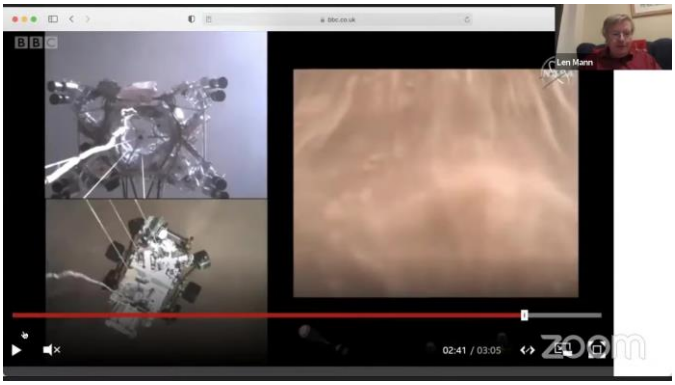
South-West Herts Astronomical Society Newsletter Mar. 2021

Notes of our online meeting on 29th January 2021

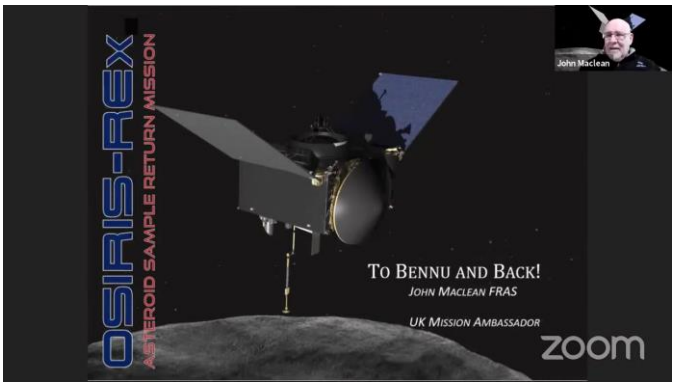
By Richard Westwood

Astro-news presented by Len Mann

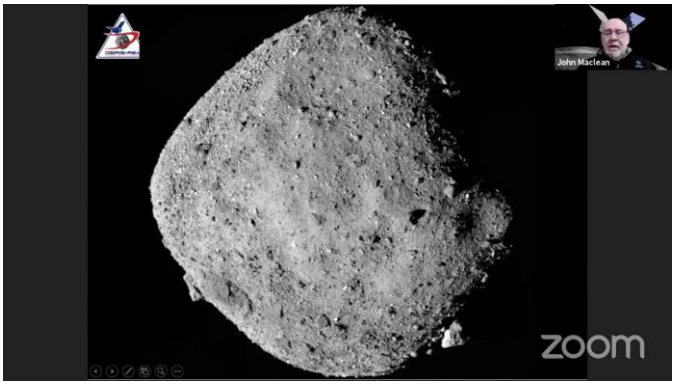


Len Mann gave an account of the arrival on Mars of the Perseverance rover and its Mars-exploring helicopter. He made the very apt comment about the construction of the rover, comparing it to Meccano – I well remember that – why did the nuts and bolts come lose so quickly? At least the rover survived the landing!
He pointed out the very advanced nature of this mission, even to sounds – actually from Mars!
And with the helicopter (Ingenuity) this rover will be much more versatile
We may not be able to visit it for some time; but for the first time we have got a real sense of 'being there'.
Thanks Len

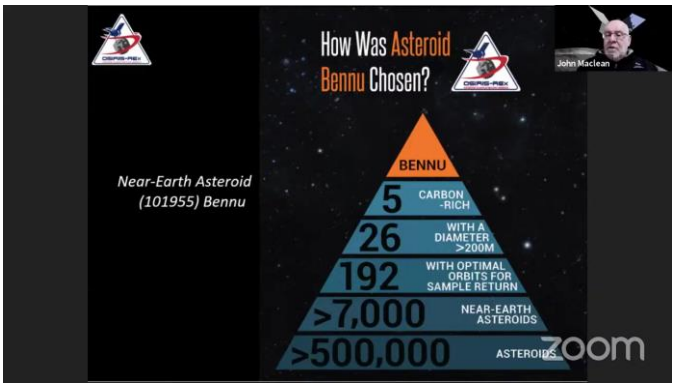
NASA Osiris-Rex – To Bennu and back - John Maclean FRAS



