National Astronomy Meeting (NAM) 2025

Monday, July 7, 2025 - Friday, July 11, 2025

Teaching and Learning Centre (TLC)

Parallel and Lunchtime Session Details

Details of each selected parallel session and lunchtime session for NAM are listed below including organiser details. Note a parallel session block is 90 mins and a lunchtime session is 45 mins.

The **parallel sessions** have been put into categories to ease navigation. However, note, these categories are not inclusive but more indicative; i.e., a session can in principle fall into 2 or more of the categories. The following categories have been used:

o Cosmology and large-scale structure
o Engagement (covering a wide range of activities)
o Facility (for facility based research that doesn't fall into a single science category)
o Galaxies and star formation
o High energy and transient phenomena
o Instrumentation
o Professional (covering a wide range of professional skills, practice, and behaviour topics)
o Solar
o Stellar and planetary (including exo planets)
o Techniques

The **lunchtime sessions** are placed in their own category but cover a wide range of topics including engagement, facility, instrumentation, and professional practice/behaviour. Note, most lunchtime sessions do not accept submitted contributions: see the lunchtime descriptions and titles to identify those that accept abstracts.

COSMOLOGY AND LARGE-SCALE STRUCTURE

These sessions are mainly focused around cosmology and large-scale structure science. Note similar science may also be covered in other categories, particularly the facility category.

Theoretical and observational approaches to the Hubble tension

Organisers: Indranil Banik, Harry Desmond, Eleonora Di Valentino, Tom Shanks

Cosmology is currently in a crisis due to the Hubble tension, the observation that redshift rises about 10% faster with distance than predicted in ΛCDM with parameters calibrated to fit the CMB anisotropies. This session would bring together researchers working on various aspects of the Hubble tension. Recent observational advances allow distances to be measured in several ways beyond the traditional route using the Leavitt law and supernovae, while precise CMB results can now be obtained without Planck data. Besides the CMB, cosmological constraints have recently been provided by novel probes such as the dispersion measure of fast radio bursts, cosmic chronometers, and accurate estimates of the age of the Universe from the oldest stars. Proposed solutions to the Hubble tension either argue that distances in the nearby Universe have been systematically underestimated, raise the present expansion rate at the background level, or assign the steep local redshift gradient to peculiar velocities, as would arise from outflows due to a large local void – as indeed suggested by galaxy number counts and bulk flows. Solutions at the background level can modify the sound horizon at recombination, as done by early dark energy models. Or they can involve a late-time modification, possibly due to the dark energy density changing with time. This is actually suggested by the latest baryon acoustic oscillation data. The proposed parallel session would allow especially early career researchers working on these and other aspects of the Hubble tension to present their work and learn from each other.

Session type: Parallel session: 1 block

Galactic Foregrounds at Low Frequencies and CMB Cosmology: Current Challenges and Opportunities

Organiser: Patrick Leahy; co organisers: Clive Dickinson, Vasundhara Shaw

Galactic foreground emissions in the Milky Way below a few 10s of GHz are dominated by three mechanisms: synchrotron radiation from cosmic ray electrons interacting with magnetic fields, free-free emission from electron-ion interactions, and anomalous microwave emission (AME) from rotating dust grains. These emissions are observed through Stokes parameters: I (total intensity), Q and U (linear polarization). Large-scale polarized emission primarily comes from Galactic synchrotron emission and thermal dust at higher frequencies.

Understanding these foregrounds is critical for decoding Galactic magnetic field structures governing Galactic dynamics and ultra-high energy cosmic ray propagation, while being fundamental for CMB cosmology research, particularly in detecting B-modes and analyzing 21-cm cosmological signals.

Recent multi-band radio surveys have revolutionized our approach through key initiatives like C-Band All-Sky Survey (C-BASS) at 5 GHz, QUIJOTE Wide Survey (11-20 GHz), Simons Observatory (27-280 GHz), and the upcoming LiteBIRD satellite mission (40-400 GHz). These observations enable comprehensive examination of Galactic foregrounds across frequencies, advancing both CMB foreground separation and our understanding of Galactic magnetic fields.

This research field exemplifies the convergence of observational capabilities and theoretical advances, fostering collaboration between CMB cosmology, 21 cm intensity mapping, and ISM physics communities. This session will feature keynote presentations on survey status, Galactic magnetic field physics, and radio foregrounds' impact on CMB science. Subsequent focused presentations and poster sessions will showcase ongoing research, followed by structured group discussions. The hybrid format ensures global participation through focused presentations, poster sessions, and structured group discussions, reflecting the field's international significance.

Session type: Parallel session: 1 block

Intracluster light: illuminating the next generation of galaxy cluster science

Organisers: Jessica Doppel, Stephane Werner, Mathilde Jauzac

In the era of next-generation telescopes such as JWST and Euclid, high-resolution, visible-by-eye images of the diffuse intracluster light (ICL) of galaxy clusters are becoming increasingly abundant. This component of galaxy clusters is comprised of stars, including star clusters, stellar remnants, gas, and dust that do not belong to the individual cluster galaxies, but rather to the overall cluster itself. The ICL has been positioned as an extremely valuable tool for understanding many properties of galaxy clusters, e.g. their dynamics, accretion histories, and shapes. Indeed, the existence of ICL itself provides a testing ground for the hierarchical formation scenario predicted by

our current cosmological paradigm. By tracing the assembly history of galaxy clusters, ICL components serve as tracers of galaxy cluster dynamics. It can thus be used to trace their dark matter distribution of clusters and act as a new dark matter probe.

Combining the incoming wealth of ICL observations and the push towards higher resolution galaxy cluster simulations has the potential to lead the field not only towards a more detailed understanding of our current datasets but also towards answering still-open and key questions: How do we quantify ICL? What is the best way to measure ICL? How does ICL evolve with time? How can ICL be used to probe dark matter? We aim for this session to address these open questions and identify scientific gaps in this emerging research field.

Session type: Parallel session: 1 block

The Golden Era of Gravitational Lensing: from Micro to Macro

Organiser: Maximilian von Wietersheim-Kramsta; co organisers: Aristeidis Amvrosiadis, Djuna Lize Croon, Leo Fung, Harshnoor Kaur, David Lagattuta, Samuel Lange, Gavin Leroy, Richard Massey, Nency Patel, Kai Wang

From the distortions of the images of stars due to exoplanets to the coherent warping of the relic radiation from the Big Bang, gravitational lensing (GL) is a phenomenon ingrained in the laws of gravity allowing us to probe astrophysics over a wide range of scales. Upcoming surveys, such as Euclid, Rubin LSST, SKA and Roman, will for the first time map weak GL over the whole sky from billions of sources. Simultaneously, instruments such as JWST, ALMA, ELT and HWO will observe strong GL with unprecedented resolution, while LIGO/VIRGO, LISA and IPTA can measure the impact of GL on gravitational waves. Truly, we are on the cusp of probing gravity, the nature of dark matter and the evolution of the Universe over untested regimes with unparalleled precision.

To mark this golden era in the field, we will bring together expert GL modelers, theorists, and observers to showcase and discuss their research. The session will focus on the scientific impact of GL probes: how they will inform novel theories, prepare the next generation of simulations, and improve data analysis techniques, while addressing current tensions. Through contributed talks, we will hear about a wide range of GL subfields with the aim of fostering collaboration and awareness within the field.

Session type: Parallel session: 2 blocks

A multi-scale and multi-tracer view of the cosmic web

Organisers: Rita Tojeiro, Alyssa Drake, Meghan Gray, Andrew Pontzen, Tianyi Yang

The cosmic web is the characterisation of the matter distribution in the Universe into distinct environments – nodes, filaments, sheets, and voids – that are shaped by the anisotropic nature of gravitational collapse. Each distinct cosmic web environment has been shown to play an important role in the evolution of dark matter halos and galaxies via a variety of complex, multi-scale physical processes. The collective impact of these environments on galaxy and halo transformation is fundamental and diverse: for example, depending on scale, cosmic web environments can sustain galaxy and halo growth, but also inhibit it through stripping or tidal effects.

Our ability to study this impact is driven by rapid advancement of larger, denser, and deeper

spectroscopic surveys alongside new generations of cosmological hydrodynamical simulations. We invite talks that consider the evolving anisotropic environment of galaxies and halos from the scales of the circumgalactic medium to that of massive clusters, and that trace the cosmic web via gas, galaxies, dark matter, or galaxy-CMB crosscorrelations. The goal of this session is to bridge research across scales and tracers, in simulations and in observations, such that the UK community can progress on questions such as:

o How do cosmic web environments influence galaxy and halo evolution across scales?
o How can cosmic web environments traced through different methods be compared?
o What links the anisotropic circumgalactic medium to larger-scale cosmic web structures?
o How do galaxies and halos transform as they traverse cosmic web environments?
o How does the cosmic web drive transformations over cosmic time?

Session type: Parallel session: 2 blocks

ENGAGEMENT

These sessions are mainly focused on broader engagement activities.

Engaging with industry

Organisers: Ariadna Calcines Rosario, Nazim Ali Bharmal, Deborah Malone

A session to facilitate interaction between the latest developments of industry and the demands of the astronomical community for the on-going and future projects. All companies participating in the exhibition will be offered a slot to present their company and their developments, followed by a discussion between industry and scientists.

Session type: Parallel session: 1 block

Lunar Classroom in Meteorite Lab: How to Develop Formal Education about Moon Exploration through Lunar Meteorites and Historic Artifacts about Outer Space

Organiser: Exodus Chun-Long Sit

In the traditional pedagogy surrounding Moon-related subjects, the conventional method typically involves direct instruction from textbooks, supplemented by official news clips, simulated videos, and Moon-themed presentations. However, for students, comprehending the historical narrative of space missions and human lunar ventures through these conventional channels can feel abstract. The "Outer Space Classroom in Meteorite Lab" educational initiative within schools has introduced a diverse array of interactive and specialized science communication tools. These include 3D-printed lunar models, scale replicas of spacecraft utilized in human lunar missions, samples of lunar meteorites, official space photographs depicting human lunar landings, miniature models of spacesuits, and interactive exhibits showcasing lunar craters. This multifaceted approach empowers students to actively connect with the significant milestones of human lunar exploration, embedding them within innovative science education and STEAM activities. Such a methodology not only encourages students to delve into astronomy, planetary science, and astrophysics but also fosters multisensory and varied learning encounters.

Session type: Parallel session: 1 block

Engaging the public with astronomy: what really works?

Organisers: Robert Massey, Andy Newsam, Lucinda Offer

40 years ago the Royal Society published its seminal report on what was then described as the “Public Understanding of Science”. Scientists moved first to public engagement, and more recently invited leadership from underserved communities, for example in the RAS 200: Sky and Earth and STFC Wonders schemes.

Few researchers now doubt the importance of public engagement. One slightly crude metric of its success is the popularity of astronomy undergraduate courses, with the number of students accepting places on these programmes growing from 581 in 2007 to 1795 in 2022.

On the other hand the field still has huge challenges in diversity. The 2023 Survey of the Demographics and Research Interests of the UK Astronomy and Geophysics Communities notes that women made up around 27% of lecturers in both astronomy and physics as a whole, for example, and just 4% of British academic staff were from minority ethnic groups.

So is it time to take a harder look at the effectiveness of the plethora of schemes to engage the ‘public’ with our science? Is the pressure for success preventing us from challenging ourselves to deliver change?

The session will include invited and contributed talks, and at least one panel discussion, thinking about how we can best draw on the incredible new astronomical facilities and space missions either under construction or expected to be operational in the years ahead.

This session will be organised by RAS staff and members of the RAS Education and Outreach Committee.

