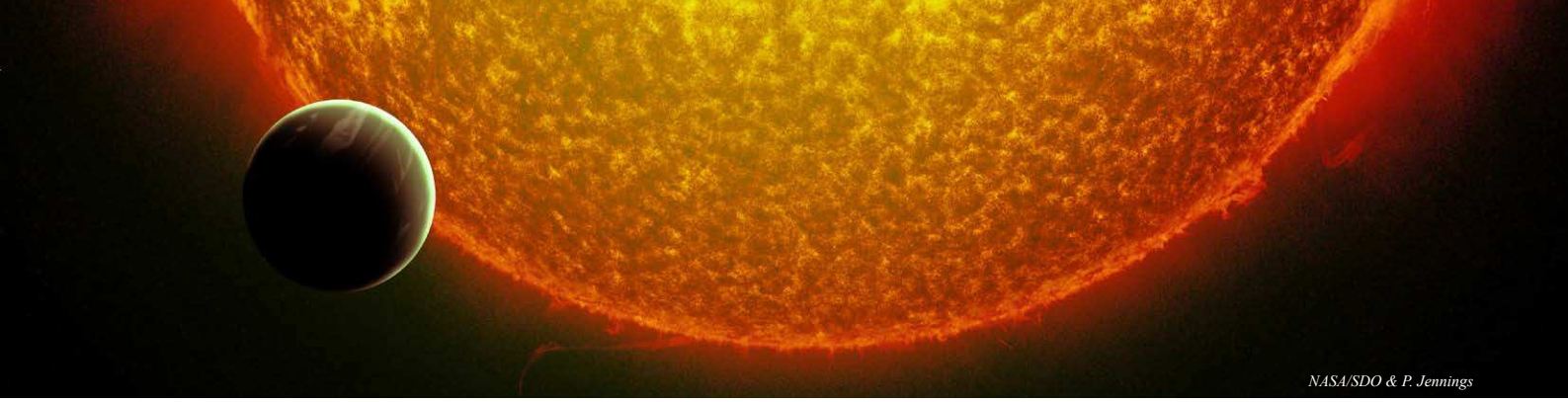


NASA/SDO & P. Jennings

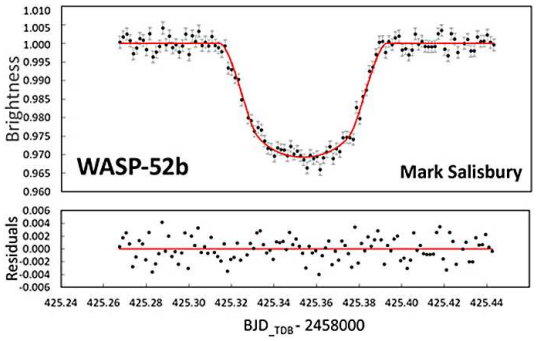
Asteroids & Remote Planets Section Meeting, 2019 September 29

Richard Miles
Director

Thanks to the support of the local Hampshire Astronomical Group (HAG), the Section was able to stage a most successful meeting that attracted some 44 participants despite rather wet and windy weather on the day.

In the previous year we founded an Exoplanets Division within the Section, headed up by Roger Dymock, and so the main theme of the day was exoplanets. Six out of nine talks were on this topic and our main speaker, professional astronomer Anastasia Kokori of the Royal Greenwich Observatory who works with Birkbeck University and University College London (UCL), gave a fascinating account of the new ExoClock Project. This project will involve ground-based exoplanet transit observations to support the forthcoming ARIEL (Atmospheric Remote-sensing Infrared Exoplanet Large-survey) space mission, by updating the transit timing ephemerides of up to 1,000 exoplanets. UCL leads this four-year European mission due for launch in mid-2028. It was very timely to hear that these types of observation will be much needed during the coming years. Our exoplanet initiative has started at just the right time for collaborating with professional astronomers involved in ARIEL.