John explained to us that this mission was designed to obtain a sample of an asteroid and return that sample to Earth. There are several good reasons for doing this, which is, after all a very expensive operation. The first, and most scientific reason is that asteroids and comets contain material that dates from the very early history of the Solar System; also, they can contain water. The more practical reason for visiting asteroids and comet is that they can, and do cross the Earth's orbit. In the past, it was thought that these bodies were solid; but now we know that they are basically 'flying rubble mountains. They may seem easier to deflect from the Earth, or not cause so much devastation. However, the reverse is true: an impacting rubble pile would act like shrapnel over a huge area.

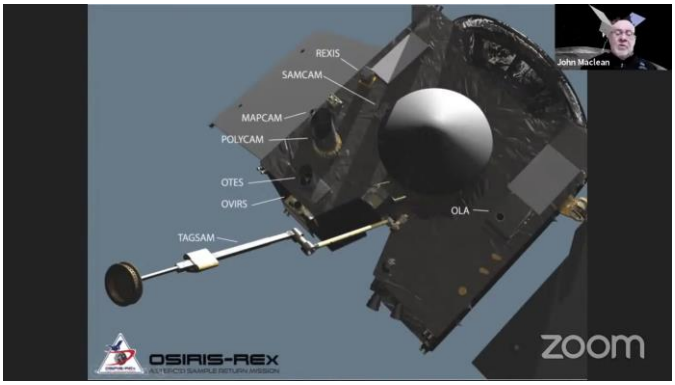


One possible method, suggested by John of deflecting the asteroid would be to capitalise on the Yarkovsky effect: differential solar heating cause an asteroid to spin; the direction of spin causes a gyroscopic effect on body. The direction of spin alters the orbit – either in towards the Sun or away out of the Earth's orbit.
However, to exploit this part of the surface needs to be whitened to change the thermal characteristics.
Bennu was carefully selected from a large number of possible targets: it was picked for several reasons: smaller than 200m, carbon rich, near Earth orbit, possibly water-rich and potentially an Earth grazer.
Known facts include; a rotation of 4.3 hrs, a 436.0-day orbital period – and it's a rubble pile.

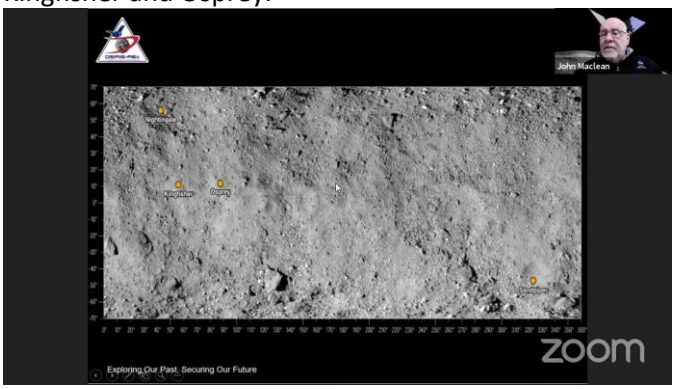


John Maclean FRAS, is very well qualified to give this talk on this mission as he is not only a professional astronomer; but was one of the first scientists to become involved in this multi-national project which has become part of NASA's 'New Frontiers' missions. He told us that Bennu is named after an Egyptian deity linked with the Sun, so the spacecraft was named Osiris- Rex, an acronym for Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer.

