Approved, DCN# 0543-186-23

# 2022 ONR GLOBAL

## International Science Prospectus

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The Diamond Light Source is a synchrotron light source located at the Harwell Science and Innovation Campus in Oxfordshire, U.K. Here, particles are accelerated to near light speeds, creating bright light that allows it to work like a giant microscope. It is used for high-fidelity experimentation in many areas of scientific research. Science Director Dr. Jay Marble represented ONR Global on a liaison visit to the facility. (Image courtesy of Diamond Light Source)

# From the ONR Global Commanding Officer

It is my pleasure to present the fiscal year 2022 (FY2022) edition of the International Science Portfolio's (ISP) Prospectus, from the Office of Naval Research Global (ONR Global).

ISP employs technically skilled scientists and engineers to enhance the international science and technology (S&T) engagement of the U.S. Navy and Marine Corps and to increase its awareness of global technology.

This Prospectus summarizes the important work accomplished by the ISP in FY2022, specifically in the areas of international networking, collaborations and fundamental research grants. The international science tools utilized by our science directors are detailed in this issue, along with research technology areas that were studied and the countries, universities and institutional partnerships that participated in collaborative research this year.

My hope is that this issue of the Prospectus reflects the many ways ONR Global engages around the globe to build trust and partnerships with the world's best researchers. In doing so, we aim to achieve our vision of being the partner of choice for international science and technology leaders.

Please contact me or my staff if you have any questions, feedback, recommendations or opportunities.

Sincerely,

ONR Global
Commanding Officer

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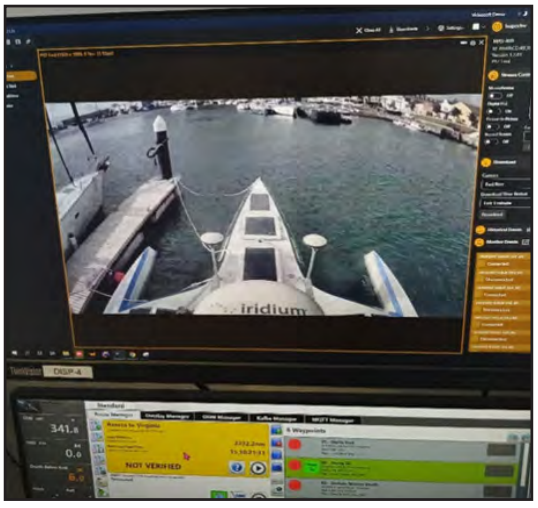
# ONR GLOBAL BACKGROUND AND MISSION RELEVANCE

The ONR Global mission of being the partner of choice for science and technology leaders worldwide started over 80 years ago in London, its headquarters.

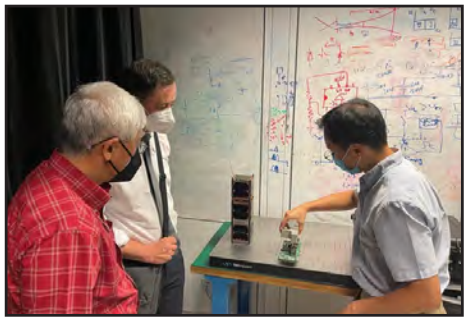
The U.S. Office of Naval Research Global (ONR Global) provides worldwide science and technology-based solutions for current and future naval challenges. Leveraging the expertise of more than 50 scientists, technologists and engineers, ONR Global maintains a physical presence on five continents. The command reaches out to the broad global technical community and the operational fleet/force commands to foster cooperation in areas of mutual interest and to bring the full range of possibilities to the Navy and Marine Corps.

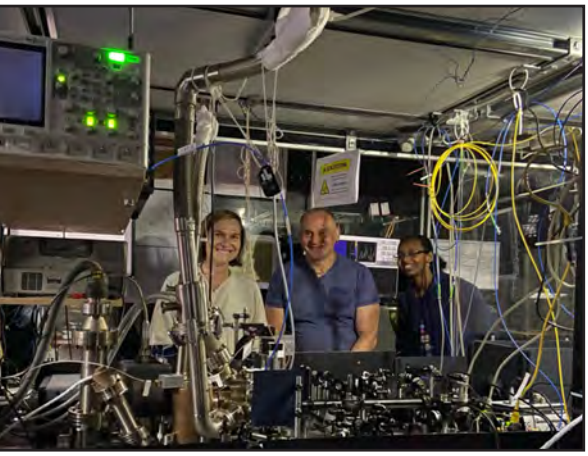
When ONR was founded in 1946, the command assumed the responsibility of the wartime-era's Office of Scientific Research and Development liaison office in London, which had been operating since 1941. It aimed to identify promising research opportunities in Europe and the Middle East. By 1977, ONR's European and Tokyo offices had combined to form the international field office with a single, U.S. Navy-wide international S&T strategy for fostering global collaboration. ONR Global has increased its presence and expanded its cooperative activities with offices in Singapore, Tokyo, Santiago, Prague, Sao Paulo, Melbourne and, most recently, with sponsorship of the London Tech Bridge, which opened in 2021.




