NEXUSS

Next Generation Unmanned Systems Science

NERC / EPSRC Centre for Doctoral Training in the Smart and Autonomous Observation for the Environmental Sciences

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NERC SCIENCE OF THE ENVIRONMENT

EPSRC Engineering and Physical Sciences Research Council

NEXUSS – The Vision

To develop, deliver and disseminate the world's first environmental science doctoral training programme founded around highly experiential, industry-engaging *Grand Challenge* events.

NEXUSS – Aims

To transform UK environmental science by embedding the application of Smart and Autonomous Observation Systems (SAOS) across the research and business landscape. Specifically…

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To transform UK environmental science by embedding the application of Smart and Autonomous Observation Systems (SAOS) across the research and business landscape. Specifically…

- Developing and sharing *an international best practice template for training* future generations of environmental scientists
- Delivering *a cohort of technology-aware leaders* who will take forward SAOS approaches in science, industry and government
- Stimulating *high-calibre SAOS technology transfer* to environmental disciplines

The NEXUSS Partnership

An established alliance of 6 leading science and engineering universities and research organisations that:

- are in the vanguard of the UK research and training excellence in the development and environmental application of SAOS

University of Southampton

Heriot Watt University

University of East Anglia

British Antarctic Survey
Natural Environment Research Council

National Oceanography Centre
Natural Environment Research Council

Scottish Association for Marine Science

The NEXUSS Partnership

An established alliance of 6 leading science and engineering universities and research organisations that:

- undertake world-leading, multidisciplinary science across the NERC remit, underpinned by a sustained stream of SAOS experiments across all of Earth's environments that is unrivalled in the UK

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Natural Environment Research Council

National Oceanography Centre
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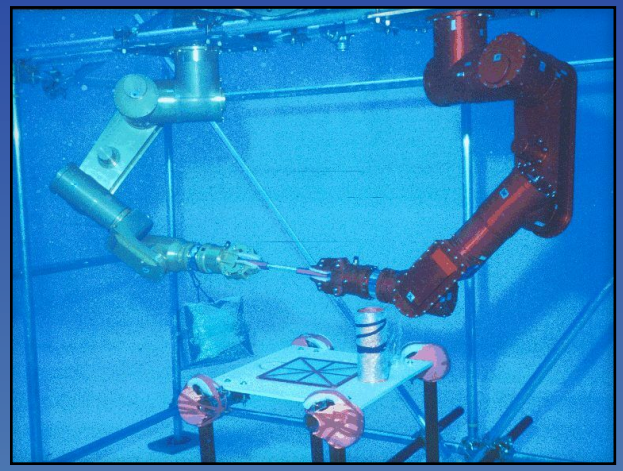
The NEXUSS Partnership

An established alliance of 6 leading science and engineering universities and research organisations that:

- include the UK's foremost SAOS engineers and physical scientists, with access to some of the world's best SAOS facilities



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University of East Anglia

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Natural Environment Research Council

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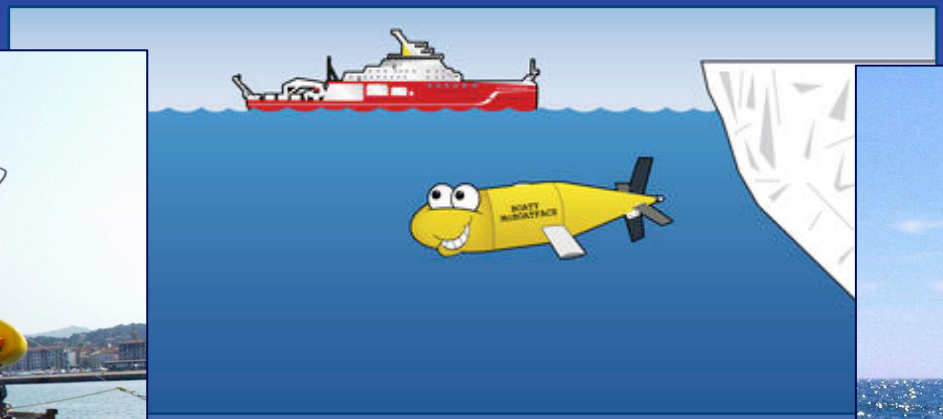
The NEXUSS Partnership

