

Institute of Physics – L & S E Branch

Retired Members Section

RECENT AND FUTURE DEVELOPMENTS IN PLANETARY SPACE

WEDNESDAY 12 JULY 2017

This meeting has been organised by Stewart Coulter, chaired by Mike Quinton and David Pick.

PROGRAMME

- 10:30 Registration
11:00 Notices
11:05 Dr Robert Massey, Deputy Executive Director: **The RAS**
11:15 Prof John Zarnecki (OU), President of the RAS: **The Cassini Mission**
12:10 Dr Laura McKemmish (UCL): **TWINKLE measuring exoplanet atmospheres**
- 13:00 Lunch: 40 buffet lunches available at £17. Many eating places locally*
- 14:00 Max Alexander (photography consultant to Tim Peake): **The View from Space**
14:30 Abigail Hutty (Airbus Space, Stevenage): **ExoMars**
15:15 Prof Gerry Gilmore (Cambridge): **The Gaia Mission**
16:00 Tea
16:30 Vacate
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Venue: Royal Astronomical Society Lecture Theatre, Burlington House, Piccadilly.
Registration on ground floor. Refreshments and lunch in Council Room on 2nd floor. There is a lift.

Costs: Free, capacity 100. £17 with lunch (for the first 40). Space is limited.

This is a London & SE Branch meeting and is open to visitors and the public free of charge.
Capacity limits numbers to 100. To register on the London and SE IOP website please visit:

<https://www.iopconferences.org/iop/frontend/reg/tOtherPage.csp?pageID=636899&eventID=1086&eventID=1086>

Note: this link might require copying and pasting into the address box of your browser.

Dr Robert Massey, Deputy Executive Director: The RAS

Robert is well placed to tell us about the role of the RAS as he has been Deputy CEO at the RAS since 2006. Prior to that he had spent 8 years as Public Astronomer at the Royal Observatory Greenwich. Both these roles have entailed engaging with the public and communicating on a broad swathe of issues. Prior to the ROG he completed his PhD in Astrophysics at Manchester on the formation of stars and planetary systems in the Orion nebula followed by a brief period in education. His skills and experience in politics and the media combine well with his science background to make him an influential advocate for astronomy and astronomers in research, education and public engagement on behalf of the RAS.

Prof John Zarnecki (OU), President of the RAS: The Cassini Mission

Director (part-time), International Space Science Institute, Switzerland & Emeritus Professor of Space Science, The Open University. RAS Council 1995-1998, RAS Vice-President 2009-2011; Institute of Physics Council 2013-2016; PPARC Council 2005-2009 ; Chair, ESA Solar System & Exploration Working Group 2014-2016 ; Chair, UK Space Agency Science Programme Advisory Committee 2012-2014.

Planetary science especially the study of surfaces, atmospheres, comets, cometary dust & cosmic dust by in-situ instrumentation (e.g. Giotto, Huygens, Rosetta). Space & science policy, education and public outreach.

Dr Laura McKemmish (UCL): TWINKLE measuring exoplanet atmospheres

Dr Laura McKemmish is a Marie Skłodowska-Curie research fellow working in Prof Jonathan Tennyson's group at University College London. By training, she is a quantum chemist and molecular physicist, and enjoys using this expertise in innovative and interesting interdisciplinary projects, such as producing data for use in studying exoplanet atmospheres.

From September 2014 to June 2016, her main project was as part of the ExoMol research group producing line lists for VO and, soon TiO, important molecules that contribute significantly to the absorption and radiative properties of hot Jupiter exoplanets and cool M-type stars. Now, her main project is developing new computational methodologies for modelling collisions between ultra cold atoms and diatomic species. In January 2018, she is moving to Australia to take up a lectureship position in the School of Chemistry at the University of New South Wales.