These are a few instances of ONR Global science directors in action — Liaison Visits, Visiting Scientists, Collaborative Science, Research Grants and the London Tech Bridge. These engagements are examples of the international science- and technology-based initiatives that the International Science Portfolio contributes to current and future naval challenges.

ONR Global provides worldwide science- and technology-based solutions for current and future naval challenges.



# ISP: INTERNATIONAL SCIENCE PORTFOLIO

Science Director (U.K.) Dr. Charles Eddy (right) with principle investigator Professor Oscar Quevedo-Teruel, inside the KTH anechoic chamber used to characterize novel microwave lenses and antennae.

Science Director (Chile) Chris Konek (center) and Associate Science Director Sonia Wolff (right) in the lab of Professor Esteban Vera from Electrical Engineering, Pontificia, Universidad Catolica de Valparaíso, Chile.

The ONR Global International Science Portfolio (ISP) employs technically skilled scientists and engineers to enhance the international S&T engagement of the U.S. Navy and Marine Corps and to increase their awareness of global technology. The technical staff, known as science directors—typically scientists with doctorates working across government, academia and industry—work out of offices around the world to scout technologies for ONR and the Naval Research Enterprise (NRE).

Science directors serve as the international arm of ONR and the NRE, helping to shape the U.S. Navy and Marine Corps' international engagement strategy and establish insight into the research agendas of ONR, the Naval Research Laboratory and other NRE organizations.

# Science Directors

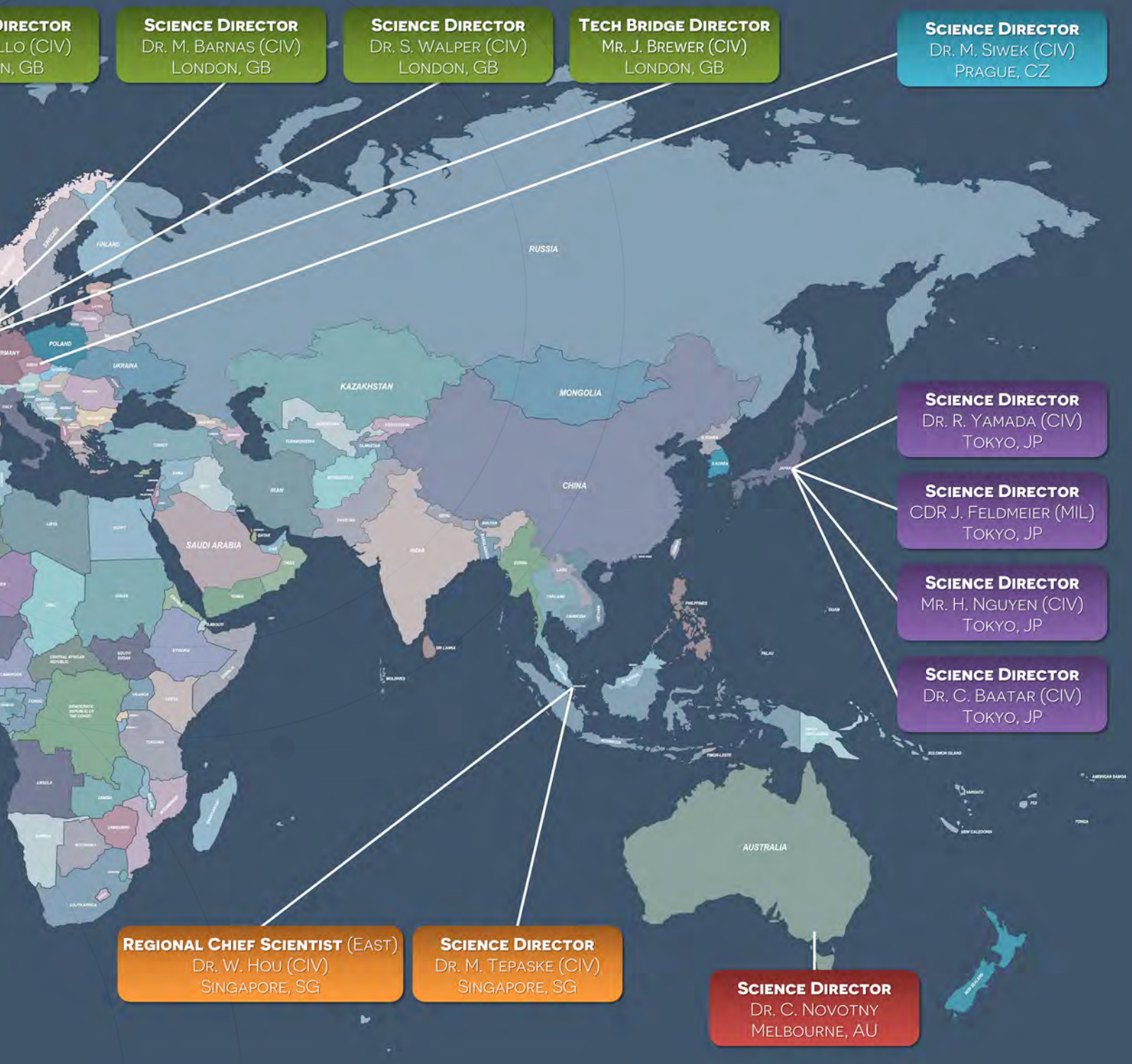
Science directors complete a three- to four-year tour in which they visit international S&T institutions to develop access and find cutting-edge science and technology, assess international innovation in areas of naval interest, provide global technical assessments, follow trends in science and technology, and track technological development in specific geographical areas. Science directors recommend innovative researchers, who they meet and work with during international engagements, to be awarded research grants.