Session type: Parallel session: 1 block

Crossing Boundaries: The benefits of ArtScience for contemporary astronomy research

Organisers: Ulrike Kuchner, Soheb Mandhai; co organisers: Jenni French, John Paice, Jake Noel-Storr, Houda Haidar

Art and science both expand human knowledge by blending imaginative thinking with analytical decision-making to create original ideas. Despite their historical synergy, fully harnessing their potential in today’s astronomy research is challenging. Ever-growing data, large-scale collaborations, and the rise of artificial intelligence often limit opportunities for creative engagement with complex ideas and data. Artistic methods like virtual reality, music, digital and performance art, offer inclusive ways for exploration, understanding and communication.

While art is widely used for information visualization in outreach and science communication, this session focuses on three less-explored aspects of ArtScience:

o Creativity: ArtScience to contribute to knowledge creation will provide an overview of research and practice into ArtScience for interdisciplinary goals (eg. Kuchner+2023; Birsel+2023).
o Inclusivity: ArtScience to improve research culture and accessibility will highlight artistic methods and tools promoting equality, inclusivity, and diversity (eg. Sensory science clubs for neurodiverse audiences).
o STEAM: ArtScience to support teaching and learning will share STEAM (STEM+Art) practice for education (eg. Aguilera+2024).

We will address key challenges, such as navigating differing disciplinary practices, finding funding, and contextualizing collaborative outcomes. Practical advice will include available UK funding schemes, joining communities, setting shared goals, and evaluating results.

We welcome contributions from astronomers, artists and “hybrids” at all levels that have engaged in or are curious about bridging art and science, either individually or as part of collaborations.

Session type: Parallel session: 2 blocks

Creativity: it’s good for you

Organiser: Lorraine Coghill; co organiser: Ged Matthews

Creativity is at the heart of astronomy, without it we wouldn’t be original, innovate and problem-solve, nor dream of unexpected connections or imagine truly big ideas. It is necessary within the process of research through both the small and large breakthroughs that take our thinking and ideas into the next phase. It can be a measure against group-think, challenge traditional thinking and contribute to better inclusion. It is identified as a key attribute of a researcher and yet creative thinking skills are not necessarily taught, highlighted or nurtured.

In this cross-disciplinary and interactive workshop space, we’ll explore creative thinking and consider how this critical transferrable skill can support our development not simply in our careers (our research, teaching and public engagement), but also within our everyday lives and personal wellbeing. We will investigate different models for creative thinking and discuss how we can lead and encourage creativity in others.

A ‘deconstructed’ panel of creatives from different sectors including science, the arts and education will actively share experiences and involve participants in aspects of their work helping us to explore and unlock creativity during the session. Contributions will come in a range of curious ways, and we invite participants to join in to share their ideas and creative responses.

Session type: Parallel session: 1 block

FACILITY

These sessions are mainly focused around individual facilities or wavebands and cover a broad range of science and other activities and so do not fall into a specific category. Please also check the science specific and other categories for related science and other activities.

Neutrino Multimessenger Astronomy

Organisers: Matteo Agostini, Anthony Brown, Teppei Katori, Ivan Martinez-Soler, Ryan Nichol

With their low interactional cross-sections, neutrinos are able to escape from dense and energetic astrophysical sources. As such, neutrino telescopes afford us a unique view with which to study the most extreme astrophysical events and particles in the Universe. The impact of this unique view can be multiplied if we employ it in a 'multi-messenger astronomy' approach to studying your favourite astrophysical topic. In this session we will look to cover the following topics:

o Neutrino telescopes (existing and future)
o Multimessenger astronomy with neutrinos
o Astrophysical neutrino sources
o Theoretical modelling of neutrino sources
o Interpreting neutrino astronomy observations
o Particle astrophysics with neutrinos

Session type: Parallel session: 1 block

The Dusty Universe - Near and Far

Organisers: Andrew Blain, David Clements, Stephen Eales, Matt Griffin, Pamela Klassen, Seb Oliver, Kate Pattle, Chris Pearson, Dimitra Rigopoulou, Carole Tucker

Dust is a significant constituent of the ISM, is strongly involved in many important processes on all scales, including star formation, planet formation, ISM enrichment, and AGN structure, and hides the physics and chemistry of these processes behind a veil of obscuration. Observations at mid-IR, far-IR and submm wavelengths provide direct observations of thermal emission from this dust and allow spectroscopy to penetrate the obscuration. With the legacy of Herschel, continuing operations at JCMT and ALMA, with JWST allowing high resolution mid-IR observations, we are at a key point in our ability to understand the dust and gas in obscured regions in nearby systems, and out to the most distant objects known. Forthcoming projects, including the Simons Observatory, PRIMA and AtLAST, will provide critical new insights. This session will explore our current understanding of the dust-obscured universe, examining synergies between local and distant universe studies, and assessing what next steps are needed - observationally, theoretically and in instrumentation - to better understand the role and importance of dust and obscured processes in the universe.

Session type: Parallel session: 1 block

Radio Astronomy in the build up to the SKAO

Organisers: Johannes Allotey, Emmy Escott, Catherine Hale, James McGarry, Lucy Oswald, David Williams-Baldwin

The field of radio astronomy will soon be revolutionised by the arrival of the Square Kilometre Array telescopes. Now that the first fringes have been recorded with SKA-Low, and the first SKA-Mid dish is in place, it is time to look to the future of radio astronomy and the scientific opportunities coming up, and to reflect on the state-of-the-art science with precursor/pathfinder telescopes.

The goal of this session is to showcase the breadth of work conducted with SKA precursor and pathfinder instruments, such as e-MERLIN, MeerKAT and LOFAR across a diverse range of science goals, and to provide an opportunity for discussion and connection over plans for future science with the SKA Observatory (SKAO). We also will likely include discussion from invited speakers to update on the SKAO and the Science Regional Centres.

The session will be organised and led by members of the SKAO UK Early Career Researcher (ECR) committee, and will build on the success of the equivalent session at NAM2023.

Session type: Parallel session: 2 blocks

SETI – The Search for Technosignatures, Biosignatures and Beyond…

Organisers: Louisa Mason, Kelvin Wandia, Michael Garrett, Andrew Siemion

The search for extraterrestrial intelligence (SETI) has profound implications in our understanding of the abundance of life and our place within the universe. An increasing number of telescopes – Green Bank, Parkes, Very Large Array, MeerKAT, e-MERLIN – are dedicating time and resources to the goal of finding evidence of intelligent civilisations, known as technosignatures. One of the key science goals of the upcoming Square Kilometre Array (SKA) will be SETI, under The Cradle of Life Working Group.

SETI has largely focused on radio and optical frequencies, with newer methods targeting infrared waste heat leakage. AI and machine learning are increasingly applied to detect anomalies in large astronomical data sets. With the Breakthrough Listen Initiative now based in Oxford and its collaborations with Manchester and other UK universities set to grow, this is the perfect moment for a SETI session at the NAM.

This session will aim to explore techniques in technosignature detection, surveys and telescopes employed to search for extraterrestrial life as well as current and future surveys in exoplanet & biosignature detection. Discussion on strategies to explore the ‘Cosmic Haystack’ across space, frequency and time will promote collaboration in our efforts to detect technosignatures. The overall goal will be to demonstrate UK contributions to the field and expand the national community.

Session type: Parallel session: 1 block

Enabling early science with Rubin LSST in 2025

Organisers: Graham Smith; co organisers: Steve Ardern, Astha, Michelle Collins, Thomas Cornish, Suhail Dhawan, Dimple, Paul Giles, Chris Lintott, Bob Mann, Garreth Martin, Steph Merritt, Mahdieh Navabi, Clara Pennock, Ana Sainz de Murieta, Jason Sanders, Matthew Temple, Roy Williams, Jacco van Loon

The Vera C. Rubin Observatory's Legacy Survey of Space and Time (LSST) will be a major pillar of the UK astronomy programme for the next two decades. Its unprecedented combination of spatial, spectral and temporal coverage enable it to probe a broad range of astrophysical phenomena, across all areas of astronomy, from near-Earth asteroids to distant quasars, the dark energy believed to drive the Universe's accelerating expansion, and much more.

NAM2025 coincides with a major milestone of broad impact across the UK and international communities: the first release of on-sky Rubin data to data rights holders. These data have already been obtained during observations with the commissioning camera in late 2024. Science Verification observations with LSSTCam are also expected to be well underway in summer 2025.

In addition to the parallel session there is also a lunchtime session. We aim to encourage and enable the widest possible participation and engagement with the early data, with a particular focus on early career researchers.

We aim for a balance between five themes, across these five sessions:
o Introduction: Rubin/LSST, LSST:UK, and the international Science Collaborations
o Early career science: plans for early and future science with the Rubin data
o Tutorials and examples: how to access, filter, and manipulate Rubin data
o Community insights: technical and scientific preparations by LSST:UK researchers
o Engagement: an introduction to the LSST:UK engagement programme

In addition to talks from across the community, the sessions will include training, Q+A for early career researchers, a hack session, and a facilitated discussion.

Session type: Parallel session: 2 blocks

Chandra and XMM-Newton at 25 - Utilising Several Decades of X-ray observation

Organisers: Norman Khan, Erwan Quintin, Robbie Webbe, Hui Yang

The X-ray observatories XMM-Newton and Chandra were both launched in 1999, and have been observing near continuously in the 25 years since. Their ability to complement each other has allowed the community to study the X-ray Universe in great detail. In concert with other X-ray instruments, and those in other bands too, the two together have helped to drive X-ray astronomy forward in leaps and bounds over the last two and a half decades.

In this milestone year this session aims to explore what can be, and has already been, achieved with this wealth of information, including the science products and source catalogues, combined containing more than 1,000,000 sources. Once combined with the observations of other instruments like Swift (which celebrates its own 20th anniversary in 2024), RXTE, eROSITA, etc., the community has access to more than half a century of observations of the soft X-ray sky. This session will showcase research that has been conducted using these vast archives, be it population studies, using advances in AI to mine for previously undiscovered phenomena, or developing tools to support the next generation of observatories. We will also bring together experts to discuss new

ways in which they can be further exploited to brighten the future of X-ray astronomy.

With the next planned X-ray observatory, Athena, still at least a decade away, and AXIS and others still awaiting adoption, leveraging the results of XMM-Newton, Chandra, and others to maintain a vibrant X-ray community has never been more important.

Session type: Parallel session: 1 block

Euclid science exploitation in the UK

Organisers: Stephen Eales, Alex Hall, Mathilde Jauzac, Christopher Lovell, James Nightingale, Francesco Shankar

Euclid launched on July 1st 2023, and is the European Space Agency's flagship dark energy mission, mapping the large scale structure of the Universe. Although primarily a cosmology mission, Euclid is expected to be a transformative survey for many different areas of astronomy, including exoplanets, galaxy evolution, and transients. The UK has made significant investments in Euclid, and there is now a large community of researchers either working in the Euclid Consortium or planning to make use of Euclid data.

After the release of the first images, the next outstanding milestone for Euclid will be the first public data release (Q1) around March 2025. The Euclid consortium is now actively working on producing a number of papers that reflect the rich variety of science that can be derived from Euclid data.

This NAM session is dedicated to showcasing how UK researchers are using Euclid data for world leading science, and synergies with other key surveys. The session will also include review talks on the key science areas of Euclid (weak lensing, galaxy clustering, and legacy science), as well as a number of contributed talks from Euclid consortium members and external users. Finally, it will also be an opportunity to look forward to data release 1 (DR1) in 2026, and the exciting science enabled by this next batch of Euclid data.

Session type: Parallel session: 1 block

Revealing the Milky Way with Gaia: Focus on Galactic dynamics in the Gaia era and beyond

Organisers: Paula Gherghinescu, Nicholas Walton; co organisers: Sioree Ansar, Giorgia Busso, Nigel Hambly, Jason Hunt, Sophia Lilleengen, Nicholas Rowell, George Seabroke, Mark Taylor

The ESA Gaia mission is creating a 3-D map of over two billion stars in our Milky Way. Gaia continues to provide new insights into our understanding of the Milky Way. In particular, the field of Galactic dynamics is an example of study that has been revolutionized with the availability of data from the Gaia mission.