The spacecraft is quite small; a 2m square box and has 5 instruments, three of which are cameras; Polycam, for visible light hi-res imaging, Mapcam, searching for outgassing plumes and satellites, imaging in RBG and infra-red, also hi-res imaging of possible sample sites; and Samcam monitors the sample finds. Other instruments include OVIRS, a spectrometer which maps minerals and organic substances on the surface between 400-4300nm. OTES is a thermal emission spectrometer working in the infra-red. REXIS images in the X-Ray region. There is also a laser-altimeter (OLA) to map topographic features There are two solar panel arrays to provide power. There are 28 thrusters on this craft to achieve the very delicate and precise navigation needed to complete its mission.
The sample equipment (TAGSAM) has a large collection box; and attached to it is a collecting scoop, the design of which is based on a human arm; the scoop engages with the surface and with the aid of a blast of nitrogen to dislodge the material and then deposits the sample in the collection capsule.



As John explained, the craft was launched from Cape Canaveral on 8th September 2016 and rendezvoused with Bennu on 3rd December 2018. The first images were very much of a shock: it seemed that the craft had arrived at the wrong asteroid! Bennu is strikingly similar to Ryugu previously imaged by Hayabusa 2. However, it was quickly realised that they were at the right place. At first the craft mapped the surface and completed a topological survey. This revealed a Regolith of rubble and boulders and even material from asteroid Vesta! The mineral pyroxene was found to be abundant and the material is highly hydrated. At the same time three possible sample sites were selected: Nightingale, Kingfisher and Osprey.



Nightingale (a 30m crater) was selected for the touch and go (TAG) sample and several trial runs were made. Finally, on 20th October 2020 the sample arm was deployed and a small amount of regolith was taken. Immediately afterward a cloud of debris was seen: at first it was thought that the scoop had lost its sample; but it was realised that the flap was not closing, due to projecting rocks it was over-full. This meant that the mission controllers decided to cancel the spacecraft spin, which would have determined the weight of the sample.

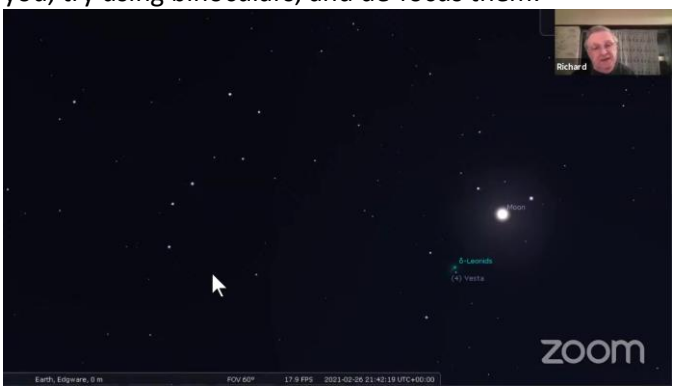
This part of the mission will end in May, when Osiris-Rex completes an orbit of Bennu to attain the plane of the Earth's orbit, and despatch and landing in Utah, of the capsule will occur in October. What about the rest of Osiris-Rex? Well, that's of to visit Apophis, its next port of call.
Meanwhile, scientists will be analysing the rock samples from Bennu.

Thanks to John Maclean for a very interesting talk, from one of the mission's leaders.

Observer's Corner
By Richard Westwood

Another month has gone by with few opportunities to observe the sky! I only had two sessions myself!
April is not as cold for observing: to offset that, we lose Orion and the bright stars of winter. Only Capella is visible in the northwest and Gemini, with Castor and Pollux is still high in the sky. This is a good time to compare the colours of three bright stars, all at the same altitude: Vega, Arcturus and Capella. All are subtly different; Vega is blueish white; Arcturus is orange and

Capella appears yellow. If the colours don't appear to you, try using binoculars, and de-focus them.