## ISP Tools

ISP sponsors investments—exchange visits, conferences and workshops, seed funding—that address the needs of the Navy and Marine Corps and enhance the S&T priorities of ONR, the NRE and our partnerships around the world.

- **Liaison Visits** allow science directors to attend international events and visit international institutions to develop, access and discover cutting-edge science and technology.
- **Visiting Scientists** support short-term travel opportunities for foreign/international scientists to the United States to socialize new S&T ideas or findings with the NRE that support advancing basic research though collaboration.
- **Collaborative Science** supports foreign or international workshops, conferences and seminars of naval interest by providing financial support.
- **Research Grants** provide direct research support to international scientists to help address naval S&T challenges. These grants support the insertion of innovative, international S&T into core ONR and NRE portfolios.

# ISP: Around the World


Director
LLO (CIV)
N, GB
Science Director
Dr. M. Barnas (CIV)
London, GB
Science Director
Dr. S. Walper (CIV)
London, GB
Tech Bridge Director
Mr. J. Brewer (CIV)
London, GB
Science Director
Dr. M. Siwek (CIV)
Prague, CZ
Science Director
Dr. R. Yamada (CIV)
Tokyo, JP
Science Director
CDR J. Feldmeier (MIL)
Tokyo, JP
Science Director
Mr. H. Nguyen (CIV)
Tokyo, JP
Science Director
Dr. C. Baatar (CIV)
Tokyo, JP
Regional Chief Scientist (East)
Dr. W. Hou (CIV)
Singapore, SG
Science Director
Dr. M. Tepaske (CIV)
Singapore, SG
Science Director
Dr. C. Novotny
Melbourne, AU
RUSSIA
KAZAKHSTAN
MONGOLIA
CHINA
AUSTRALIA
SAUDI ARABIA
IRAN
INDIA
POLAND
UKRAINA
FINLAND
cz
Santiago, CL
São Paulo, BR
Singapore, SG
Tokyo, JP