It is now possible to directly map the structure and kinematics of all major Galactic components to unprecedented detail and precision. However, many traditional dynamical modelling methods use the Jeans theorem and start by assuming the galaxy is in dynamical equilibrium and axisymmetric.

While these models continue to be valuable in offering a' big picture' view up to large scales, their underlying assumptions can describe our Milky Way to first order only. For example, prominent non-axisymmetric structures such as the bar and spiral arms influence the dynamics of stars far across the disc, while the phase spiral (first revealed in the Gaia DR2 data), the warp, and the perturbation induced by the LMC in the outer halo highlight departures from equilibrium both locally and on the largest scales.

Current models do not fully capture the complexity of the data. With the increase in quantity and quality expected from Gaia DR4 and DR5 (supplemented with data from Euclid, LSST, and more) improved modelling methods are required.

The session will begin with an update from the Gaia:UK project team describing the latest scientific and technical performance of Gaia, developments in Gaia data acess, and giving a look ahead to the rapidly approaching seminal release of Gaia DR4, the full release of the 5 year Gaia nominal mission.

It will then focus more specifically in bringing together researchers working on a variety of novel numerical and analytical tools, as well as expertise in Gaia and associates survey data, to address challenges in improving our modelling techniques. Half block sessions will cover on (a) features and dynamics in the disc, (b) the dynamics of the halo, and (c) the Milky Way in a cosmological context.

Session type: Parallel session: 2 blocks

GALAXIES AND STAR FORMATION

These sessions are mainly focused on science orientated around galaxies and star formation. Note similar science may also be covered in other categories, particularly the facility category.

Barred Galaxies: Unraveling Their Evolution, Dynamics, and Cosmic Role

Organiser: Zoe Le Conte; co organisers: Alex Merrow, Rebecca Smethurst, Thomas Tomlinson

Our understanding of bar formation, evolution, and their interactions with host galaxies is rapidly advancing, revealing new insights into their role in galaxy evolution. Bars are among the most common features in disc galaxies, present in over two-thirds of local spirals, and they influence their hosts by redistributing angular momentum, triggering gas inflows that fuel star formation and potentially feed AGN. Bars also reshape stellar orbits within the galaxy, including the inner regions, outer discs, and stellar halos.

Recent observations from high-resolution surveys like the HST and JWST have provided unprecedented insights into bar-driven evolution across environments and redshifts. Integral field units such as MUSE offer critical data on stellar populations, stellar and gas kinematics, bar-driven star formation and AGN activity, while Gaia enables a star-by-star analysis in the Milky Way.

Simulations complement these advances by modelling barred galaxies with increasing resolution, allowing for detailed studies from high redshifts to the present. These simulations help interpret observational data and improve understanding of stellar chemical evolution and accretion processes, thus facilitating a more accurate interpretation of observational data.

This session will address the still outstanding questions about bar formation, environmental influences on galaxy stability, the kinematics of bars, the role of bars in triggering and fuelling AGN, and bar-driven evolution within dark matter halos. We will discuss how combining high-resolution photometric surveys with cosmological simulations can bridge theory and observations, and how upcoming facilities like MOONS, BlueMUSE, MAVIS, SKA, and ELT will enhance our understanding of galaxy dynamics.

Session type: Parallel session: 1 block

Illuminating the Faintest Galaxies: Dwarf Galaxies as Probes of Dark Matter, Feedback, and the First Stars

Organisers: Alejandra Aguirre-Santaella, Shaun Brown, Ting-Yun (Sunny) Cheng, Jessica Doppel, Isabel Santos-Santos, Joaquin Sureda

Dwarf galaxies are the most numerous yet faintest type of galaxy in the Universe. As the most dark matter dominated systems in our Universe they offer a powerful laboratory to probe the nature of this elusive form of matter and search for potential decay signals. Their observed abundance and distribution can place strong constraints on different dark matter models.

Dwarf galaxies also serve as powerful tools for exploring the limits of galaxy formation, as they form in the smallest haloes. Their shallow potentials provide an excellent testing ground for feedback processes, such as supernovae, stellar winds, and AGN feedback. At the faintest end of the luminosity function, ultra-faint dwarfs are believed to be relics from the epoch of reionization, providing insights into the physics of reionization, the first stars, and early galaxy formation.

In the local Universe, dwarf galaxies offer the most detailed studies of stellar populations, kinematic analyses, and chemical abundances. These observations are critical benchmarks for validating and refining predictions from cosmological simulations. Upcoming facilities and surveys such as Euclid, LSST, Roman, WEAVE, 4MOST, SDSS-V, SKA, CTA and MeerKAT, will soon provide deeper and higher resolution observations for countless more dwarf galaxies, revolutionising our view of the Universe in the low-mass regime.

This session aims to foster interdisciplinary discussion and collaboration between observers and theorists working on dwarf galaxies from the classical to the ultra-faint regime. As a world leader in dwarf galaxy science the UK is well placed to fully exploit this new wealth of data.

Session type: Parallel session: 2 blocks

Basis Function Expansions in Galactic Dynamics and Evolution

Organisers: Jason Hunt, Sophia Lilleengen, Michael Petersen, Eugene Vasiliev

Half a century after their introduction, basis function expansions are seeing a renaissance in galactic dynamics and evolution owing to (1) the ability of basis function expansions to model disequilibria, critical given modern observations in the Milky Way and nearby galaxies, (2) the need for compression and analysis efficiency with the sheer size and scope of modern simulations, and (3) the accessibility of modern software frameworks (agama, EXP, gala). Work over the past decade, often led in the UK, has generated a wealth of technical improvements, enabling wider and more creative applications to analytical, numerical, and observational galactic dynamics.

Some of the earliest uses of basis function expansions in galactic dynamics described systems in analytic terms, capturing complex dynamical mechanisms such as the evolution of spiral arms. Through modern software packages, basis function expansions power rapid N-body integration of idealised systems and detailed dynamical experiments, e.g. the Milky Way-LMC interaction. More recently, basis function expansions enable detailed-yet-computationally-inexpensive representations of galaxy components in cosmological simulations, describing the shape of cosmological halos and their evolution. Further, basis function expansions can also describe images, velocity moments, and chemical fields. These additional uses of basis function expansions are still in their infancy but show significant promise for coupling theoretical and observational dynamics in the large survey era.

The session will bring together developers, practitioners, and learners for a highlight tour of recent results in galactic dynamics and evolution to set the future of basis function expansion usage and development in the UK.

Session type: Parallel session: 1 block

The Role of Star Clusters in Star Formation from Local to Galaxy Scales

Organisers: Anne Buckner; co organisers: Ahmad Ali, Sean Linden, Hektor Monteiro, Steven Rieder, Christina Schoettler, Nick Wright

Star clusters are thought to be fundamental building blocks of our galaxy as most stars form in clustered environments of some sort. As such they provide crucial insights into the physics underpinning star formation from the local ISM to galaxy scales. For example, individual clusters are ideal laboratories to study stellar evolution and the mechanics of N-body stellar systems; while cluster populations can be used to trace galactic structure and investigate the physical processes of galactic evolution.

Unfortunately, the mechanisms of cluster formation, effect local and galactic environmental conditions have on this, as well as clusters longer term evolution,remain unclear. To better constrain them requires a multi-pronged analysis of (1) the internal structure and dynamics of the stellar and gas components of individual clusters; (2) cluster populations, comparing variation in their properties (age, mass, stellar composition) as a function of galactic environment and conditions.

This session will bring together a wide range of observers and modelers in the field of star clusters, from small-scale studies of individual clusters through to galaxy-scale population studies, to build

up a cohesive picture of our current understanding of the critical role clusters play in star formation and the evolution of galaxies. We will focus the discussion around (1) new findings obtained using state-of-the art observations (e.g., Gaia & JWST) and simulations; (2) the best techniques/tools to effectively analyse and compare results from these.

Session type: Parallel session: 2 blocks

Forging the elements: Understanding chemical evolution and stellar populations across cosmic time

Organisers: Conor Byrne, Stephanie Monty, Ankur Upadhyaya, Louise Welsh; co organisers: Nathan Adams, Karla Arellano-Cordova, Andreea Font, Robert Izzard, Chiaki Kobayashi, Christopher Lovell, Katherine Ormerod, Vadim Rusakov, Aayush Saxena, Ragandeep Singh Sidhu, Charlotte Simmonds, Elizabeth Stanway

The origin and build-up of chemical elements in stars, dust and gas throughout the Universe is a fundamental question in modern astrophysics. Addressing this requires understanding stellar nucleosynthesis, stellar evolution and galaxy evolution across all epochs and length scales. Progress hinges on combining constraints from cutting-edge observational facilities with state-of-the-art theoretical models of stars, the Milky Way, galaxies, and the interstellar and intergalactic medium.

The advent of JWST has revolutionized studies of chemical and galactic evolution at the earliest epochs. Interpreting these observations requires advanced stellar, galactic and chemical evolution models encompassing many physical processes, including: nuclear and atomic physics, chemistry and dust formation. Combining and discussing the results from these different areas is necessary to forge a unified model of the early Universe.

One area in which models need refinement is accurately representing the conditions in the distant Universe. Observations of extreme stellar populations such as young, massive stars at low metallicity and future studies with ELT are valuable tools to bridge the gap between high- and low-redshift stellar populations. A close relationship between observations and models is essential; high-quality observations constrain models, while improved models provide better insight into early chemical and galactic evolution.

This session targets these open questions from observational and theoretical perspectives, involving stellar and galactic astronomers. Through short talks and focused discussion, we will bring together the considerable leadership and expertise of UK-based researchers in these fields, gain insight into uncertainties and limitations of data interpretation, and outline a roadmap to addressing these challenges.

Session type: Parallel session: 3 blocks

Star formation across environments: From individual molecular clouds to entire galaxies

Organisers: Eva Duran Camacho, Rebecca Houghton, Elizabeth Watkins; co organisers: Helena Faustino Vieira, Rowan Smith, Thomas Williams

Star formation (SF) is a fundamental process in the Universe, driving processes from the chemical and physical evolution of galaxies down to the initial conditions for planet formation. Local star forming processes, such as stellar feedback, and the larger galactic environment self-interact, altering star-forming conditions within individual molecular clouds and within galaxies globally. However, we still do not have a complete picture of SF across different scales and environments, from both observational and theoretical perspectives.

During this session, we will aim to:
o Link SF studies across different physical scales and environments (i.e. spiral arms, inter arms, galactic centres, and outer galactic regions).
o Improve cross-disciplinary discussions and encourage collaboration between observers and theorists.

The session will be divided into two blocks. The first block will explore resolved SF within individual molecular clouds and their connections to their galactic environment. The second block will provide insights on how galaxy evolution and galaxy-scale structures impact molecular cloud properties and SF within. Each block will consist of a 75-minute series of talks (1 review and ~4-5 contributed), followed by a 15-minute discussion on open questions in the field and how to address them, from both an observational and theoretical standpoint.

With facilities such as JCMT, ALMA, and JWST providing a wealth of new information both in the Milky Way and in nearby galaxies, this session will share the latest results across the star formation community and facilitate discussions between both simulators and observers working across different scales and environments.

