BAA Summer Meeting – Saturday 7th July - Exploring Solar Systems – Near and Far

Speakers Bios & Synopsis: -

Prof Giovanna Tinetti (University College London) - Chemical composition of planets in our Galaxy

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Dr Leigh Fletcher (University of Leicester) - Exploring the Weather of the Giant Planets via Professional-Amateur Collaboration

Bio: - Dr. Leigh Fletcher (@LeighFletcher) is a Royal Society University Research Fellow (URF) and Associate Professor in Planetary Sciences at the University of Leicester, specialising in the exploration of planetary weather and climate using Earth-based observatories and visiting spacecraft. He earned a Natural Science degree from Cambridge, a PhD in Planetary Physics from Oxford, and has since worked as a NASA fellow at the Jet Propulsion Laboratory and as a Research Fellow at Oxford. He was the recipient of the 2016 Harold C. Urey prize for outstanding achievements in planetary science by an early-career scientist, awarded by the Division for Planetary Sciences (DPS) of the American Astronomical Society. He is a co-investigator on the Cassini mission to Saturn, the JUICE mission to Jupiter, and a passionate advocate for future exploration of the distance Ice Giants. He currently leads a planetary atmospheres team at the University of Leicester, funded by the Royal Society, STFC, and the European Research Council. You can follow his research on Twitter (@LeighFletcher) and his website (planetaryweather.blogspot.co.uk).

Synopsis: Exploring the Weather of the Giant Planets via Professional-Amateur Collaboration
Despite four decades of robotic planetary missions to the outer solar system, many crucial questions remain unanswered. Robotic planetary explorers – from the Grand Tour of the Voyagers, to the orbital missions of Galileo and Cassini-Huygens, to the targeted missions of Juno, JUICE (ESA's Jupiter Icy Moons Explorer), and Europa Clipper – deliver astounding views of the complex, ever-changing atmospheres of these giant worlds and their myriad satellites. Today, NASA's Juno spacecraft has revealed astounding chains of cyclones at Jupiter's unexplored poles, a meteorological layer that extends some 3000 km below the cloud tops, and a fluffy core left over from the planet's formation. But each of these missions are relatively short-lived glimpses at worlds that take decades to orbit the Sun. And the Ice Giants, Uranus and Neptune, have only been visited once, by a brief flyby, three decades ago. To address this problem, professional planetary astronomers and amateur observers collaborate to explore the meteorology and climate of these worlds over long spans of time, identifying cycles of atmospheric activity and bridging the gap between robotic missions.

Prof Sara Russell (Natural History Museum) - Rocks from Space: Deciphering the formation of the solar system from Meteorites and space missions

Bio: - Professor Sara Russell is Head of Planetary Materials at the Natural History Museum. Her interests are in the formation and evolution of the planets and the Earth's Moon. She is a Science Team member for NASA's OSIRIS-REx mission returning a piece of asteroid Bennu to Earth in 2023.

Synopsis: - Rocks from Space: Deciphering the formation of the solar system from meteorites and space missions. Most meteorites are fragments of asteroids that formed at the time of Solar System formation. Analysing them has revealed new information about how the planets formed and evolved. The next step for meteoriticists is to go to space to collect our own asteroid pieces, and two current space missions, Hayabusa2 and OSIRIS-REx are currently doing just that. I will provide an update about these missions and discuss their scientific aims.

Alex Pratt (BAA) Confessions of an amateur astronomer - A tribute to Melvyn Taylor

Bio: - Alex's main observing interest is video astronomy, applying video techniques to record transient phenomena. His observing programme includes lunar and asteroidal occultations, meteor showers, astrometry of asteroids, comets and Near Earth Objects. He knew Melvyn for over 45 years and is one of the many amateur astronomers who are thankful to him for his wise guidance.

Synopsis: - His talk will summarise Melvyn's extensive range of observing interests and the roles he served on the BAA VSS Committee, The Astronomer and JAS/SPA. He travelled the country giving talks on visual observing and he was a keen hill walker. The talk will include a few anecdotes from Melvyn's adventures.

Prof David Rothery (Open University) - Icy Bodies

Bio: - In November 2013 I became Professor of Planetary Geosciences. I was a Senior Lecturer in the Open University Department of Earth Sciences since 1994 (transferring to the Planetary & Space Sciences Division of the new Dept of Physical Sciences in August 2011), and before that was a Lecturer here. During 1999-2004 I was Director of Teaching and Geosciences Programme Director. I have also been Leader of the IAVCEI Commission on Remote Sensing, and in 2005 I was appointed to the PPARC Solar System Advisory Panel and the BepiColombo Oversight Committee. In May 2006 I was appointed UK Lead Scientist on MIXS (Mercury Imaging X-ray Spectrometer), which is the only UK Principal Investigator instrument on BepiColombo, the European Space Agency mission to Mercury to be launched in 2018. I became MIXS Lead Co-Investigator in 2014. I chair ESA's Mercury Surface and Composition Working Group. As from 1 March 2018 I am leading the geological mapping workpackage for a the Horizon 2020 Planmap project, which aims to improve European capabiliy in planetary geologic mapping. My research interests centre on the study of volcanic activity by means of remote sensing, and volcanology and geoscience in general on other planets.