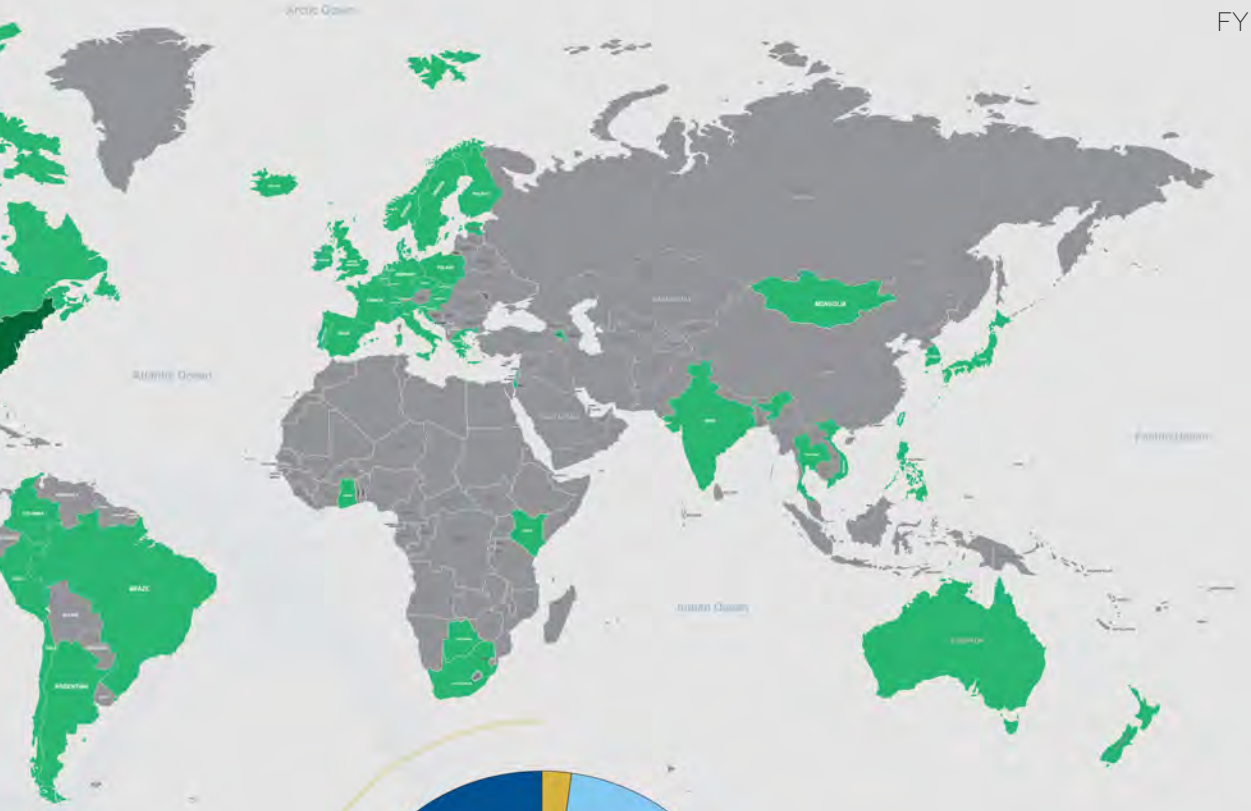
# 2022 AT A GLANCE

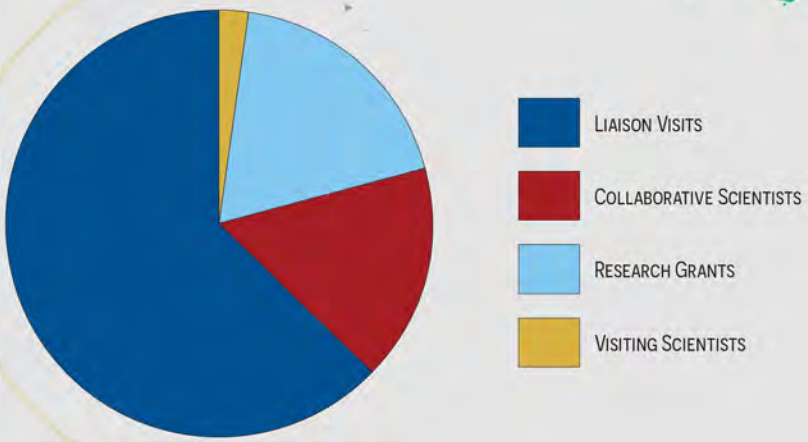

**48** COUNTRIES

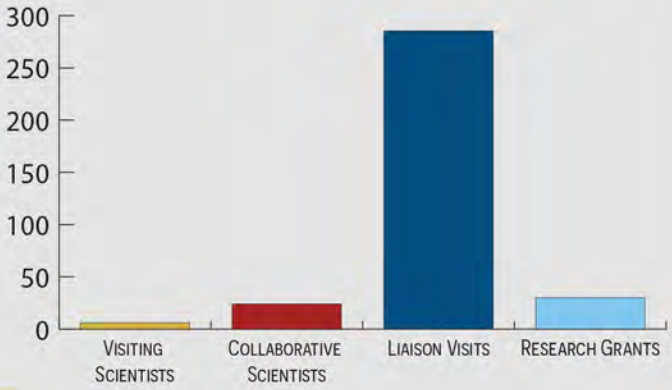
**156** RESEARCH TECH DOMAINS

**327** PERFORMERS

**351** VISITS AND ENGAGEMENTS




Liaison Visits
Collaborative Scientists
Research Grants
Visiting Scientists


300
250
200
150
100
50
0
Visiting Scientists
Collaborative Scientists
Liaison Visits
Research Grants


Visiting Scientists
Collaborative Science
Liaison Visits

# LIAISON VISITS

In FY2022, ISP had over

**324** LIAISON VISITS

to **44** COUNTRIES

**97** RESEARCH TECH DOMAINS

**271** PERFORMERS VISITED (UNIVERSITY-INSTITUTE OR CONFERENCE)

Liaison visits are vital opportunities for science directors to attend international events and visit international institutions where they can create close working relationships with other innovative individuals in the science community, as well as develop, access and discover cutting-edge technologies.