Session type: Parallel session: 2 blocks

The ultimate fate of multi-phase gas in galaxies: from giant molecular clouds to the virial radius

Organisers: Bronwyn Reichardt Chu, Thomas Rintoul; co organisers: Alex Cameron, Fred Jennings, Seoyoung Lyla Jung, Hengxing Pan, Martin Rey, Tianyi Yang

The baryon cycle regulates star formation and shapes galaxies across cosmic time. Gas is accreted onto galaxies from the circumgalactic medium (CGM), used as fuel for star formation, stirred up by young massive stars, and expelled out of galaxies by stellar feedback processes, contributing back to the CGM where it can cool and reaccrete. Characterising multiphase gas - its structure and dynamics, the impact of stellar feedback, and its interplay with local, galaxy and cluster scale environments - is a key problem of modern galaxy formation.

There are many challenges in both observing and simulating the full baryon cycle. Gas is impacted over a vast range of scales, from individual massive star winds, ionising radiation and explosions (~pc) to star formation-driven galaxy-scale outflows contributing to the CGM (~100s kpc) and IGM (~Mpc). In addition, gas within and surrounding galaxies is intrinsically multiphase, spanning more than 8 orders of magnitude in both density and temperature. This requires the combination of multi-wavelength observational data and high-resolution simulations on a range of scales to form an understanding of the role of gas within galaxies.

This session seeks to bridge the gap between observers and simulators to discuss recent progress towards tackling these challenges, solidifying our current understanding of questions such as “How can we constrain the physics driving the baryon cycle?”; “What effect does environment have on the multiphase baryon cycle?”; “How can we connect the effects of feedback across scales?”; and “How can we best use numerical simulations to interpret and inform observations of multi-phase gas in and around galaxies (and vice versa)?”

Session type: Parallel session: 2 blocks

Galaxy formation simulations at the Frontier

Organisers: Sarah Johnston, Stephen Wilkins; co organisers: Sownak Bose, Sophie Koudmani, Andrew Pontzen, Sandro Tachella

For over a decade, cosmological galaxy formation simulations have had a transformative impact on modern extragalactic astronomy, becoming indispensable tools for understanding galaxy formation and evolution. This session examines three major frontiers in galaxy formation modelling:

Observational Frontier: revolutionary data from the James Webb Space Telescope has revealed unexpected phenomena – surprisingly abundant bright ultra-high redshift galaxies, early SMBHs, and early quiescent galaxies, and unique chemical signatures – posing challenges to current models. Observations from Webb will soon be complemented by upcoming wide-area surveys (Rubin/LSST, DESI, 4MOST, Euclid), and future observatories (SKA, ELTs, LISA) will expand the scope of observational constraints with unprecedented area, sensitivity, wavelength coverage, and resolution. Together these will provide new opportunities to test and refine models.

Meeting these observational challenges is the Physics Frontier: models are continuing to increase in complexity, adding processes like radiative transfer, magnetohydrodynamics, and more sophisticated modelling of SMBHs and star formation.

Meeting the challenge of more sophisticated models and large volumes is the Scale Frontier: thanks to improvements in code efficiency and access to new facilities, entering the exascale regime, simulations can increase in complexity, resolution, volume, or number; with large ensembles of simulations now allowing the systematic exploration of model parameters.

This session will focus on results from these three frontiers: the observations that are challenging current models and informing next generation models, the new physics being implemented, and the prospects for the future in the exascale regime.

Session type: Parallel session: 2 blocks

HIGH ENERGY AND TRANSIENT PHENOMENA

These sessions are mainly focused around high energy and transient phenomena. Note similar science may also be covered in other categories, particularly the facility category.

Ins and Outs of Accretion: The Consequences of Mass Transfer onto Compact Objects

Organisers: Noel Castro Segura, Melissa Ewing, Scott Hagen, Amy Knight, Martina Veresvarska, Federico Vincentelli

Accretion processes are ubiquitous throughout the universe and play a crucial role in the evolution of astrophysical systems across all size scales. Accretion often occurs in binary systems like white dwarfs and X-ray binaries, which can host neutron stars or stellar mass black holes. Here, the gravitational pull of a compact object draws material from its companion star, resulting in bright emission across the electromagnetic spectrum. The consequences of accretion in binaries are widespread and vital when investigating supernovae progenitors, energetic transients and gravitational regimes. Despite the diversity among accreting systems, accretion itself is scale-invariant. Therefore, gathering the accretion community at NAM is essential to foster discussions of the connections and analogies between different classes of accreting systems and the advancements from forthcoming missions like NewAthena.

In this session, we will discuss the inward and outward flow of mass, energy and angular momentum in white dwarf, neutron star and black hole binaries and their consequences, covering topics from accretion disc radiation and outflows to thermonuclear bursts and quasi-periodic oscillations. Historically, high-energy astrophysics sessions at NAM have combined discussions of accreting binaries with supermassive black holes.

Session type: Parallel session: 2 blocks

Gamma-ray Bursts and their contribution to multi-messenger astronomy, cosmology, and the cosmic star-formation rate

Organiser: Gavin Lamb; co organiser: Kendall Ackley, Dimple, Ben Gompertz, Nusrin Habeeb, Shiho Kobayashi, Joe Lyman, Soheb Mandhai, Conor Omand, Patricia Schady, Nial Tanvir

Gamma-ray bursts are shining beacons that mark the moment of black-hole formation following the violent core-collapse of massive-stars, and the gravitational-wave-driven mergers of neutron-star binaries. The electromagnetic observations of gamma-ray bursts and their accompanying transients (the afterglow and supernova or kilonova) continue to reveal unexpected phenomenology, and generate new questions, some of which multi-messenger probes will answer. One such example is the long held assumption that the population-level bimodality of observed burst-duration clearly indicates the gamma-ray burst progenitor. This has been spectacularly cast in doubt following the discovery of kilonovae (merger origin) following two long-duration gamma-ray bursts (classically assumed to be core-collapse supernovae), GRB211211A and GRB230307A – where JWST observations of the latter, were crucial in determining the merger origin. These transient events originate in extreme astrophysical environments where: heavy elements are synthesised (r-process nucleosynthesis) and thrown out to enrich their host-galaxy (see GRB230307A); space-time is twisted and highly curved (Kerr metric), relativistic jets are launched and matter is accelerated to > 99.995% the speed of light; ionising radiation is emitted in beams from host galaxies out to, at least, z~9.4 (see GRB090429B), within or before the era of reionization; gravitational-waves are combined with highly luminous electromagnetic signals (GRB170817A); and the ideal conditions (large energy densities and magnetic fields, relativistic shocks, neutrino winds, particle acceleration etc.) for astro-particle experiments.

This session will highlight new observations, theory, modelling developments for gamma-ray bursts

and related multi-messenger transients, their influence on their environments, and the discovery potential of new and upcoming instruments.

Session type: Parallel session: 1 block

Physical effects and multi-messenger signatures of energetic particles in galactic environments

Organisers: Ellis Owen, Kinwah Wu

Energetic particles, particularly hadronic cosmic rays, represent a significant fraction of the energy budget in many galaxies. They can deposit substantial energy and momentum within galactic media, influence galactic outflows and the circulation of baryons, and alter the thermal properties of the interstellar medium, potentially regulating long-term galaxy evolution.

Recent theoretical and observational advancements have improved our understanding of the role energetic particles play in galaxy evolution. However, the full implications of their complex, multi-channel feedback mechanisms operating over many decades in energy and across the full hierarchy of galactic structures are yet to be fully understood.

Energetic non-photonic particles are generated by cosmic ray processes in galaxies. They directly carry information about these processes, which are not always accessible through traditional photonic observations. Adopting a multi-messenger approach can therefore reveal crucial new insights about how cosmic rays engage with galaxies. With an upcoming new generation of high-energy multi-messenger and multi-wavelength observatories and experiments, it is timely to discuss how observational strategies and theoretical approaches can be aligned to promote the development of a complete picture of cosmic ray effects in galactic ecosystems.

This session will review the current state of our understanding of cosmic ray processes in galaxies. It will explore on their role in galaxy evolution, promote synergies between photonic and non-photonic domains, and highlight emerging opportunities within the broader context of multi-messenger astronomy.

Session type: Parallel session: 1 block

Active Galactic Nuclei – from ISCO to CGM and from cosmic dawn to the present day

Organisers: Carolina Andonie, Vicky Fawcett, Jiachen Jiang, Amy Knight, Amy Rankine, Matthew Temple

AGN are multi-scale phenomena, with interesting physics operating from the event horizon to the circumgalactic medium. In this session, we will bring together research on different aspects of SMBH accretion physics, AGN population studies, and AGN demographics. In this session we will cover:

Accretion discs, jets and outflows in the centers of AGNs. With the recent launch of Xrism and the ongoing success of existing missions, there is a wealth of data from high-energy telescopes. We

will accept presentations of observational data analysis, observation-related numerical simulations, and theoretical research for this first session. We also encourage presentations of multi-wavelength and multi-messenger observations.

Obscuration in AGNs from both dust and gas, examining the accretion and host galaxy properties of different AGN populations such as obscured AGNs, red quasars, and HotDOGs. What can these different AGN populations tell us about the SMBH-galaxy connection?

Current and future large-scale surveys such as SDSS, 4MOST, MOONS, WEAVE, DESI, LSST, Euclid and LOFAR. These facilities will produce unprecedented samples of millions of AGN. With the UK taking a leading role in many of these projects, NAM is an excellent opportunity to examine the completeness of our AGN census, and the accretion, galactic and large-scale environmental properties of AGN across luminosity, stellar masses, and cosmic time.

Session type: Parallel session: 2 blocks

Explosive Transients in the Present and Future Sky

Organisers:
Aysha Aamer, Edward Charleton, Benjamin Godson, Joshua Pollin, Ana Sainz de Murieta, Xinyue Sheng, Ben Warwick

This session aims to explore the present and future sky of extragalactic transients. These explosive events provide invaluable insights into the universe’s most extreme environments, encompassing phenomena such as the diverse range of supernovae, tidal disruption events (TDEs), and superluminous supernovae (SLSNe). Beyond driving nucleosynthesis and shaping star formation, some of these events also serve as vital cosmological distance indicators.

Despite significant progress, many intriguing questions remain unanswered, and the arrival of extensive surveys like LSST and 4MOST promises to increase this discovery rate by a further order of magnitude. Simultaneously, a new generation of space missions (SVOM, EP) are already providing novel insights and challenges to our understanding of the high-energy regime. In this era of big data, machine learning and AI are being increasingly employed across various stages of survey pipelines, enabling more efficient and effective searches for these transients, but it is crucial to understand where these methods excel, and where they are limited.

The primary aim of our session will be to bring together members of the UK transient community to showcase new observational and theoretical results and current projects in the field. This includes talks on a broad range of extragalactic astrophysical transients to disseminate ideas and foster collaboration between those working across the complete spectrum of transient types, wavelengths, and messengers. We also encourage talks looking at the science being facilitated by current and future photometric and spectroscopic facilities to promote discussion on future projects.

Session type: Parallel session: 3 blocks

INSTRUMENTATION

These sessions are mainly focused around instrumentation.

The Extremely Large Telescope: Science and Instrumentation

Organisers: Kathryn Hartley, Aurelie Magniez, Deborah Malone, Kieran O'Brien

The European Extremely Large Telescope (ELT) is currently under construction by a consortium of leading research institutes across Europe, including notable contributions from institutions in the UK. This groundbreaking telescope is poised to usher in a new era of high-resolution imaging, facilitated by its advanced adaptive optics systems and highly sensitive instruments.

This session will offer a platform for project participants to showcase their contributions to the construction of the telescope and its scientific instruments. Additionally, it will provide an overview of the anticipated scientific missions and the transformative impact these missions are expected to have on our understanding of the universe. Attendees will gain insights into the innovative technologies employed, the collaborative efforts driving the project, and the future research opportunities enabled by the ELT.