On the zenith is Ursa Major; this is the best time to look for M81 and M82, close to the star 24 UMjr they are well seen in large binoculars and present a fine sight in a 6" reflector. It's even possible to see that they are not the same: M82 has a much more disturbed appearance and M81 has a much more oval shape. If the night is very clear you might be able to see M101, a face-on spiral floating above the 'handle stars ε and ζ. I have seen this galaxy, a long time ago, so reserve this for a very good night sky or try imaging it if you can!
A beautiful bright double star lies in Boötes, that's ε Boötis, a bright yellow primary and blue secondary – but – you'll need a high-power eyepiece
You will need to be an early riser to see the planets this month; Jupiter and Saturn are low in the pre-dawn sky.
More next time!
Richard W

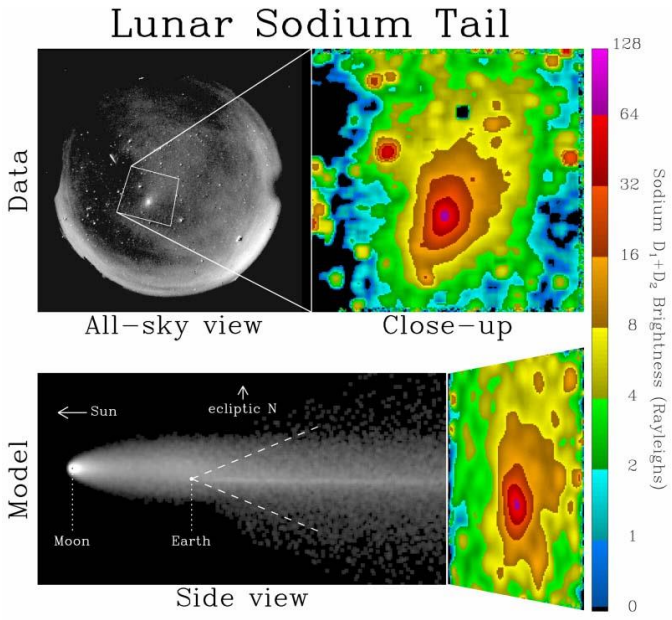
Is the Moon a comet?
By Graham Marett

No, of course not, but surprisingly the Moon does have a diffuse 'tail', reminiscent of the ionised gas tail of a comet: a new kind of 'moonbeam'.

The discovery of the tail, composed primarily of sodium gas, was first announced by Boston University astronomers in June of 1999. Now, after research based on fourteen years of observations, a new study has been published by the AGU (American Geophysical Union).

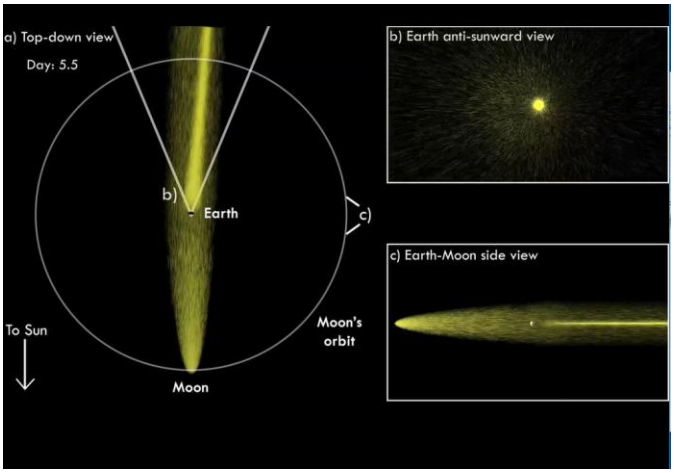
As the diagram shows, the faint tail streams away from the Moon, driven by the pressure of the Solar wind. This means that once a month, at New Moon, the Earth is in line with the tail. The Earth's gravity effectively 'focuses' the beam of sodium atoms passing our planet. The result is that a small diffuse spot of light appears in the sky in the opposite direction to the Sun and the Moon.

But don't rush out and start looking for it: although quite large (several times the apparent diameter of the Moon), the spot is extremely faint, at least 50 times fainter than can be seen by the naked eye. Its visibility requires the use of sensitive cameras with filters tuned to the orange wavelength of sodium.



The colourful spectral analysis is from images taken in 1998, a few days after the November peak of the Leonid meteor shower.