These international science networking liaison visits are the primary tool in monitoring overall Global Technical Awareness (GTA). Additionally, they can create opportunities for those institutions to partner with ONR Global's visiting scientists, collaborative scientists or potential research grant opportunities.

In FY2022, ISP had over 320 liaison visits with 43 countries.

Science Director Dr. Chagaan Baatar (Tokyo, Japan) visiting the National University of Mongolia (top) and Chulalongkorn University in Thailand (bottom).

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# LIAISON VISIT DATA SUMMARY

## Total Number of Countries Visited and Total Number of Visits*

| Countries | Total # of Visits |
|---|---|
| Australia | 64 |
| Belgium | 3 |
| Botswana | 3 |
| Brazil | 15 |
| Canada | 2 |
| Chile | 4 |
| Colombia | 7 |
| Croatia | 4 |
| Czech Republic | 15 |
| Denmark | 1 |
| Estonia | 3 |
| Finland | 6 |
| France | 6 |
| Germany | 2 |
| Ghana | 2 |
| Hungary | 5 |
| India | 10 |
| Ireland | 1 |
| Israel | 6 |
| Italy | 7 |
| Japan | 30 |
| Kenya | 2 |
| Mexico | 8 |

| Countries | Total # of Visits |
|---|---|
| Mongolia | 3 |
| The Netherlands | 9 |
| Multiple Asia-Pacific Countries | 1 |
| New Zealand | 1 |
| Norway | 1 |
| Peru | 3 |
| Philippines | 1 |
| Poland | 6 |
| Portugal | 3 |
| Singapore | 17 |
| Slovakia | 3 |
| Slovenia | 1 |
| South Africa | 5 |
| South Korea | 6 |
| Spain | 5 |
| Sweden | 4 |
| Taiwan | 1 |
| Thailand | 7 |
| United Kingdom | 28 |
| United States | 4 |
| Vietnam | 9 |
| **Total= 44** | **Total= 324** |

*5.6 percent virtual

# Research Tech Domains

1. Acoustics
2. Additive and Advanced Manufacturing
3. Additive Manufacturing
4. Advanced Computation
5. Advanced Computing
6. Advanced Materials
7. Advanced Networked Sensing and Signature Management
8. Advanced Optics
9. Advanced Photonics
10. Advanced RF and Microwave Technologies
11. AI/ML
12. Applied Physics
13. Applied Psychology
14. Astronomy
15. Atmospheric Science
16. Auditory and Acoustic Signal Processing
17. Autonomy and Unmanned Systems
18. Aviation Technologies
19. Biology
20. Biomechanics
21. Bioprinting
22. Biotechnology
23. Chemical Engineering
24. Chemistry
25. Climate Change
26. Coatings
27. Cold Spray Deposition
28. Computational Biology
29. Computational Imaging
30. Computational Science
31. Computer Science
32. Conformal Antenna Technologies
33. Decision Science
34. Directed Energy
35. Energy Storage and Battery Technologies.
36. Environmental Science
37. Fiber Lasers
38. Fluid Dynamics
39. Foreign Comparative Testing
40. FutureG
41. Geology
42. Geoscience
43. High Energy Lasers
44. High Power Microwave
45. Human Digital Twin
46. Human Performance
47. Human-Machine Interfaces
48. Human-Machine Teaming
49. Hydrology
50. Hypersonics
51. Infectious Disease
52. Information Science
53. Life Sciences
54. Light Metal Alloys
55. Marine Mammals
56. Marine Science
57. Maritime Autonomy
58. Maritime Domain Awareness
59. Material Science
60. Medical Devices
61. Medical Research
62. Meteorology
63. Microeletronic Materials
64. Mine Hunting Technologies
65. Modeling and Simulation Blockchain Technologies
66. Nano Electronics
67. Nanoscience
68. Nanotechnology
69. Natural Materials
70. Neural Networks
71. Neuroscience
72. Nuclear Energy
73. Oceanography
74. Optical Biosensors
75. Physics
76. Polar Science
77. Power and Energy Technologies
78. Propulsor Technologies
79. Quantum Communications
80. Quantum Computing
81. Quantum Materials
82. Quantum Science
83. Quantum Sensing
84. Renewable Energy
85. Robotics
86. Seismology
87. Signal Processing
88. Space Domain Awareness
89. Space Technologies
90. Space Weather
91. Spectrum Technologies
92. Synthetic Biology
93. Thermodynamics
94. Translational Medicine
95. Underwater Technologies
96. Viral assays
97. Wind Energy