Session type: Parallel session: 2 blocks

The Interplay between Technology and Astronomy

Organisers: NAZIM ALI BHARMAL, Meryem Kubra DAG, DEBORAH MALONE

This parallel session focuses on the dynamic interplay between astronomy and technology, examining how astronomical innovations influence fields beyond space sciences and how advancements in other disciplines contribute to the progress of astronomy. The session will explore the transformative impacts of astronomical technologies on engineering, medicine, environmental science, data analytics, and social systems.

Key topics may include the application of space telescope imaging technologies in medical devices, the adaptation of adaptive optics systems for environmental monitoring. Additionally, the integration of astronomical data analysis techniques into social sciences and other interdisciplinary interactions will be discussed. By bringing together researchers and practitioners from diverse fields, this session aims to highlight the value of interdisciplinary collaboration and the broader societal impact of astronomical innovations.

Through these discussions, the session seeks to strengthen the connections between astronomy and other disciplines, emphasizing the scientific and societal importance of technologies originating from space sciences.

Session type: Parallel session: 1 block

Blue sky to night sky: development of astronomical instrumentation

Organisers: Carolyn Atkins, Cyril Bourgenot, David Lee, Matthias Tecza

This session invites contributions that present innovative concepts, emerging technologies, and new designs driving the future of astronomical instrumentation. From conceptual blueprints to

unique prototypes and advanced systems, speakers will have the opportunity to present their latest ideas and developments, including those in early development, and to discuss the challenges and opportunities associated with their realization.

The session aims to foster interdisciplinary collaboration and spark creative dialogue, covering a broad range of topics such as additive manufacturing, multi-object spectrographs, integral field units, adaptive optics, detector advancements, and novel telescope designs. Whether addressing ground or space-based instrumentation, we welcome fresh perspectives and ideas on instrumentation development that will define tomorrow's observational astronomy.

Session type: Parallel session: 1 block

Advancing Space Instrumentation and Low-Cost Mission Concepts

Organisers: Adam Amara, Steve Eckersley, Lucia Fonseca de la Bella, Hamish Reid; co organisers: Malcolm Dunlop, Oscar Gonzalez, David Hall, Beatriz Sanchez-Cano

The rapid evolution of space instrumentation and mission design is ushering in a transformative era for solar-terrestrial physics, planetary science, and astrophysics. With an increasing emphasis on affordability and innovation, the space science community is exploring cutting-edge technologies and low-cost mission concepts that promise groundbreaking scientific discoveries. Recent initiatives by the European Space Agency (ESA)—including the M7/F2 program, the forthcoming M8 and F3 calls, and the agile mini-Fast mission concepts—highlight the growing demand for advanced instrumentation and creative mission architectures. In parallel, the UK Space Agency (UKSA) is driving technological progress through its Enabling Technology Programme and bilateral Science and Exploration Programme, fostering international collaboration and the development of next-generation space science missions.

This session invites contributions from researchers, engineers, and mission teams engaged in the design and development of innovative instrumentation and low-cost missions. We particularly welcome discussions on instruments targeting solar-terrestrial physics, extrasolar astrophysics, and planetary exploration, as well as proposals for small satellite missions and other cost-effective approaches. This session provides a unique platform for Principal Investigators (PIs) to lead the charge on these transformative missions. By bringing together expertise from academia, industry, and space agencies, this session seeks to highlight the UK's pivotal role in shaping the future of space science. Attendees will explore how technological advancements, strategic collaborations, and resourceful mission planning can deliver high-impact scientific outcomes. Together, we can unlock the full potential of low-cost space science and exploration missions.

Session type: Parallel session: 2 blocks

PROFESSIONAL

These sessions are mainly focused on professional skills, practice, and behaviour.

Astronomy futures – new missions, facilities and the support needed to exploit them

Organisers: Martin Barstow, Giulio Del Zanna

Important scientific advances in astrophysics often depend on combining specialised observations with state-of-the-art theoretical models. This requires new missions and instruments (space/ground-based) targeted on specific science goals. Such facilities need a supporting infrastructure and a critical mass of well-trained researchers, without which the science outcomes cannot be achieved.

We propose a forum for the presentation and discussion of new missions and facilities covering the wide astrophysics and planetary science interests of the UK community. Importantly, we will also address their requirements for multi-disciplinary support, covering a diverse range of topics including new technologies, laboratory astrophysics, computational needs and data analysis tools to ensure that the UK benefits fully from its investments. We will also look at training requirements for young researchers, e.g. developing new skills (e.g. AI, machine learning, code development) or recovering historically important, but neglected, underpinning knowledge (e.g. atomic and molecular physics – measurements and theory, physics modelling including radiative transfer). This key support and training is often neglected in facility planning.

Traditionally, NAM sessions are organised by science subject. However, facilities and infrastructure typically encompass many research areas and the problems often overlap. We will address shared problems spanning disciplines to the benefit of the astronomical and planetary science community at large. The meeting will be structured in a way that promotes discussion with a panel of selected experts, introduced by a number of contributed / keynote talks. The programme will include any new facilities that are being proposed or are approved and under development.

Session type: Parallel session: 1 block

Discovery in Astronomy and Space Physics enabled by large-scale Digital Research Infrastructures (ASTROCOMP)

Organiser: Nicholas Walton; co organisers: George Beckett, Louise Chisholm, Jon Hays, Anna Scaife, John Veitch, Mark Wilkinson

Computing and specialist technical skills underpin scientific exploitation across the Astronomy, UKSP, MIST community domains. STFC supports a range of infrastructures to enable High Throughput Computing (HTC, e.g. GridPP) and High Performance Computing (e.g. DiRAC). STFC's IRIS (https://www.iris.ac.uk) digital research infrastructure (DRI) provides seamless access to these and other (e.g. The Hartree Centre, AIRR) resources.

This session will update the community on developments in IRIS and its partner infrastructure providers (e.g. DiRAC), highlighting the emerging scientific exploitation and data science opportunities opened up by access to massive scale computational and AI resources. Presentations will include examples of IRIS supporting gravitational wave analysis, large radio surveys (e.g. SKA), theoretical computational modelling, large optical imaging (e.g. Vera Rubin Observatory) spectroscopic surveys (e.g. 4MOST) and space (e.g. Gaia, Euclid, PLATO). The session will include discussion of how users can access IRIS resources through their particular project joining IRIS, providing detail on the opportunities to enhance their science.

The session will discuss the importance of enhancing research software engineer career paths and

diversity in keeping the UK at the forefront of data exploitation. The session will also give the opportunity to discuss initiatives aimed at reducing the carbon impact of DRIs.

Early stage researchers, in particular, are encouraged to present their science enabled by use of IRIS facilities.

The session is organised by representatives of major projects involved in the IRIS initiative (https://www.iris.ac.uk/about-iris/partners/), and follows our successful AstroComp sessions that we have organised at the NAM 22, 23 and 24 meetings.

Session type: Parallel session: 1 block

Jobs in Astronomy and Geophysics

Organisers: RAS Early-Career Network, Matthew Temple, Marieta Valdivia Lefort

The RAS Early-Career Network Steering Group will organise a skills session featuring 3-4 talks aimed at early-career researchers who are considering careers in astronomy and geophysics. The presentations will cover topics such as how to apply for postdocs, how to apply for fellowships (in the UK and abroad), and how to apply for faculty positions.

There will also be time for questions to all speakers, and presenters will be invited to join the early-career networking lunch to follow.

This careers panel is organised by the Early Career Network (ECN) of the RAS. We do not seek abstract submissions for this session but you are welcome to get in touch with the ECN with recommendations for panellists.

Session type: Parallel session: 1 block

A holistic view of space sustainability

Organisers: James Blake; co organisers: Katherine Courtney, Stuart Eves, Robert Massey, James Osborn, Marieta Valdivia Lefort, Phineas Whitlock

The recent explosion in commercial activity in the near-Earth environment has paved the way for rapid growth and innovation in the space industry. Access to low Earth orbit is more affordable than ever, and consequently a diverse and expansive range of payloads are currently operating in the space domain. As humanity’s footprint in space continues to grow, the need for a comprehensive and sustainable approach to space exploration and utilisation has never been more pressing. In this session, we aim to examine a holistic view of space sustainability, integrating technical, governance and societal perspectives to address the short- and long-term impacts of current trends on both the space and terrestrial environment. How do activities in space support our quality of life, and why are they accelerating? What are the key concerns associated with this acceleration, across all stages of the mission lifetime of a spacecraft? How do we best mitigate these concerns to ensure safe and sustainable use of space, in light of latest developments in technology? What regulatory frameworks are needed to enforce responsible behaviour in the space domain, and how do we most effectively facilitate the global, cross-sector and interdisciplinary discussions necessary to ensure these frameworks are built on strong foundations of technical evidence. Importantly, what

does the future hold for the space industry? We welcome contributions from the NAM community exploring the complex challenges of maintaining space as a safe and accessible domain.

Session type: Parallel session: 1 block

Spacecraft Disposal by Impact on the Lunar Surface: The Next Big Threat to Astronomy and Planetary Science?

Organiser: John Zarnecki; co organiser: Julie Holt-Jones, Fionagh Thomson

Over the next decade, there seems little doubt that we will see a burgeoning lunar ‘economy’, involving science, exploration and commerce. Estimates suggest some 150 such launches in the next 10 years. Many of these spacecraft will be placed into lunar orbit to provide communications, navigation and monitoring capabilities for lunar-based facilities. There are limited end-of-life options for spacecrafts orbiting the Moon, unlike the Earth where there are designated graveyard orbits to move up or down into, oceans to land in and an atmosphere to burn up in on re-entry. Therefore, it appears highly likely that in the short- to medium-term, lunar-orbiting spacecraft will be disposed of through impact onto the lunar surface. This type of post mission disposal offers significant technical, environmental and ethical challenges to the future of astronomy and planetary science activities on the moon. Consequently, the unintended consequences could be disastrous, if not regulated or/and mitigated in an effective way.

This session will address this impending challenge to Science and will ask:
o What might be done to mitigate any potential negative unintended consequences?
o What could we learn from current discussions and research on disposal options for Earth’s orbits, if any?

Session type: Parallel session: 1 block

Community EDI initiatives in Astronomy and Geophysics

Organisers: Katrine Glasscock, Marieta Valdivia Lefort, Laura Wolz; co organisers: Dominic Bowman, Andrew Curtis, Karen Devoil, Benjamin Fernando, Farideh Honary, Kirushney Kalamohan, Robert Massey, Nathan Mayne, Ingrid Murray, Jasmine Sandhu, Jane Smith, Matthew Temple, Luis Welbanks

A persistent challenge in Equity, Diversity, and Inclusion (EDI) is creating spaces to exchange ideas, share successful initiatives, and start critical conversations that foster meaningful change. The fields of astronomy and geophysics face widespread issues, such as imposter syndrome, balancing family life and the transient nature of research posts, and bullying and harassment. These issues significantly impact the ability to attract and retain diverse scientists and create inclusive workplaces. Addressing these challenges requires evidence-based, localised EDI practices that consider intersectional perspectives and support underrepresented groups, including LGBTQ+, ethnic minorities, disabled, neurodiverse, and first-generation scientists.

This session invites contributions from individuals who have designed and hosted impactful EDI projects or community events, such as EDI forums, EquiTea, and online platforms, aimed at improving equity and accessibility within their institutions. We encourage participants to share best practices for planning, delivery, and evaluation of EDI initiatives, as well as resources to support sustainable change. By showcasing the experiences and successes of our community, we aim to

spark meaningful conversations and empower the astronomy and geophysics communities to build more equitable and supportive spaces.