As part of the ExoMol team, she has become heavily involved in the outreach and education aspects of the Twinkle Space Mission project which plans to launch a telescope to characterise exoplanetary atmospheres. In particular, she has taken over leadership of the Original Research By Young Twinkle Students (ORBYTS) program in which young PhD students and post-docs work with high school students to produce original,

publishable research. The first ORBYTS paper has recently been published in the Astrophysical Journal Supplementary Series with three student co-authors. The research provides key spectroscopic data for TiO, a key molecule in red dwarf stars (such as Proxima Centauri and TRAPPIST-1) whose absorption properties must be understood before we can characterise the potentially habitable exoplanets around these stars.

If it is okay, I will send you an abstract for the talk on Monday.

Max Alexander FRAS (photography consultant to Tim Peake): The View from Space

Editorial photographer Max Alexander has photographed icons from the worlds of science, astronomy and politics, including Neil Armstrong, Stephen Hawking and Nelson Mandela. Originally from New Zealand, Max has worked for a large number of prestigious organisations around the world for over twenty-five years.

Max specialises in science communication through photography, the subject of two high profile exhibitions at the Royal Albert Hall in London for UK research councils in recent years. *Explorers of the Universe* was a major project for the International Year of Astronomy 2009, and *Illuminating Atoms* was for the International Year of Crystallography in 2014.

He is the UK Space Agency's freelance photographer, with other clients including STFC, European Space Agency, European Southern Observatory, BBC, and numerous publishers. In the charity sector, Max has worked for The Children's Society for over a decade, telling the stories of young carers' lives – as a former young carer himself. His acclaimed *Hidden* portrait exhibition was shown at the Oxo Gallery and Royal Festival Hall on the South Bank, and also at Winchester and Ely Cathedrals.

Abigail Hutty (Airbus Space, Stevenage, formerly Astrium): ExoMars 148

Abigail Hutty is one of the most exciting and accomplished young engineers working in the UK today. Her command of the subject and her commitment to the profession have helped her fulfil the requirements of Fellow to which she was elected whilst still in her 20s taking half the time most Fellows need to achieve the requirements. In 2012 she joined the ExoMars Rover Team becoming Lead Spacecraft Structures Engineer in 2014.

Her passion for Mars Rovers was ignited by Beagle II . She was awarded a scholarship to the University of Surrey, graduating with an MEng in Mechanical Engineering in 2010. While at Surrey she spent several years on the restoration of the Brooklands Museum Concorde.

She then worked at Surrey Satellite Technologies Ltd (SSTL) as an award-winning intern before moving to Airbus Defence and Space, where she continued to develop her experience as a stress engineer.

extends beyond the workplace and she has become a recognised authority on the subject. As well as an appearance on Stargazing Live she presents lectures at science fairs and for Institution events. She describes Mars Rovers as ‘my favourite subject’ and has constructed models in paper, knitting, snow, gingerbread - and even a carved Hallowe’en pumpkin!

Abbie has been a STEM Ambassador since 2010 and has held several mentor roles at the Engineering Education Scheme, the Arkwright Scholarships Trust and the Institution, supporting applicants for professional registration.

She said: “I was very fortunate to find engineering as a career path. It is a profession I’m truly passionate about, and thoroughly enjoy. I’m determined to do everything I can to give young people both the inspiration and the information they need to understand whether they would enjoy a career in engineering too.”

Abbie is a committee member of the Institution’s Aerospace Division and the IET Satellite Applications Network, and a former board member of the Institution’s Eastern Region Young Members’ Panel.

She was recognised as one of the Institution’s Vision Awards winners in 2013 and was IET Young Woman Engineer of the Year 2013. She was among those given an Engineering Rising Star Award by the Royal Academy of Engineering in 2014. In 2015, Abbie was invited to the ceremony at Buckingham Palace for the Queen Elizabeth Prize for Engineering.

She said: “To be able to meet the Queen in my capacity as an engineer really emphasises how well respected a career in engineering can be.”