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# Performers Visited
## (University-Institute or non-CSP Conference)

| Performers Visited |
|---|
| 01. 10th International Congress on Biocatalysis |
| 02. 1st Ammonia Energy Symposium |
| 03. 45th Annual Meeting of the Japan Neuroscience Society |
| 04. Advanced Manufacturing Research Institute, AIST |
| 05. Alan Turing Institute, London |
| 06. All India Institute of Medical Science |
| 07. Asia Oceania Geosciences Union Meeting |
| 08. Asia Pacific Conference on Near-Field Optics |
| 09. Atomic Layer Deposition/Atomic Layer Etch Conference |
| 10. Australian Bureau of Meteorology |
| 11. Australian Defence Science, Technology and Research Summit |
| 12. Australian National University |
| 13. Bar-Ilan University |
| 14. Ben Gurion University of the Negev |
| 15. Boeing Research & Technology |
| 16. Botswana Institute for Technology Research & Innovation |
| 17. Botswana International University of Science and Technology |
| 18. Bright Green Summit |
| 19. Budapest University of Technology and Economics |
| 20. Cambridge University |
| 21. Cardiff University |
| 22. CENSIPAM, Brazilian Government |
| 23. Center for Engergy Reserch |
| 24. Center for Marine Research - Ruđer Bošković Institute |
| 25. CentraleSepulec University |
| 26. Charles University |

| Performers Visited |
|---|
| 27. Chironix - Prject Simpson |
| 28. Chulalongkorn University |
| 29. CINVESTAV |
| 30. CNR - IPCF |
| 31. CNR - ISTEC |
| 32. Conference on Liquid and Amorphous Metals |
| 33. Council for Scientific and Industrial Research |
| 34. Curtin Univeristy - Optus-curtin Centre of Excellence in AI |
| 35. Cybernetica |
| 36. Czech Academy of Sciences - Institute of Photonics and Electronics |
| 37. Czech Academy of Sciences - leadership |
| 38. Czech Academy of Sciences, Institute of Chemical Process Fundamentals |
| 39. Czech Academy of Sciences, Institute of Physics - Nanosurface Lab |
| 40. Czech Academy of Sciences, Institute of Physics (4 Depts) |
| 41. Czech Academy of Sciences, Institute of Thermomechanics |
| 42. Czech University of Technology - AI Center |
| 43. Czech University of Technology, Czech Institute of Informatics Robotics and Cybernetics |
| 44. DBC LTD |
| 45. Deakin University |
| 46. Defence Science & Technology Group |
| 47. Defence Science and Technology Group, Australia |
| 48. Defense and Security Expo 2022, Bangkok, Thailand |
| 49. Defense Science and Technology Department |
| 50. Defense Science Technology Group |
| 51. DSO National Laboratories |

| Performers Visited |
|---|
| 52. DSTL |
| 53. EAFIT |
| 54. Eindhoven University |
| 55. ELI Beamlines |
| 56. Engineered Living Material Conference |
| 57. European Conference on Applied Surface & Interface Analysis |
| 58. Finnish Minister of Defence |
| 59. Fiocruz, Rio de Janeiro HQ |
| 60. Fiocruz-AM, Manaus |
| 61. Forging the Future - US-BE Workshop |
| 62. Future of Space Forum, Japan |
| 63. Gdańsk University of Technology |
| 64. Gdynia Maritime University |
| 65. General Electric Research |
| 66. Geoptic Inc. |
| 67. Gifu University |
| 68. Griffith University |
| 69. Hanoi University of Science and Technology |
| 70. Hanyang University |
| 71. HiLASE |
| 72. Ho Chi Minh City University of Technology |
| 73. Hokkaido University |
| 74. Icebreaker K/V "Svalbard" |
| 75. IEAPM, Brazilian Navy |
| 76. Imperial College London |
| 77. Inaugural OSD BRO 6.1 Basic Research Conference |
| 78. India Institute of Technology, Delhi |
| 79. India Institute of Technology, Delhi |
| 80. India Institute of Technology, Hyderabad |
| 81. Indian Ocean Defense and Security Conference |
| 82. INDO PACIFIC International Maritime Exposition/ Royal Australian Navy's Sea Power 22 Conference |
| 83. INETEC |
| 84. INPA, Manaus |

| Performers Visited |
|---|
| 85. Institute for Research & Innovation in Health |
| 86. Internatinal Conference of Young Researchers in Advanced Materials |
| 87. International Conference on Low Temperature Physics |
| 88. International Conference on Southern Hemisphere Meteorology and Oceanography |
| 89. IPN |
| 90. Israel Institute of Technology - Technion |
| 91. ITM |
| 92. ITT, Genova |
| 93. Japan Advanced Institute for Science and Technology, JAIST |
| 94. Japan Geoscience Union Meeting |
| 95. Japan Ministry of Defense, ATLA |
| 96. Japan Society for Artificial Intelligence Annual Meeting |
| 97. JFE Minerals |
| 98. JICAMARA |
| 99. Joint Advanced Technoloyg Center |
| 100. KAICO LTD |
| 101. Kanazawa Institute of Technology |
| 102. Kenya Industrial Research and Development Institute |