The origin of the sodium is the surface of the Moon, where the atoms are liberated by the impact of meteorites, light photons from the Sun, and the solar wind. The faint tail is of no particular significance to the Earth, with very little of the sodium reaching the Earth's surface. The purpose of the study was to determine more precisely the origin of the sodium atoms.



It was found that there is a good correlation between the brightness of the observed sodium spot and the rate of meteor impact, as determined from radar data on Earth. Meteor-fueled moonbeams show us that the Moon has a more dynamic surface than we might imagine, and no doubt many more secrets waiting to be discovered.

Graham

The Winchcombe Fireball
By Graham Marett

Most of you will surely have seen the news reports of the bright fireball seen over southern England on the evening of Sunday, February 28th (it was reportedly also seen over parts of northern France). It was recorded by a number of security cameras which happened to be pointing in the right direction, as well as the automated cameras of the UK's Meteor Observation Network.

From numerous observations the trajectory was quickly computed, and it was predicted that pieces of the disintegrating meteorite could be located in Gloucestershire, particularly in the area centred around the Cotswold town of Winchcombe.

London's Natural History Museum put out an appeal to local residents to be on the look out, and were rewarded with many photographs of the event and of meteorite fragments. One of the first finds was from a driveway in Winchcombe itself, and a diligent search of the area recovered about half a kilogram of meteorite fragments.

Analysis of the samples revealed that they were from a category of meteorites that have orbited the Sun since the origin of the Solar System more than four and a half billion years ago. Not only that, but they are from a sub-category known as carbonaceous chondrites, unaltered since the earliest origins of the Solar System. This rare find caused great excitement, not only for the Cotswold villagers but also for the meteorite specialists at the Natural History Museum.

It is perhaps ironic that complex and expensive missions have been sent to asteroids in space to recover such material: about 5 grams have been recovered from the Japanese Hayabusa2 mission, and about 200 grams are hopefully on their way back from asteroid Bennu, due to arrive in late 2023 (the subject of our talk last month). All we had to do was sit tight and wait, and rocks almost certainly from an asteroid would fall into our back gardens – literally!

Graham

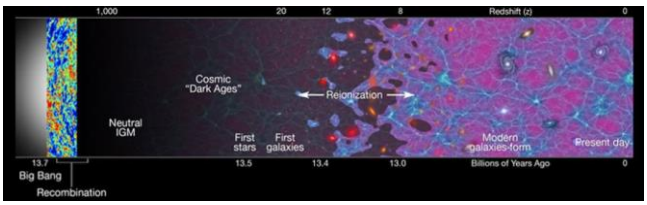
Society Notices

All Meetings at The Royal Masonic School are suspended until further notice.

Our Next Meeting - Friday 26th Mar. 2021 at 8pm

"GALAXIES AND BLACK HOLES IN THE EARLY UNIVERSE" By Dr. Aayush Saxena

Aayush has long been involved in the study of the evolution of the physical properties of very distant galaxies using state-of-the-art optical and radio telescopes from around the world.



This fascinating talk delves into the mysteries and origins of Galaxies and Black Holes in the early universe.

A Zoom meeting link for the event will be sent out to all members two days before the meeting, but if you would like to put a placeholder or reminder on your calendars now, the meeting will take place **on Zoom.**

Meeting protocols

We will allow access to the meeting approximately 15 minutes before the start time of 8pm. This will allow members to "chat" beforehand if they wish to do so.

Once the meeting commences, all mics will be muted to avoid extraneous noises.

You can ask questions at any time throughout the presentation by using the chat function, but to avoid disruption, these questions will be not be answered until the end of the presentation.
You will also be able to ask questions using audio at the end of the talk.

The meeting will be recorded and made available to members on our YouTube channel afterwards.

SWHAS Contacts

Chairman: Sean Meehan
01923 228969
chairman@swhas.org

Membership: Peter Craft
07958 776028
membership@swhas.org

Webmaster: Andrew Lane
webmaster@swhas.org

Content supplied by Richard Westwood, Graham Marett and Sean Meehan
Editing and publishing by Sean Meehan