Session type: Parallel session: 2 blocks

Mitigation and the Underbelly: dark and quiet skies and the darker side of satellites

Organisers: Fionagh Thomson, Marieta Valdivia Lefort; co organisers: Leah-Nani Alconcel, Martin Barstow, Lily Beesley, James Blake, Dan Cziczo, Federico Di Vruno, Robert Massey, Lesley Jane Smith

Since 2019, the call to protect Dark and Quiet Skies has gathered significant attention, as the deployment of mega-constellations into low-earth orbit (LEO) escalates - and launch to Very Low Orbit is planned. Satellite launch will only increase as will the reflective sunlight pollution from the orbiting metallic bodies and the noise interference from their broadband transmissions that negatively impacts optical and radio observations, respectively. The astronomy community has made progress, including extensive negotiations with satellite operators. But we need new ideas, collaborations and strategies to move this complex and challenging issue from the sidelines into the spotlight for government and industry.

This session invites abstracts in two different categories on this topic:

(1) Improving technical and legal mitigation strategies
The astronomy community has worked to raise awareness, including partnering with lawyers and social scientists to develop a more holistic approach to find solutions. But more research and collaborations are needed to persuade governments and industry to define mitigation strategies at both technical and regulatory levels. This session aims to continue exploring mitigation strategies for the impact of large satellite constellations in astronomy by presenting more evidence for stricter technical requirements applicable to the design and authorisation of space technologies. We welcome contributions ranging from scientific research and simulations showing data for technical improvements, to suggestions for improvement of regulatory frameworks at both the international and national levels.

(2) Will megaconstellations deliver all their heavenly promises to Earth?
New commercially-led Space wields significant economic and geopolitical power over astronomy. Private venture capitalists and public space agencies project vast economic return on investments and increased jobs. LEO and GEO are protected by international regulations. New Space is painted as a benevolent ‘ecosystem’ serving humanity on Earth, providing important scientific data. At all costs, orbits must be protected. In this global power contest, astronomy is often placed on the sidelines as a non-commercial beautiful scientific endeavour that (when push comes to shove) is secondary to the benefits of New space. But are these promises fact or fiction? This section invites abstracts on the following questions: Is everything launched into LEO/GEO linked to worthwhile scientific or humanitarian endeavours? Is the space sustainability movement designed to benefit both New Space and Astronomy? Are there alternative options to LEO satellites for launching/deploying payloads?

Session type: Parallel session: 2 blocks

SOLAR

These sessions are mainly focused around solar science. Note similar science may also be covered in other categories, particularly the facility category.

Magnetohydrodynamic waves in the solar atmosphere: new insights from advanced observations and modelling

Organisers: Tim Duckenfield, Shahin Jafarzadeh, Samuel Skirvin

Building on the UK's legacy of groundbreaking MHD wave research, this session explores the crucial role of magnetohydrodynamic (MHD) waves in solar atmospheric dynamics and energy transport. MHD waves are powerful tools for probing plasma conditions and are thought to be key to heating the corona and driving the solar wind. This is a critical moment for MHD wave research, with new high-resolution observations from facilities like DKIST (with strong UK involvement) and SUNRISE providing unprecedented detail of magnetic oscillations across the solar atmosphere. These observations, combined with advanced modelling techniques, are revolutionising our understanding of wave generation, propagation, and dissipation across different atmospheric layers (i.e., photosphere, chromosphere, transition region, and corona) through multi-line observations and sophisticated numerical models. This session aims to connect researchers within the broad field of MHD wave research to discuss recent breakthroughs in observational, theoretical, and modelling efforts. It will provide a platform to showcase cutting-edge research using state-of-the-art facilities. In addition to the groundbreaking observations from DKIST and SUNRISE, the session will draw on the latest results from missions like Solar Orbiter, Aditya-L1, and ALMA, laying the groundwork for analysing the wealth of data soon to emerge.

Session type: Parallel session: 1 block

UK Solar Physics Open Session

Organisers: Natasha Jeffrey, Marianna Korsos, Matthew Lennard, Karen Meyer, Ryan Milligan, Rahul Sharma, Suzana Silva, Peter Wyper

The activity of our nearest star, the Sun, drives variability within the heliosphere in a myriad of different ways, impacting the Earth and other planets. As the only star on which we can begin to resolve physical processes at their intrinsic scales, the Sun provides a unique laboratory for plasma astrophysics. In this session, we welcome all contributions describing advances relating to physical processes occurring from the interior to the outer atmosphere, based on space- or ground-based observations, simulations, or theory. This session is open to all members of our community to present their work, irrespective of career level, including early-career researchers (PhD and postdoctoral).

Session type: Parallel session: 2 blocks

Advancing Our Understanding of the Solar Corona-Wind Connection in the Age of Solar Orbiter and Parker Solar Probe

Organiser: Jesse Coburn; co organisers: Deborah Baker, Luca Franci, Alexander James, Pauline Simon, Stephanie Yardley

The Solar Orbiter and Parker Solar Probe missions have both been operating for several years now providing state-of-the-art in situ measurements of the solar wind and remote sensing observations of its source regions on the Sun. They have ventured closer to the Sun than ever before providing new insights into the mechanisms that heat the corona and accelerate the solar wind. This unprecedented view of the solar corona-wind connection with the aid of advanced magnetic field modelling permits precise identification of the solar wind source regions (such as coronal holes and active region boundaries). In particular, we are able to put observational constraints on theories that invoke magnetic field reconnection and energisation by plasma turbulence and waves to explain coronal heating and solar wind acceleration. In this session, we will celebrate and discuss the latest advances in solar wind and solar corona research. We encourage observations from Solar Orbiter, Parker Solar Probe, Daniel K. Inouye Solar Telescope (DKIST), Advanced Composition Explorer, Swedish 1-m Solar Telescope, Solar Dynamics Observatory, Hinode and other Heliospheric observatories.

Session type: Parallel session: 2 blocks

Next generation solar physics – preparing for MUSE and Solar-C

Organisers: Sarah Matthews, Patrick Antolin, Ineke De Moortel

In 2017 the international solar physics community agreed the highest priority science questions for solar physics in the coming decade and the measurements and instruments needed to answer those questions:
o Formation mechanisms of the hot and dynamic outer solar atmosphere
o Mechanisms of large-scale solar eruptions and foundations for predictions
o Mechanisms driving the solar cycle and irradiance variation

The realisation of those recommendations is the combination of two complementary solar space missions: NASA’s MUlti-slit Solar Explorer (MUSE) and JAXA’s multi-agency Solar-C. MUSE (launch 2027) will be a unique multi-slit spectrograph able to provide imaging spectroscopy of the corona at multiple wavelengths up to 100 times faster than current instruments. Solar-C (launched 2028), combines the EUV High-throughput Spectroscopic Telescope (EUVST) and the Solar Spectroscopic Irradiance Monitor (SoSpIM). EUVST will seamlessly and simultaneously observe a range of temperatures spanning more than three orders of magnitude from the chromosphere to the corona, providing unprecedented plasma diagnostic capability, while SoSpIM will provide complementary EUV spectral irradiance measurements. The combination of MUSE and EUVST will revolutionise our ability to probe the multi-scale nature of the physical processes in the corona, from small-scale energy release to large-scale impacts.

Supported by STFC and ESA the UK is both developing the short-wavelength camera for EUVST and helping to develop the science and tools to exploit MUSE, EUVST and SoSpIM. This session will bring together observers, modellers and theoreticians to discuss current work and future directions on all relevant science topics to promote optimum UK science return.

Session type: Parallel session: 1 block

Magnetic reconnection, topology and non-ideal instabilities

Organisers: Alexander Russell, Jonathan Eastwood, Gunnar Hornig, James McLaughlin, Christopher Prior, Julia Stawarz, Peter Wyper, Anthony Yeates

Magnetic reconnection is one of the most important processes in solar, space and astrophysical plasmas. In a highly conducting plasma with large length scales, magnetic field connections between plasma elements are conserved, allowing the accumulation of magnetic energy over time. However, conservation of connectivity can break down in small volumes – this has global consequences, for example enabling rapid conversion of magnetic energy in solar flares, auroral substorms and astrophysical jets and disks.

This session aims to bring together researchers working on magnetic reconnection, magnetic topology and resistive and collisionless instabilities, from the solar, space and astrophysics communities. Cross-cutting scientific discussions will cover theory, simulations, remote observations and in-situ observations.

Some of the key questions we are interested in addressing are:
o What do the latest numerical simulations and observations reveal about reconnection and non-ideal instabilities?
o How do recent new perspectives on topological properties, such as magnetic skeletons or helicity, shed light on dynamics such as flaring and coronal heating?
o How does turbulence affect reconnection, and vice-versa?
o How have results from the latest missions (e.g. Solar Orbiter and MMS), observatories (e.g. DKIST) and analysis tools (e.g. field line helicity) changed our understanding of these topics?

Session type: Parallel session: 1 block

Common Nature of Physical Processes in Solar and Stellar Coronae

Organisers: Patrick Antolin, Simon Daley-Yates, Jack Jenkins, Sargam Mulay, Christopher Osborne, Aaron W. Peat, Alexander Russell

The Sun offers unique insight and observational applications to the detailed understanding of stellar physics. The Sun serves as both a benchmark and laboratory for stellar processes. High-resolution and novel observations allow for the investigation of magnetic structure, coronal heating, condensations, and solar wind, to name a few. The broader statistical studies of stellar events can assist in the understanding of patterns and extremes of solar phenomena.

Stellar statistics constrain the frequency of, and energy associated with, extreme events. These, in turn, offer insight into coronal energy release mechanisms with applications to solar physics. Flare statistics and prominence formation are of great interest to the solar community as it can assist in the constraint of the formation and properties of these phenomena.

Recent advancements in both simulation and observation are gifting us new insight into and understanding of the aforementioned phenomena. Bridging solar and stellar astrophysics, both theoretical and observational, is essential to the understanding of solar and stellar processes. This session will focus on:
o Linking stellar flare, superflare, and CME statistics to solar coronal energy release mechanisms.
o Studying stellar winds to refine solar wind models and vice versa.

o Exploring solar/stellar prominence and condensation formation and/or ejection mechanisms, and properties.
o Investigating novel trends in coronal heating to resolve solar and stellar physics questions.

This session aims to foster interdisciplinary collaboration, and leverage stellar data to advance solar physics while using solar theories as a framework to understand stellar processes.

Session type: Parallel session: 1 block

STELLAR AND PLANETARY

These sessions are mainly focused around stellar and planetary type science, including exo planets. Note similar science may also be covered in other categories, particularly the facility category.

The UK White Dwarf Community: An Opportunity to Connect

Organisers: Andy Buchan, Emily Roberts, Jamie Williams

Although the field of white dwarf research in the UK is rapidly expanding, meetings focused on this subject remain infrequent. Following the success of the white dwarf session at NAM 2022, we propose another session in 2025 to allow the presentation of new work, particularly by early career researchers. There have been many new developments in the field since the last NAM session. These include data releases from JWST and DESI, as well as the application of machine learning techniques to white dwarf spectra. With the primary white dwarf meeting, EuroWD, only occurring biennially and the next conference being held in Boston, there are few opportunities for early career researchers in the UK to present their work and for collaborations to begin and be fostered. As the previous white dwarf session envisioned, we propose white dwarf NAM meetings in the off-years from EuroWD, in order to grant more chances for the community to meet. We invite talks on any topic related to white dwarfs including, but not limited to, stellar archaeology, evolved planetary systems, white dwarf modelling, and supernovae. These topics will not only help progress our understanding of white dwarfs, but will have wide-ranging impacts on other areas of astronomy, including planet formation, galactic evolution and transients. We will give priority to early career researchers, allowing them an opportunity to present their work and develop collaborations with the wider community.