An established alliance of 6 leading science and engineering universities and research organisations that:

- represent the UK focus of development and application of SAOS approaches in marine science



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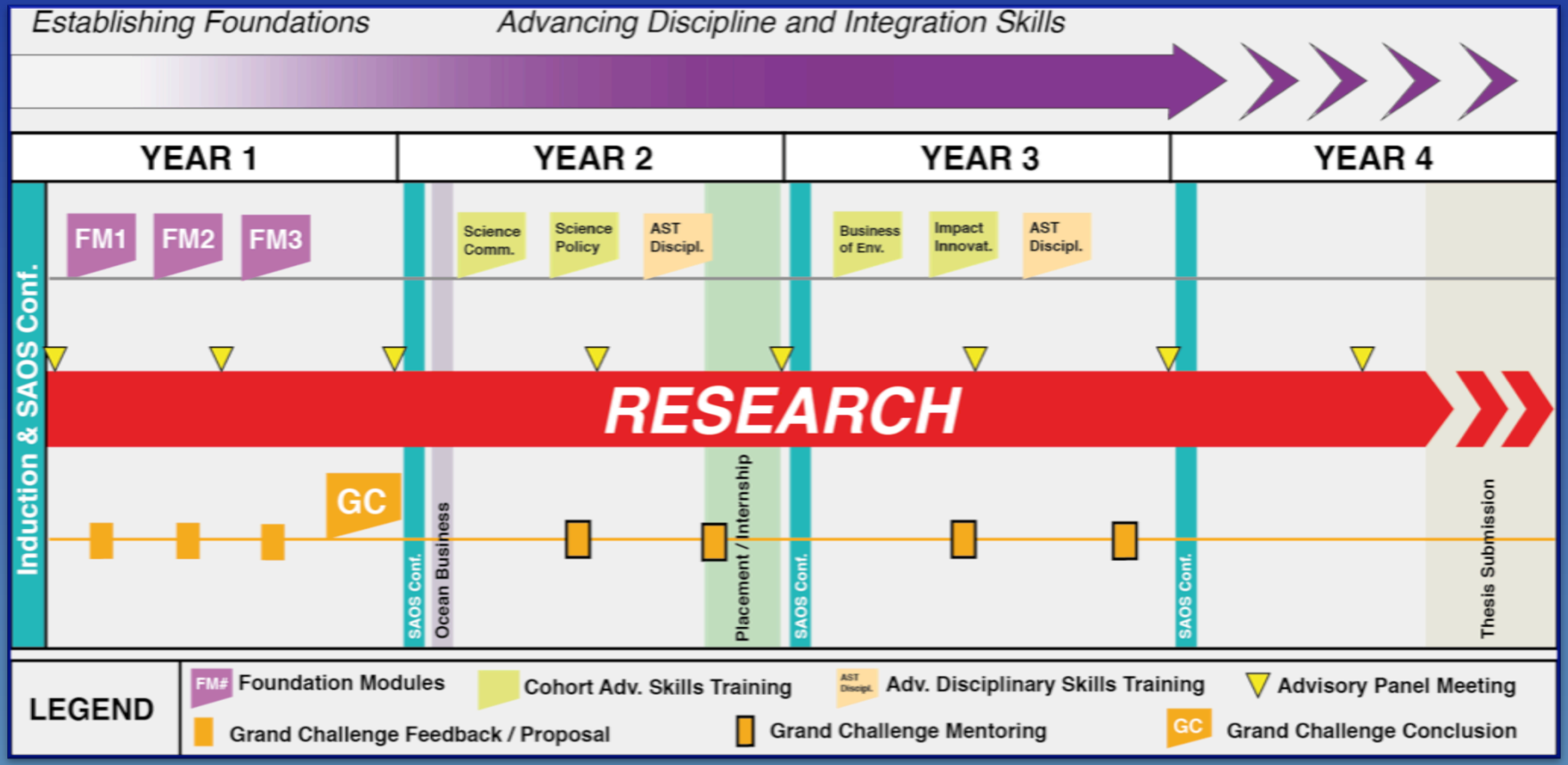
The NEXUSS Training Mission