Kookmin University, Seoul, South Korea. (Image courtesy of Kookmin University)

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| Performers Visited |
|---|
| 103. King Mongkut's Institute of Technology Ladkrabang |
| 104. King Mongkut's Institute of Technology Ladkrabang (KMITL) |
| 105. Konkuk University |
| 106. Kookmin University |
| 107. Korea Advanced Institute of Science and Technology |
| 108. KOZWaves Conference |
| 109. KTH |
| 110. Kwame Nkrumah University of Science and Technology |
| 111. La Rochelle University |
| 112. Lund University |
| 113. Macquarie University |
| 114. Magnesium Research Center, Kumamoto University |
| 115. McMaster University |
| 116. MINDEF Future Systems Technology Directorate |
| 117. MINEF Future Systems Technology Directorate (FSTD) |

The International Conference on Soft Robotics 2022, at the University of Edinburgh, Edinburgh, Scotland. (Image courtesy of RoboSoft)

| Performers Visited |
|---|
| 118. Monash University |
| 119. Mongolian Academy of Sciences (MAS) |
| 120. Mongolian University of Science and Technology (MUST) |
| 121. Nakatsuyama LTD |
| 122. Nanocarbons and New Diamonds Conference |
| 123. Nanyang Technical University |
| 124. Nanyang Technological University |
| 125. National Center for Telecommunications |
| 126. National Cheng Kung University |
| 127. National Defense Academy |
| 128. National Institute of Advanced Industrial Science and Technology |
| 129. National Physical Laboratory |
| 130. National Science and Technology Agency (NSTDA) |
| 131. National University of Mongolia (NUM) |
| 132. National University of Singapore |
| 133. NATO Centre for Maritime Research and Experimentation (CMRE) |
| 134. Netherlands Organisation for Applied Scientific Research (TNO) |
| 135. Nokia Over-the-Air Laboratories in Oulu |
| 136. Northeastern University |
| 137. Novel Crystal LTD |
| 138. Oceanology Conference, London |
| 139. Okayama University |
| 140. Palacky University |
| 141. Pázmány Péter Catholic University |
| 142. Philippine Atmospheric, Geophysical and Astronomical Services Administration |
| 143. Polish Academy of Sciences |
| 144. Polytechnic University o Valencia |
| 145. Pontificia Universidad Catolica - Valparasio |
| 146. Pontificia Universidad Catolica del Peru |
| 147. PUC Rio |


The Eindhoven University of Technology is a public technical university in the Netherlands, located in the city of Eindhoven. (Image courtesy of the Eindhoven University of Technology)

| Performers Visited |
|---|
| 148. PUC-Parana |
| 149. Pusan National University |
| 150. Queensland University of Technology |
| 151. Raboud University |
| 152. Research Center for Natural Sciences |
| 153. RIKEN |
| 154. RIKEN - National Science Institute |
| 155. RISE |
| 156. ROBOSoft Conference, Edinburgh |
| 157. Royal Melbourne Institute of Technology (RMIT) |
| 158. Saab Kockums Stirling |
| 159. SABIC |
| 160. Sensor Electronics and Emerging Applications Workshop |
| 161. Seoul National University |
| 162. Singapore Air Show |

| Performers Visited |
|---|
| 163. Singapore Space Technology Limited |
| 164. Singapore University of Science and Technology |
| 165. Slovak Academy of Sciences |
| 166. Slovak Academy of Sciences, International Cooperation |
| 167. Slovak Academy of Sciences, Research Center for Quantum Information |
| 168. Space Faculty |
| 169. Spanish Ministry of Defence, Madrid |
| 170. SPIE Photonics Conference, Strasbourg |
| 171. Swansea University |
| 172. Swinburne University - Manufacturing Futures Research Institute |
| 173. Swinburne University of Technology |
| 174. Takasaki Advanced Radiation Research Institute, QST |
| 175. Tallinn University of Technology |

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| Performers Visited |
|---|
| 176. Tata Institute of Fundamental Research (TIFR) |
| 177. Technical University of Delftg |
| 178. Technical University of Eindhoven (TU-e) |
| 179. Technical University of Liberec |
| 180. Tel Aviv University |
| 181. Toyohashi Institute of Science and Technology |
| 182. Trusted Autonomous Systems (TAS) Defence CRC |
| 183. Tshwane University of Technology |
| 184. Tsukuba University |
| 185. UFAM, Manaus |
| 186. UFPA, Curitiba |
| 187. UFPE, Recife |
| 188. UFRJ, Coppe |
| 189. UK National Oceanography Centre, Southampton |
| 190. UNINDETEC First Symposium |
| 191. UNINDETEC, Mexican Navy Research Lab |
| 192. UNIPRESS |
| 193. Univerisdad de Medellin |
| 194. Univeristy of Nottingham |
| 195. Univeristy of Oulu |
| 196. Universidad Carlos III de Madrid |
| 197. Universidad Catolica del Norte |
| 198. Universidad de Antioquia |
| 199. Universidad de Los Andes |
| 200. Universidad de Magallanes |
| 201. Universidad Militar |
| 202. Universidad Nacional |
| 203. Universidad Nacional Autonoma de Mexico |
| 204. Universidad Veracruzana |
| 205. Universidade de Campinas |
| 206. Universidade de Fortaleza |
| 207. Universirty of Zagreb |
| 208. Universite Catholique de Louvain |