Session type: Parallel session: 1 block

The Future of Exoplanet Detection

Organiser: Aurelie Magniez; co organisers: Kathryn Hartley, Deborah Malone

Scientific interest in the search for exoplanets has reached a new level with the development of innovative technologies that promise to reveal undiscovered planetary systems. The current instruments, which use techniques such as radial velocity, direct imaging or transit, have enhanced our comprehension of exoplanets. However, their capabilities are constrained to observing only a limited number of planetary systems. To overcome these constraints, researchers are developing innovative technologies and methods in spectroscopy, adaptive optics, interferometry and other areas with the aim of improving performance. Consequently, innovative projects such as the

PLATO space mission and the Planetary Camera Spectrograph (PCS) on the Extremely Large Telescope (ELT) are being developed to observe a wider range of exoplanets in greater detail. These instruments will facilitate the identification of smaller, Earth-like planets and provide deeper insights into their atmospheres and potential habitability.

This session will present the latest advances in exoplanet instrumentation, emphasise significant forthcoming missions, and examine how these developments will enhance our capacity to detect and characterise exoplanets, unlocking new avenues for understanding planetary systems.

Session type: Parallel session: 1 block

Solar System Insights from Small Body Populations

Organisers: Abbie Donaldson, Alan Fitzsimmons, Charlotte Götz, Agata Rożek, Colin Snodgrass

The formation and migration history of the Solar System is encoded in remnant planetary disc material, known to us as the diverse populations of minor planets. These objects make compelling and informative targets for spacecraft encounters, and in recent years major scientific advances have been possible with data returned by missions such as DAWN, Rosetta, and New Horizons. A host of current and upcoming missions will further revolutionise our understanding of the Solar System's structure and history e.g. the characterisation of numerous Jupiter Trojans by the Lucy flybys, the Hera mission to assess the Didymos-Dimorphos system following the DART impact, and the first ever up-close study of a dynamically new comet by Comet Interceptor.

Our ability to characterise small bodies remotely is also rapidly improving. JWST and powerful ground-based facilities can now probe the compositions of objects and their atmospheres from near-Earth space through to the trans-Neptunian region. The imminent Legacy Survey of Space and Time will discover millions of small bodies across the entire Solar System, providing long-term monitoring and capturing transient events like activity and collisions. The ability of the forthcoming 39-m ELT to characterise distant Solar System objects will be entirely unprecedented. This wealth of observed properties will inform current and new theoretical models of planetary formation and evolution.

In this highly exciting time for small body science, we welcome presentations from researchers working on any and all minor planet populations including relevant missions, new observations, or theoretical studies.

Session type: Parallel session: 1 block

Planetary science and exploration

Organiser: UK Planetary Forum (UKPF); co organisers: Peter Fawdon, Mark Fox-Powell, Dimitri Veras, Duncan Lyster, James Darling, Jordan Stone, Karen Devoil, Lee White, Martin Subtle, Megan Schwamb, Peter Mc Ardle, Stephanie Halwa, Tom Harvey, Mark Nottingham

The UK is home to an internationally significant research community devoted to the study of the formation and evolution of planetary bodies in our Solar System and beyond. This session aims to (1) showcase the latest research from across the breadth of UK planetary science, and (2) identify areas of mutual scientific interest and catalyse collaboration across geoscience, planetary science, and astronomy. Topics include (but are not limited to): Analysis and experimental investigations of

planetary materials; (e.g., meteorites, lunar, martian and terrestrial samples); Remote sensing and modelling of planetary bodies; (e.g., geology and surface processes of terrestrial planets, icy moons and small bodies, observations and models of planetary atmospheres and giant planets); Ongoing and upcoming exploration of planetary bodies in our Solar System (e.g., Mars rover missions, lunar exploration, BepiColumbo, JUICE, Europa Clipper). Additionally, we welcome submissions concerning the ethics and astrobiological considerations of Solar System exploration.

Session type: Parallel session: 2 blocks

Solar Physics, Stellar Physics, and Exoplanetary joint session: bridging the gap

Organisers: David Brown, Malcolm Druett, Alex Pietrow, Don Pollacco, Angela Santos, Thomas Wilson

Understanding the formation, evolution, and behavior of our own Star and Solar System in a Stellar or Galactic context requires deeper coordination between solar and solar system investigations and the characterisation of stars and planets across the Milky Way.

The objectives of this session are:
(1) To bridge the gap between the stellar and solar communities, and between the exoplanet and stellar communities by bringing together experts to discuss the latest results in these fields.
(2) To provide a platform for collaborations and dissemination channels between the solar, stellar, planetary and exoplanetary communities.
(3) To provide an update about the PLATO mission (ESA’s next medium-class mission, which will continuously observe over 200,000 FGKM-dwarf stars with high cadence and quality for at least 2 years) and discuss its stellar and planetary characterisation potential.

We particularly encourage applications with relevance to the Sun-as-a-star, discoveries in Stellar physics with relevance to the Sun, advances in exoplanet discovery and characterisation, and Extreme space weather events and habitability such as:

Spatially resolved or Sun-as-a-star observations and models giving insight into mechanisms responsible for signatures in unresolved observations of stars, for example longer-term variations, flares, and other activity, and feature locations on the stellar disk.
Space weather observations and models with applications to understanding the environments and conditions around stars.

The latest findings regarding solar-type stars, including physical modelling, and stellar populations and the insights these can provide regarding behaviours that may occur on our local star and surrounding planetary environments.

Recent observations and modeling related to the spatially resolved images of nearby supergiants. How can the future of spatially resolved stellar observations help us to better understand the Sun?
Transit, radial velocity, and astrometry discovery and characterisation of terrestrial exoplanets particularly related to understanding the formation and evolution of these bodies.

Works related to the preparation and prospects for PLATO With the launch of PLATO in late 2026,

this discussion is timely to highlight advances in the mission and galvanise the UK community to take full advantage of the data.

Session type: Parallel session: 2 blocks

TECHNIQUES

These sessions are mainly focused around techniques, methods, and skills.

print('Hello Future'): Developing Next Generation Astronomical Codes

Organisers: Sarah Johnston, Alastair Basden, Carlton Baugh, Sownak Bose
Modern computing capabilities are allowing us to delve further and learn more about our universe. Ongoing developments to simulations allow us to model larger problems and do so in greater detail than ever before, and our instrumentation advancements are leading to telescopes which produce massive amounts of data. To accommodate this, astronomy codes are relying more on High Throughput Computing or High Performance Computing systems to support their workload. With this move to highly parallel, data or memory intensive systems, the world of astronomy codes and tool-chains must adapt to follow the trend. With more and more codes looking to reach the petascale and exascale regime, utilising powerful compute systems is becoming more important.

We also want to ensure the long-term usability of our codes and this includes making sure it is forward compatible with future systems e.g. by fully utilising available hardware and leveraging the highest efficiency and performance. There are also increasing environmental impacts to consider when it comes to making sure the future of supercomputing is sustainable.

With many different approaches being taken across the community from the use of GPUs and Machine Learning, to novel infrastructure approaches, this session aims to bring code and software developers together from across astronomy. This includes updates and discussions on the future of computing within astronomy from a technical perspective. This could be current code development or porting initiatives, data management or processing pipelines, or sustainability efforts within the computational community. Submissions from active developers and ECRs are particularly encouraged.

Session type: Parallel session: 1 block

Unseen Astronomy: Multi-sensory approaches for research, communication and education

Organiser: James Trayford; co organisers: Nicolas Bonne, Chris Harrison, Sarah Kane, Daniel Ratliff, Rose Shepherd, Andrew Spencer

Visual approaches have long dominated in astronomy. This may not be so surprising - astronomy has produced some of the most scientifically rich and stunning imagery humanity has. However, as astronomy becomes more data intensive, with the volume and complexity (e.g. multi-dimensionality) of data exploding in recent years, traditional visual inspection methods have become increasingly untenable, with ever more ceded to complex machine-based approaches which can be difficult to interpret or verify. What's more, reliance on visuals excludes people who

are blind or have low vision, and does not cater to those with different sensory preferences or learning styles. Educational research shows a multisensory approach can help reinforce learning more generally for better learning outcomes. By making use of the strengths of our diverse senses, we may develop new and powerful multi-dimensional interfaces with the data across a range of levels, and even gain new perspectives to discover ‘unknown-unknowns’ in the data.

With this session, we aim to unite a rapidly growing (but disparate) field of research into multi-modal approaches (e.g. including, sound & touch as well as vision), and how this can be used to better inspect and communicate astronomical data. Through both talks and practical sessions (divided into two parallel session blocks) we hope to investigate ways of combining approaches, while introducing attendees to these new perspectives on astronomy. In particular, a goal of the session is to move from disparate ideas towards unified approaches and practical tools that can be used in scientific and educational contexts alike.

Session type: Parallel session: 1 block

LUNCHTIME SESSIONS

Note lunchtime sessions are focused on information sharing, discussions, and specific activties and they typically do not accept contributions. If you want to present in a lunchtime session then please directly contact the organisers of that session.

STFC Astronomy Grants Panel Community Session (not accepting abstracts)

Organisers: Kim Burchell, Jenny Hiscock, Mark Sullivan, Mark Swinbank, Chloe Woodcock

The STFC Astronomy Grants Panel (AGP) funding schemes are the primary source of support research in astronomy, astrophysics, solar system, and planetary science in the UK. This session will provide an overview of the Small Award and Large Award funding routes, and provide details on the general outcomes of the schemes following their implementation in 2023. This session is an opportunity for the community to give feedback on the new schemes, and participate in a question and answer session with the STFC Astronomy Team and the AGP Chairs. This session is designed for all prospective applicants, whether new to the schemes or experienced.

Note this lunchtime session does not accept abstracts.

Session type: Lunch-time session

Women in astronomy (not accepting abstracts)

Organisers: Ariadna Calcines Rosario, Mathilde Jauzac, Aurelie Magniez, Perrine Lognone, Meryem Dag

We propose a networking lunch for all who identify as women in Astronomy. This session intends to facilitate connections and build community.

Note this lunchtime session does not accept abstracts.

Session type: Lunch-time session

Publishing workshop (not accepting abstracts)

Organisers: Liz Baker, Gemma Cannon, David Flower; co organisers: Kim Clube

Publishing workshop for Authors and Referees.

For all early-career researchers looking to publish their research or to review papers.
The course will be run by the MNRAS Editor-in-Chief and journal staff and will cover:
o How to write a good paper
o MNRAS submission process
o How the review process works and how long it takes
o How to respond to referee reports
o How to be a referee
o Ethical issues associated with research publishing

Note this lunchtime session does not accept abstracts.

Session type: Lunch-time session

Student Rocketry: Inspiring the Next Generation of Scientists and Engineers

Organiser: Isabelle Crossley

This lunchtime panel will explore the transformative impact of student-led rocketry projects and associated outreach initiatives on the career development of participants and the broader STEM community. Panellists will discuss how the provided hands-on challenges build technical expertise, leadership, and resilience while fostering interdisciplinary collaboration and employability. The session will highlight the societal impact of these initiatives, breaking barriers to STEM for diverse communities and inspiring future scientists and engineers. For example, we will delve into the role of competitions such as Mach-X and Race 2 Space and outreach programs like Launch 4 Change. Ending in an open Q&A that invites audience insights on maximising their educational and societal potential.

Session type: Lunch-time session (**abstracts accepted**)

Early Career Lunch and RAS ECN Town Hall (not accepting abstracts)

Organiser: RAS Early-Career Network, Matthew Temple, Marieta Valdivia Lefort

During this lunch session, Early Career Researchers (ECRs) will have the opportunity to meet in person, network, and learn more about the RAS Early-Career Network. Previous NAM lunch

sessions have provided a popular forum for ECRs to network and access informal peer-support. Given that many PhD students and postdocs can feel isolated within larger physics departments, this networking lunch aims to provide not only a social space for ECRs but also a sense of community, and to give delegates a chance to meet fellow Astronomy & Geophysics researchers and, for new PhD students, their nationwide PhD cohort.