To develop a cohort of world-class environmental scientists with a wide multidisciplinary bandwidth and high-calibre SAOS technological skills by:

- *Recruiting the best*
- Designing a *personalised training programme* of research and professional skills that prioritises the student's development experience
- *Engaging the stakeholder community* fully in building the training programme to ensure that it is bespoke and aligned with the community's needs

The NEXUSS Student Experience

Training programme a combination of 16 weeks high-quality training (cohort-based foundation elements and personalised advanced activities), with strong peer learning and stakeholder engagement.



NEXUSS – Active Projects

Active projects are primarily marine – but span a range of areas across the NERC remit, and from engineering to environmental science, e.g.,

- *Lab-on-chip sensors for environment, fisheries and aquaculture science* **(NOC, UoS, Cefas)**
- *Animal-borne sensors for studying foraging and habitat use of marine predators in the Southern Ocean* **(St. Andrews, SAMS)**
- *Multi-vehicle swarm behaviours for monitoring of rapidly evolving ocean phenomena* **(NOC, UoS)**
- *Sounds in the sea: how can we listen from ocean gliders?* **(UEA, SAMS, Cefas)**
- *Learning in the Deep: Quantifying change in deep-sea benthic environments using 3D image reconstructions* **(UoS, NOC)**
- *Blue eyes: New tools for monitoring coastal environments using remotely piloted aircraft and machine learning* **(UEA, NOC)**
- *Terrain-following UAVs for sampling of boundary layer turbulent fluxes* **(UoS, NOC, HWU)**
- *GPU-accelerated 3D visualization and analysis of migratory behavior of long-lived birds* **(UEA, HWU, BTO)**

NEXUSS training – Year 1

- FM1 – ‘Smart and Autonomous Platforms and Sensors for Environmental Science’ – Southampton, Dec 2018
- FM2 – Glider Advanced Training Short Course – Norwich, January 2019
- FM3 – ‘Opening the Black Box of Robotics’ – Oban, date to be set
- Grand Challenge, location and date to be set (more in next session)

NEXUSS Training Outputs

- *A new breed of environmental scientist*

  – *more aware* of the cutting-edge technologies that will transform the field;
  – *more versatile* in applying and developing these technologies;
  – *more capable* of communicating across disciplinary barriers and extracting value from science.

- *A cultural change in UK environmental science*

  – addressing environmental problems with *bespoke SAOS approaches*.

NEXUSS in numbers

- NEXUSS – 6 Core Partners (UoS [lead], NOC, BAS, UEA, HWU and SAMS) and a range of Associate Partners (Bath, Exeter, St. Andrews, Cefas, Teledyne, MASTS, Rockland, Gardline…)
- NEXUSS supported by NERC / EPSRC in October 2015, with an investment of £2.5M for 30 (3.75 year-long) PhD studentships
- Centre's lifetime of 6 years, with 3 starting cohorts → 46 students
- First cohort started in October 2016, you are the third cohort
- NEXUSS supported with £600k investment in off-the-shelf SAOS assets to support and enhance PhD projects and Grand Challenge

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EPSRC Engineering and Physical Sciences Research Council