Richard Miles opened proceedings by giving an overview of Section activities, which have seen significant changes. Asteroid discovery is no longer a realistic prospect for the amateur given the number of large telescopes surveying the sky – the current asteroid count (as of 2019 Nov 2) is 839,908; up from 809,045 just prior to the meeting! Richard outlined the niches where amateurs may contribute, including occultation studies, which are especially effective for distant solar system objects; and studying rotation and surface light-scattering properties *via* photometry, especially main-belt asteroids passing through low phase angles at opposition.



Light curve by Mark Salisbury, using his UK-based 400mm *f*/6.8 ODK telescope and ST10XME CCD camera. Each data point represents a single 120s exposure through an Rc filter. Images processed using *AstroImageJ* and NASA's *EXOFAST* software.

Another niche for the amateur is providing follow-up astrometry of recently discovered near-Earth objects (NEOs) and Peter Birtwhistle gave an up-to-date *exposé* of recent changes to NEO follow-up. Many more faint NEOs are now posted on the Minor Planet Center NEO Confirmation Page, but the majority are too faint to be reached by amateurs. The new Astrometry Data Exchange Standard (ADES) format requires observations to be submitted using a web form. Peter has written a Windows program to take *Astrometrica* output and edit it for submission to the MPC. He also highlighted some very effective software made available by Bill Gray (*Project Pluto*) for achieving accurate camera exposure timing (to ~10ms absolute). It requires short (~0.2s) exposures of global navigation satellites (GNSS), having apparent motion on the sky of 15–30arcsec/s. Astrometry of these images provides a measure of the required timing offset relative to UT.

Roger Dymock opened the afternoon session by exploring the potential for exoplanet activities within the Section, such as transit imaging and analysis, participation in citizen science initiatives (*e.g.* Planet Hunters and TESS), use of robotic telescopes (*e.g.* MicroObservatory Robotic Telescope Network), micro-lensing follow-up, astrobiology and the search for extra-terrestrial intelligence. He was particularly enthused by the possibilities for pro-am collaboration with the ARIEL project, for which Section member Mark Salisbury has agreed to be our contact point.

On the exoplanet theme, Peta Bosley gave an introduction to the topic of astrobiology with the Stephen Hawking quote: 'there is no bigger question in science than the search for extra-terrestrial life'. Peta drew our attention to the importance of understanding the atmospheres of exoplanets, which is the primary goal of ARIEL, and in particular the detection of biosignatures such as infrared reflections of vegetation and various gases. For those wanting to know more, there are now online astrobiology courses offered by a number of organisations in conjunction with universities.

Asteroid occultation studies are increasingly of interest, with exciting times ahead for observers as detailed by our Occultation Coordinator Tim Haymes. Year on year, more observers take up the challenge. Tim described the highlights of 2018–'19, including coverage of the (156) Xanthippe event involving a record total of 19 UK-based observers and 14 timing chords. He maintains a detailed archive of results from UK observers at: **bit.ly/3eYCyNX**.

Photometric observation of exoplanets transiting in front of their host star is likely to be the mainstay work of the Exoplanet Division. One of the foremost proponents of this activity in the UK is Mark Salisbury, who presented the ►

Speakers at the 2019 September ARPS Meeting (left to right): Peta Bosley, Martin Fowler, Steve Futcher, Richard Miles, Mark Salisbury, Anastasia Kokori, Roger Dymock, Tim Haymes and Peter Birtwhistle. *(Photo courtesy of Steve Bosley)*

BAA Ordinary Meeting, 2020 January 25

held at the Institute of Physics, 37 Caledonian Road, Kings Cross, London, N1 9BU

Alan Lorrain, *President*

Bill Tarver, Hazel Collett & Dr Jeremy Shears, *Secretaries*

Alan Dowdell
Meetings Recorder

The meeting was opened at 2.30 p.m. by the President, Alan Lorrain, who welcomed the members to the Institute of Physics building. Before proceeding he said that he would like to thank the Institute of Physics and the Meetings Secretary Hazel Collet, who organised the event but was unable to attend. As has been arranged for previous meetings in this venue, a recording was streamed to members live *via* YouTube.

