward the Sun," he said.

Because the spacecraft will often need to operate autonomously when it is behind the Sun or subject to communication delays because of its distance from Earth, the probe includes a system to detect and quickly recover from even a slight misalignment of its axis. "If it starts tilting, for instance, that would be a problem that would have to be detected very quickly, and you want to recover from that," said Kinnison. "We do an awful lot of testing on the spacecraft here on Earth before we launch to know that that's going to work. We're very certain that it will work." The development of solar power arrays able to withstand the intense solar environment has also enabled the mission, Kinnison said. The probe will operate on about 350 watts of power for all of its science and engineering needs, including collecting scientific measurements and downlinking data. Aside from the solar array and the heat shield, most of the spacecraft's other components are "relatively normal," he said.

Fox and others noted that the mission, which has a launch window from 31 July to 19 August 2018, could help scientists to better understand how outbursts of energy and particles from the Sun, known as space weather, affect Earth. "We can have beautiful aurora. We can also have catastrophic events," Fox said. "Until you go up and really understand what's going on in that region, you really can't do a better job of predicting what's going to hit the Earth. So [the mission] is important for fundamental science, but it has very real world impacts." It could lead to "transformational changes to the models that we use to predict space weather," she added.

Eric Christian, deputy principal investigator for the solar probe's Integrated Scientific Investigation of the Sun (ISIS) instrument suite, told *Eos* that the Sun's activities can affect the power grid and human and satellite operations in space. Just as terrestrial weather forecasting has gotten better, space weather forecasting also needs to improve, he contended. "If we want to spread throughout the solar system with robots and manned missions," Christian said, "we're going to need to understand [the Sun and space weather] better."

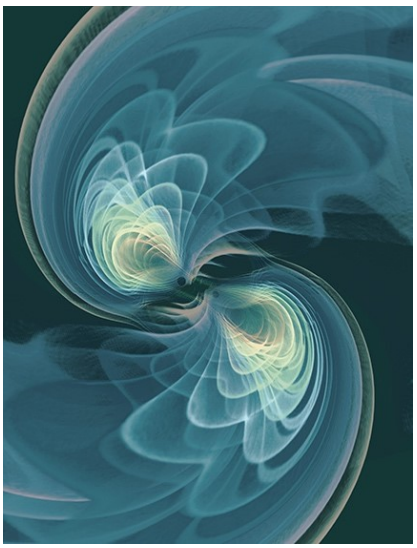
Weiss, Barish, and Thorne share 2017 Nobel Prize in Physics by Andrew Grant

PHYSICS TODAY

Rainer Weiss of MIT and Barry Barish and Kip Thorne of Caltech are to be awarded the 2017 Nobel Prize in Physics "for decisive contributions to the LIGO detector and the observation of gravitational waves," the Royal Swedish Academy of Sciences announced on Tuesday. Weiss will receive half the prize of 9 million Swedish krona, roughly $1.1 million; Barish and Thorne will split the other half.

Weiss and Thorne, along with the late Ronald Drever, cofounded LIGO—the Laser Interferometer Gravitational-Wave Observatory—a pair of L-shaped Michelson interferometers in Livingston, Louisiana, and Hanford, Washington. Barish became the leader of LIGO in 1994; three years later, he established the LIGO Scientific Collaboration, which today includes more than 1000 scientists worldwide.

On 14 September 2015, nearly a half century after Weiss conceived of the basic experimental design, LIGO made the first direct detection of gravitational waves, which were emitted by a pair of coalescing black holes about 1.3 billion light-years away (see *Physics Today*, April 2016, page 14). The observatory has since identified at least three additional black hole mergers, with the most recent one detected in tandem with the Virgo observatory in Italy.



This is the second time the Royal Swedish Academy has awarded a physics Nobel related to gravitational waves. The 1993 prize went to Joseph Taylor Jr and Russell Hulse, who inferred the emission of gravitational energy from the orbital decay of a binary pulsar system (see *Physics Today*, December 1993, page 17).

But the 2017 prize is not so much for confirming Albert Einstein's century-old prediction of gravitational waves as for opening up a new field of astronomy. The four detections by the LIGO–Virgo team have already informed physicists about gravitational-wave polarization and black hole spin and mergers. Future discoveries by LIGO, Virgo, and their ground- and space-based successors should provide insights about cosmic evolution, neutron star mergers, supernovas, and other phenomena, some of which are largely inaccessible to traditional light-capturing telescopes.