NEXUSS Capital Fund

- Two Announcements of Opportunity per academic year
- Open to *active* NEXUSS PhD supervisors and students
- Intended to *enhance* projects, not to enable projects
- Each bid up to £35k per associated PhD project
- Maximum of 1 bid per PhD supervisor and student in each funding round
- Bids ranked by NEXUSS Steering Committee according to 3 criteria:
  - (1) Potential to lead to innovative or high-reward science
  - (2) Potential to add value to or reduce risk in bidder's PhD project
  - (3) Potential to add value to Grand Challenge activities

NEXUSS Capital Fund

Nine bids (£162k) supported to date:

- Wideband echosounder (Kongsberg WBT mini) for AUV applications (BAS) ~ £24k
- Passive acoustic monitoring sensor for Seaglider (UEA) ~ £25k
- Fluidion Deep Water pH sensor (UEA / NOC) ~ £5k
- FLIR Vue Pro thermal camera for drones (BAS) ~ £5k
- Electromagnetic current meter for ocean gliders (UEA) ~ £23k
- Weather-proof UAV lifting platform (SAMS) ~ £9k
- GPS loggers + SIM cards + UAV + ancillary equipment (UEA) ~ £40k
- FLIR Vue Pro thermal camera + Mapir Kernel array (UoS) ~ £16k
- 3 Planet Ocean ecoSUB AUVs (NOC) ~ £15k

→ Upcoming capital deadline in October with a notional budget of £100k

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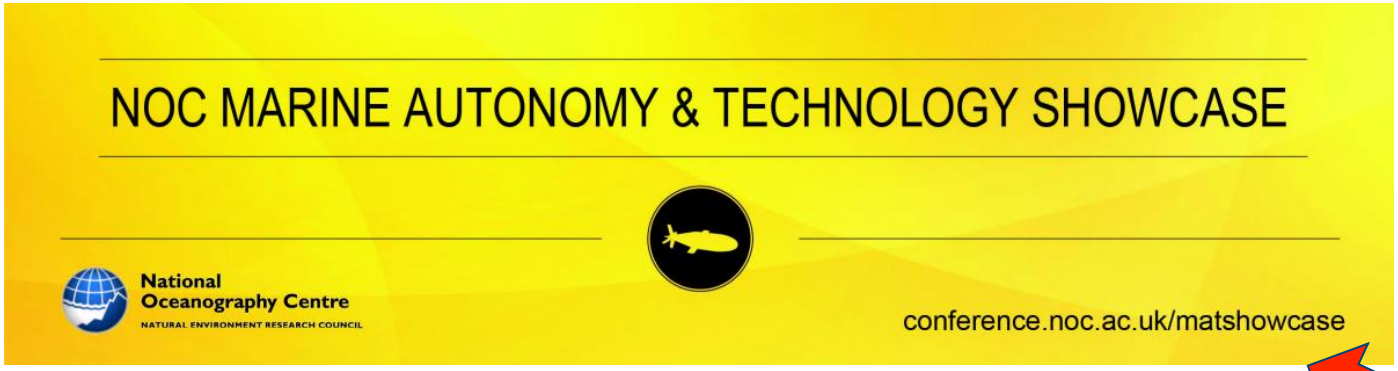
NEXUSS – Engagement with SAOS stakeholders

Marine Autonomy & Technology Showcase



Marine Autonomy & Technology Showcase 2018

13 - 15 November 2018

The countdown to MATS 2018 has begun and with record number of exhibitors and abstracts submitted it looking to be our best MATS to date. In early September we will be announcing our Keynote speaker for the event which will be well received.

Highlights to look out for are, day one we will round off by holding an icebreaker session featuring posters from NEXUSS students, showcasing some of the bright new talent coming forward over the next few years, Day two will feature a parallel session from the Southern branch of the Hydrographic society with the day being rounded off with an informal networking supper.

New for 2018 will be our series of MAS 101 sessions, led by the leading experts of various vehicle / technology types offering a chance to lift the lid on what makes them operate. further details of this to be announced soon.