The Papers Secretary Dr Jeremy Shears could not be present, so the President read out his report giving the title of a paper that had been accepted by Council that day for eventual publication in the *Journal*:

Searching for lunar domes in Sinus Iridium region: identification of a volcanic dome termed L1, by Raffaello Lena *et al.*

He then reminded members of upcoming scheduled meetings, including the Deep Sky Section Meeting on Mar 14 and the Special General Meeting on Mar 25.

The President then introduced the first speaker, Fred Nye, who is a retired consultant physician and a member of both the Association and the Liverpool Astronomical Society. For the last 12 years he has been a regular solar observer.

Latitude movements of solar prominences 2010–2017

Mr Nye thanked Dr Shears in his absence, for his help with this talk which was based on the speaker's two papers on this subject. The first had been already published in the *Journal*, with the second due to appear soon.

He then started his talk by showing a few images of solar prominences and filaments. His work is based on his visual observation of these features, using a PST (Personal Solar Telescope). To record them, he plots their positions on a 150mm disc outline. The analysis of these positions is then performed using Stoneyhurst discs and the software program *Helio 3.2*. He has recorded prominence latitudes obtained by this method for a period of nine years, and the positions of the prominences he has recorded can be used to track the magnetic field boundaries of the Sun.

He described how from his observations that he could monitor the polar boundary migration towards the poles, consistent with the N/S magnetic reversals. This 'rush to the poles' is due to the solar conveyor belt of circulation which flows towards the poles and then dives down below the surface and back to the equator. He showed results of his observations which demonstrate that excess of westward-diverging boundaries peaked at solar maximum, suggesting an interaction between the Sun's poloidal and toroidal magnetic fields.

Mr Nye took a few questions, during which he explained further about his methods of observing and how he got involved in this subject.

After the speaker was thanked, the meeting was paused for a tea break.

On return, the President introduced Dr Julian Onions, who has had a lifelong interest in astronomy as an amateur and has also received a doctorate from University of Nottingham, where he is an astrophysicist. It was there that he started work on astronomical computer models.

Asteroids & Remote Planets Section Meeting (Continued)

Section Meeting participants. ***(Photo courtesy of Steve Bosley)***

► 'What, how and why' of the subject, which is a major growth area for observers across the world. He illustrated the talk with examples of his own transit light curves of WASP-52b and HAT-P-23b, the 0.015mag dip of the latter showing up very clearly when observations from several epochs are combined. Mark explained step-by-step the procedure for optimising observations, including: online planning tools for identifying worthwhile targets, calibration and defocussed imaging using an R filter, and subsequent analysis using the software *AstroImageJ*. Results can be reported to the Exoplanet Transit Database, the BAA Photometry Database, and NASA's *EXOFAST* facility.

Dr Martin Fowler rounded off the day's talks by showing how he has utilised a robotic telescope network, namely the MicroObservatory Network: a group of weatherproof 0.15m aperture remote-controlled telescopes developed and operated by the Harvard-Smithsonian Center for Astrophysics and supported by NASA, to measure exoplanet transit lightcurves. Martin showed that transit timings with routine accuracies of ~2min (s.d.) are achievable with these relatively small-size telescopes. He also outlined a new NASA initiative called the Exoplanet Transit Survey, that is due to go live in 2020.

We have much to look forward to in coming years in studying the nature of asteroids and remote planets, especially exoplanets in orbit around other stars. Richard Miles closed proceedings with a short Q&A session and by thanking all those (especially members of HAG) who organised the meeting at the Clanfield Memorial Hall, as well as Ann Davies and David Boyd for bringing along the BAA Sales stand.