Synopsis: - Icy bodies. Within our Solar System, spherical bodies with surfaces made of ice are more abundant than those with rocky surfaces. Under typical cold surface conditions, this ice behaves mechanically like rock and is subject to the same geological processes, so studying them is more akin to geology than to glaciology.
Ice can include frozen volatiles such as methane, ammonia, carbon monoxide or nitrogen, but water-ice is the most abundant form. Some icy bodies, most notably Europa and Enceladus, evidently have internal oceans of liquid water. These provide potential habitats for microbial life, especially where the liquid water rests on top of warm rock because this allows for chemical reactions that could sustain metabolic pathways for 'chemosynthetic' as opposed to photosynthetic, life.

Prof John Bridges (University of Leicester) - Exploring Mars

Bio: - I went to school in Aberdeen then moved on to Edinburgh University graduating with a BSc in Geology in 1988. Following that I went to the Open University graduating with a PhD in mineralogy in 1992. In 1992 I joined the then Dept. of Mineralogy at the Natural History Museum as a research assistant to study meteorites and planetary science. After subsequent periods working at the Open University, UCLA, NASA Johnson Space Center (2003-7) I joined the Space Research Centre in 2007 as a Research Councils UK Research Fellow, to start a new theme of planetary science research at our university, becoming a Reader in 2012 and Professor in 2015.

My research interests and those of my team are interdisciplinary, focusing on planetary materials and the evolution of the Mars surface. We have developed new electron microscopy, synchrotron techniques to analyse microsamples of asteroidal and martian meteorites and cometary grains in response to the challenges of sample return missions like *Stardust*. This research has included detailed analyses of hydrothermal processes in the nakhlite martian meteorites, and evidence for water-rock reaction on the Comet Wild2 parent body. My papers

include some of the most highly cited works on martian meteorites and planetary materials. I lead the only European Mars Science Laboratory Participating Scientist team (2012-), ChemCam investigator (2012- on the Curiosity Rover), Beagle2 team member, HiRISE camera Co-I on Mars Reconnaissance Orbiter, *ExoMars*, *Stardust* cometary return. One of the highlights of my research career so far is being at JPL in Pasadena during the landing of the Curiosity Rover in August 2012 and giving a talk a few hours later by video link to an audience of school children and potential scientists at the National Space Centre.

My teaching has developed in tandem with my research and includes distance learning in Astronomy and planetary science courses for the Open University as an Associate Lecturer 2005-2011. Along the way I enrolled in more courses myself to keep up to date with a rapidly evolving Physical Sciences teaching and research environment. I am committed to public outreach and have been a Project Scientist at the National Space Academy since 2013, and more recently teach in the new Foundation Course for the College of Science. I have introduced many Leicester Dept. of Physics and Astronomy undergraduates, PhD students and interns to planetary materials research and mission involvement.

Synopsis: - Since the earliest telescopic observations of Mars through to the space age, the planet has fascinated us with its hints of an Earth-like past. The desires to explore Mars and look for signs of water and life have motivated space missions from Mariner 4 to Mars Science Laboratory, and the identification and study of over 100 martian meteorites. This in turn has required new images of the martian surface at tens cm scale, and analytical techniques at the micron scale in our laboratories. Preparation for Mars Sample Return and ultimately human exploration will continue to stimulate new advances in planetary and analytical science. Europe, USA, China, India, Russia, UAE are all developing plans to explore Mars.
Using the new remote and meteorite evidence we now have a record of Mars' evolution spanning over 4 billion years and showing a change from a 'warm and wet' environment to today's cold and dry desert. Understanding this great change is a key challenge in planetary science. In this talk I will describe how we are piecing together the puzzle of Mars' evolution with current missions and laboratory analyses, and our plans for future exploration.

Prof Boris Gaensicke (University of Warwick) - Gaia: Transforming Stellar Astronomy

Bio: - Boris Gänsicke obtained his PhD in Physics and Astronomy in 1997 in Göttingen, Germany, and relocated to Southampton in the UK in 2002 on a PPARC Advanced Fellowship in 2002. In 2003, he moved with Tom Marsh to the University of Warwick, where they set up a new Astronomy and Astrophysics group that has grown in the meantime to fourteen faculty members. Boris is an astrophysicist interested in the formation, evolution, and demise of stars and their planetary systems, and his scientific contributions range from model atmospheres for neutron stars to population studies of close binary stars to measuring the bulk abundances of exo-asteroids. He enjoys (sometimes) breaking away from established compartmental structures and straying off beaten paths.

Synopsis: - The only way to measure the distances to stars is via a geometric parallax, making use of the fact that the Earth orbits the Sun. Over a century of work on ground-based parallaxes was limited in reach to a few 100pc, at best, and much of our understanding of stellar physics had to be based on proxy distance measurements. On April 25th, the ESA Gaia mission unleashed space-based astrometric data for over 1.3 billion sources, transforming stellar astrophysics over lunch time. I will illustrate the quantum leap in stellar astronomy that these data enable, and will discuss how future large spectroscopic and photometric surveys will augment our understanding of stars both in quality and quantity.