This session is organised by the Early Career Network (ECN) of the RAS. It will also provide an informal ‘town hall’ space for Early Career Researchers to meet the RAS ECN and express their concerns and opinions about the current challenges facing PhD students and postdocs. At the same time, speakers from the “Jobs in Astronomy and Geophysics” session will be present to answer questions and provide advice in a more informal setting.

Note this lunchtime session does not accept abstracts.

Session type: Lunch-time session

UK Solar Physics Business Session (not accepting abstracts)

Organisers: Natasha Jeffrey, Marianna Korsos, Matthew Lennard, Karen Meyer, Ryan Milligan, Rahul Sharma, Suzana Silva, Peter Wyper

In this session, we will host the UK Solar Physics (UKSP) business session, which is a place where the UKSP Council will provide updates on our initiatives and projected plans to the solar community. We will have invited presentations from representatives on key funding councils (for example, the Solar System Advisory Panel). We will have an open forum for discussing key concerns within the community, including, but not limited to, access to funding opportunities, doctoral student support, space and ground-based instrumentation, and community meetings/conferences. We welcome input and participation across the breadth of the community and across all career stages.

Note this lunchtime session does not accept abstracts.

Session type: Lunch-time session

Sandwiches, stars and space: the NAM public engagement lunch (not accepting abstracts)

Organisers: Robert Massey, Andy Newsam, Lucinda Offer

NAM 2025 brings together astronomers and space scientists at all career stages. A large fraction of our community see communicating astronomy with the public as an important part of their work, from giving occasional talks and media interviews to running science festivals. (According to the 2023 RAS Demographics and Research Interests of the UK Astronomy and Geophysics Communities, staff members in universities and research establishments typically spend around 5% of their time on public engagement activities).

In this lunch we will bring together this diverse group for informal conversations on good practice in public engagement, with invited local speakers inspiring attendees with an outstanding exemplar of

work with children and young people.

We encourage all delegates at NAM to come to our lunch, whether you are a novice or an experienced practitioner, to join this conversation on sharing our inspiring science.

This session will be organised by RAS staff and members of the RAS Education and Outreach Committee.

Note this lunchtime session does not accept abstracts.

Session type: Lunch-time session

Moon Palace: training physics student ambassadors in arts-based engagement methods (not accepting abstracts)

Organiser: Lorraine Coghill; co organisers: Kerry Harker, Eliza Hunt, Claire Irving, Ged Matthews, Erin McNeill

Moon Palace, an artwork and mobile observatory by Heather Peak and Ivan Morison, brings together arts organisation, the East Leeds Project, and Physics departments at the University of Leeds, Durham University, University of Hertfordshire, and Queen Mary University of London.

This collaborative project, funded by The Ogden Trust, aims to empower undergraduate and postgraduate student ambassadors with interdisciplinary skills, fostering their growth as leaders while enhancing access to astronomy and culture for underserved communities. By bringing the mobile observatory which is also an artwork directly to local neighbourhoods, we aim to deepen relationships between universities and their local communities.

A key component of this initiative is evaluating the impact of arts-science outreach collaboration on our physics ambassadors. The evaluation will explore how this unique blend of disciplines enhances the ambassadors' creativity, confidence, and engagement with diverse groups, including artists and community partners. We are committed to understanding the transformative experiences of our ambassadors and how these experiences contribute to their personal and professional development.

The Moon Palace itself will be present at NAM and all are invited to experience its unique atmosphere (times tbc). This interactive session will offer a taster of the training programme offered to the Ambassadors, allowing participants to explore the background, methods and practicalities of using arts-based methods for engaging with communities in astronomy, and consider how these could be used in their own settings.

Note this lunchtime session does not accept abstracts.

Session type: Lunch-time session

Workshop: How to build an Instrument for Astronomers (not accepting abstracts)

Organiser: Deborah Malone; co organiser: Meryem Dag, Emily Ronson

This session is to facilitate the communication between Astronomy and Instrumentation Early Career Researchers as a fun activity which encourages groups of participants to design a new instrument together from scratch. First, the group is given a brief introduction (~5 minutes) on how instruments are built, including the kinds of criteria that are important to define. Then, the groups (3-4 people) can be given a random observation target, or decide for themselves, along with keywords to help in designing the instrument, and work together for ~20 mins to determine what kind of instrument they would need to observe it with, the size of the telescope, how long they need to observe it for, and what kind of adaptive optics they would need to use. Is it an exoplanet? Does it need high-contrast imaging? Is it a high red shift galaxy? Does it need to be observed with an extremely large telescope? Perhaps it's a fast-moving comet that's very close to the sun!

At the end, each group has two minutes to present their concept instrument for their chosen observation target, and a panel of peers will give out prizes for best pitch, along with a few other fun awards.

Astronomers and Instrumentation Scientists must work together to develop the next generation of Telescopes, and it is extremely important to understand the needs of each group to successfully design and build the instruments that will form part of the telescopes.

Note this lunchtime session does not accept abstracts.

Session type: Lunch-time session

Panel Discussion: The Future of UK Astronomical Instrumentation (not accepting abstracts)

Organiser: Kathryn Hartley; co organisers: Aurelie Magniez, Deborah Malone

In this lunchtime panel discussion, we will bring together leading experts from academia and industry to discuss the future of UK astronomical instrumentation. Discussions will include the role of instrumentation in addressing key astrophysical challenges, such as probing the early universe, studying exoplanet atmospheres, and mapping dark matter. We will focus on emerging technologies, interdisciplinary collaborations and the current challenges in astronomical instrumentation. We will then open the floor to questions from the audience.

Note this lunchtime session does not accept abstracts.

Session type: Lunch-time session

Revealing the Milky Way Ecosystem with GaiaNIR (not accepting abstracts)

Organiser: Nicholas Walton; co organiser: Vasily Belokurov, Cathie Clarke, Alis Deason, Victor Debattista, Denis Erkal, Andreea Font, Daisuke Kawata, John Magorrian, Jason Sanders, Vicky Scowcroft

The ESA Gaia 3-D map of over two billion stars in our Milky Way (MW) coupled with community-powered research is both challenging and refining our understanding of the complex, interlinked processes governing the formation and evolution of the MW.

Next generation near infrared astrometry has been identified through the ESA Voyage 2050 process as a candidate ESA Large (L5) mission. Building on Gaia heritage, the GaiaNIR mission will probe the Milky Way's hidden regions, enabling a comprehensive understanding of galaxy formation across time.

The lunch session will include an update on the GaiaNIR mission (from the GaiaNIR PI, David Hobbs, Lund). It will include talks detailing GaiaNIR's prime science goals, for example showing how its survey of some 15 Billion sources concentrated in the inner regions of the MW, un-surveyed by Gaia but transparent to GaiaNIR, will untangle the complex interplay of the MW ecosystem. This revealing, for example, how the oldest stellar population at the heart of the MW affected the development of its disc structure seen today. The baseline design for the instruments on GaiaNIR will be presented, noting significant recent developments (driven from the UK) in nearIR detectors, which in turn opens the possibility for a wider range of instrument capabilities.

The opportunity for UK researchers to become involved in developing the case, scientific and technical, for GaiaNIR, through the nascent GaiaNIR:UK group, will be highlighted. This timely as planning for GaiaNIR is accelerating, with key decisions to be taken in the next few years.

Note this lunchtime session does not accept abstracts.

Session type: Lunch-time session

Pathways to sustainable research in astrophysics, cosmology, and instrumentation (not accepting abstracts)

Organisers: Nazim Bharmal, Lindsay Stringer, Meryem Kubra Dag

Ensuring that human activities are, or that they can become, environmentally sustainable is essential in order avoid the worst effects of climate change. There is also an imperative for scientists to undertake environmentally responsible research and innovation activities, with research funders increasingly requiring green lab certifications. For an individual researcher in astronomy and adjacent fields, it is not easy to understand what the impact is from their professional activities. Environmental impacts can originate from a large number of disprate sources, from locally within their institute all the way up to the shared use of global facilities such as telescopes and super-computers. This session aims to convene the people who want to take positive action, so that together we can develop our understanding of how research can be effectively carried out while simultaneously minimising its environmental impact. It will consider existing good practices and identify what else we can do to make our science more environmentally sustainable, with a view to informing a wider conversation and set of actions.

Note this lunchtime session does not accept abstracts.

Session type: Lunch-time session

Habitable World Observatory UK Involvement Planning and Discussion

Organisers: Jessica Doppel, Qiuhan He, David Lagattuta, Richard Massey, James Nightingale

NASA’s Habitable World Observatory (HWO), which is set to launch in the late 2030s, will transform our understanding of exoplanets and the potential for life beyond Earth. Its primary goal is to identify and directly image at least 25 potentially habitable worlds and use spectroscopy to detect chemical biosignatures, such as oxygen and methane, in their atmospheres. This mission has scope well beyond exoplanets, including stellar astrophysics, cosmology, and extragalactic astronomy.

The telescope will feature a 6.5-meter primary mirror with infrared, optical, and ultraviolet detectors across a broad range of wavelengths. It will also include sensitive spectrometers, coronagraphs for direct imaging, and space-based imaging quality and optics, enabling exquisite imaging of exoplanet atmospheres, biosignatures, and distant galaxies.

Now is the critical time to explore how to maximize the nation's involvement. The UK leads 3 of the 65 science cases being used to optimise hardware design, and UKSA are negotiating a (potentially substantial) contribution of an instrument - but which is not yet agreed. This session will serve as a forum for UK researchers to present science objectives, discuss engagement strategies, and identify key areas where the UK can secure a leading role. Topics will include exoplanets, stars, galaxy evolution, dark sector physics, and how HWO can complement other space missions and UK contributions to ground-based observatories.

Session type: Lunch-time session (**abstracts accepted**)

How do we make progress in science?

Organisers: David Alexander, Ryan Hickox, Ulrike Kuchner

How do we make progress in scientific (more specifically astronomy) research? Astronomy is strongly driven by new facilities, cutting edge observatories that explore new regions of parameter space and ever more powerful computers that allow for the investigation of more refined physics at higher spatial and temporal resolution. But scientific progress is more than just exploitation of new facilities: larger datasets from existing facilities, the utilisation of new analysis techniques, possibly adapted from different disciplines, facilitated community engagement, and inspiration are also powerful drivers of progress.

In this lunchtime session we, a group of astronomers, philosophers, and sociologists, aim to discuss how scientists make progress in research and how we can recognise and track this progress, including demonstrating some of the tools and approaches at our disposal. All are welcome to join!

Session type: Lunch-time session (**abstracts accepted**)

LSST and LSST:UK for Early Career Researchers

Organiser: Graham Smith; co organisers: Steve Ardern, Astha Astha, Michelle Collins, Thomas Cornish, Suhail Dhawan, Dimple, Paul Giles, Chris Lintott, Bob Mann, Garreth Martin, Steph Merritt, Mahdieh Navabi, Clara Pennock, Ana Sainz de Murieta, Jason Sanders, Matthew Temple, Roy Williams, Jacco van Loon

The Vera C. Rubin Observatory's Legacy Survey of Space and Time (LSST) will be a major pillar of the UK astronomy programme for the next two decades. Its unprecedented combination of spatial, spectral and temporal coverage enable it to probe a broad range of astrophysical phenomena, across all areas of astronomy, from near-Earth asteroids to distant quasars, the dark energy believed to drive the Universe's accelerating expansion, and much more.

NAM2025 coincides with a major milestone of broad impact across the UK and international communities: the first release of on-sky Rubin data to data rights holders. These data have already been obtained during observations with the commissioning camera in late 2024. Science Verification observations with LSSTCam are also expected to be well underway in summer 2025.

At NAM2025 we aim to encourage and enable the widest possible participation and engagement with the early data.

This lunch session will be organised by and dedicated to Early Career Researchers, offering a selection of talks and other activities that are focused their needs and interests.

Session type: Lunch-time session (**abstracts accepted**)