Abbie explained that, since becoming chartered, she had aspired to become a Fellow and recently realised that she seemed to fulfil all the requirements. Close colleagues who are also Fellows of the Institution encouraged her and supported her application.

“At the time, I had no idea what age was normal to become a Fellow – otherwise I doubt I would have had the audacity to apply so soon!

"I would encourage anyone wondering about becoming a Fellow to find out more. If you are working in a role that allows you to demonstrate all the required attributes for fellowship, then why not give it a go? Or, think about how you could guide or grow your role over the next few months and years to develop those areas – it can only do your career good to be growing your skills base!"

Abbie doesn't think Fellowship will change her role on the project she loves, but could have a positive effect on her future. She intends to keep on pursuing excellence and has ambitions to be an engineering manager on a space mission. She is also determined to continue encouraging others to find out more about careers in engineering.

Prof Gerry Gilmore (Cambridge): **The Gaia Mission**

Abbie was inspired to pursue a career in science and engineering by the Beagle 2 Mars lander programme, and gained her Masters' Degree in Mechanical Engineering in 2010 at the University of Surrey. Here she received several awards and prizes, including for her placement year at SSTL, her Masters' thesis on the use of composites in spacecraft structures, and for the highest graduating mark in the department.

Abbie joined Astrium at Stevenage, now Airbus Defence and Space, as a Mechanical Engineer in 2010, moving to the ExoMars rover team as a Spacecraft Structures Engineer in 2012. Abbie spent 5 years as the lead structures engineer for the Rover Vehicle, coordinating a team of design specialists, and responsible for producing a structure design meeting all of the functionality required of such a mission. Following successful delivery of the first full structure, Abbie has recently taken on the role of Platform Delivery Manager for the Rover. In this role she is responsible for all of the subsystems on the Rover Platform being delivered, tested and integrated together to create the first build of the Rover, used for structural and thermal testing to prove the design performs as expected.

Alongside her day job, Abbie takes on many STEM Education and Outreach roles, talking about the mission and her role to students and the wider public in order to promote engineering careers and the study of STEM subjects to the next generation. She has appeared in numerous print, radio, and televisual roles in her capacity as an ExoMars Engineer, including on the Sky at Night, the Royal Institution Christmas Lectures, and on Stargazing live with Brian Cox and Dara O'Briain. In 2013 she was selected as the IMechE's Young Member of the Year and later named as the IET's Young Woman Engineer of the Year, followed by the accolade of "Rising Star 2014" from the Royal Academy of Engineering. A chartered engineer through the IMechE, as well as a member of the IET, in 2016 Abbie was elected Fellow of the Institution of Mechanical Engineers, the youngest individual in the Institution's 169 year history to achieve this status at only 29.

An overview of the ExoMars rover, just in case you need it:

Establishing if life ever existed on Mars is one of the outstanding scientific questions of our time. To address this important goal, the European Space Agency (ESA) has established the ExoMars

programme. This programme comprises two missions; one consisting of the Trace Gas Orbiter plus an Entry, Descent and landing demonstrator known as Schiaparelli, both of which arrived at Mars in October 2016. The other part of the mission, the main surface exploration mission featuring Europe's first Mars rover, has a launch date of 2020.

The 2020 mission will deliver a European rover, built in the UK by Airbus Defence and Space, and a Russian surface platform, to the surface of Mars. The ExoMars rover will travel across the Martian surface to search for signs of life. It will collect samples with a drill and analyse them with next-generation instruments. ExoMars will be the first mission to combine the capability to move across the surface and to study Mars at depth.

And scope of talk (titled “ExoMars Rover: Engineering for the Red Planet”):

ExoMars is Europe's first Rover mission to Mars – a mission in search of life, past or present, to answer one of mankind's big questions: are we alone in the Universe? AbbieHutty, Platform Delivery Manager for the rover, will talk through what the mission's aims and objectives are, what some of the major challenges and design drivers of a mission to Mars are, and how the team are engineering solutions to meet those challenges.