| Performers Visited |
|---|
| 209. Université Claude Bernard Lyon 1 |
| 210. Université de Versailles St. Quentin-en-Yvelines |
| 211. University of Adelaide |
| 212. University of Amsterdam |
| 213. University of Aveiro |
| 214. University of Botswana |
| 215. University of Bristol |
| 216. University of Cape Town |
| 217. University of Cordoba |
| 218. University of Delft |
| 219. University of Ferrara |
| 220. University of Foreign Languages and Information Technology |
| 221. University of Ghana |
| 222. University of Glasgow |
| 223. University of Johannesburg |
| 224. University of Lisbon (ITQB) |
| 225. University of Maribor |
| 226. University of Massachusetts - Lowell |
| 227. University of Melbourne |
| 228. University of Montreal |
| 229. University of Nairobi |
| 230. University of New South Wales - Canberra/ Australian Defence Force Academy |
| 231. University of New South Wales, Canberra |
| 232. University of New South Wales, Main Campus |
| 233. University of Oulu |
| 234. University of Oxford |
| 235. University of Pau |
| 236. University of Pavia |
| 237. University of Plymouth |
| 238. University of Queensland |
| 239. University of South Australia |
| 240. University of Southern Queensland |

| Performers Visited |
|---|
| 241. University of Sussex |
| 242. University of Sydney |
| 243. University of Tartu |
| 244. University of Tasmania |
| 245. University of Technology Sydney |
| 246. University of the Sunshine Coast |
| 247. University of Tokyo, Institute of Industrial Science |
| 248. University of Twente |
| 249. University of Valencia |
| 250. University of Western Australia - Data Institute and Human Factors & Applied Cognition Lab |
| 251. USP |
| 252. USP, Sao Carlos |
| 253. US-UK Reactive Materials Workshop |
| 254. UTEC |
| 255. Vietnam Academy of Science and Technology |

| Performers Visited |
|---|
| 256. Vietnam German University |
| 257. VinAI Research |
| 258. VinUniversity |
| 259. VNU Institute for Environment and Resources |
| 260. VNU International University |
| 261. Vrgineers, Inc |
| 262. Wageningen University |
| 263. Warsaw Polytechnic |
| 264. Warsaw University |
| 265. Wartsila |
| 266. Weizmann Institute os Science |
| 267. West Bohemia University |
| 268. Western Sydney University |
| 269. Winger Reserch Center for Physics |
| 270. WITT - Energy |
| 271. Workshop on Cold Regions Infrastructure |

Universidad de los Andes, Santiago, Chile. (Image courtesy of Universidad de los Andes)

# VISITING SCIENTISTS

**In fiscal year FY2022, ISP had three scientist visits with three countries, which included four tech domains.**


As part of the Visiting Scientists, the U.S. Naval Research Laboratory (NRL) in Washington, D.C., hosted atmospheric chemistry researchers from the Spanish National Research Council in Spain. NRL is the Department of the Navy's corporate laboratory and is dedicated to research that drives innovative advances. NRL has direct ties with sources of fundamental ideas in industry, the academic community and throughout the world. (Photo courtesy of independent photographer Jim Meiklejohn)

The FY2022 numbers reflect international travel restrictions, due to COVID-19. However, we're looking forward to increasing our Visiting Scientists to its full potential in the coming year.

The Visiting Scientists (VS) Program supports short-term travel opportunities for international scientists to visit the United States or attend international conferences. Through this science tool, international scientists can interact with U.S. researchers and learn about new science and technology ideas or findings within the NRE that advance basic research through collaboration.

In FY2022 international travel has been difficult due to the COVID-19 pandemic and travel restrictions. ISP is looking to offer and facilitate more travel opportunities for international scientists in FY2023.


Dr. Sanjay Sharma, associate professor in intelligent autonomous control systems, Plymouth University, U.K., visiting the Massachusetts Institute of Technology (MIT), in Cambridge, Massachusetts.

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# VISITING SCIENTISTS DATA SUMMARY

## Total Number of Countries Visited and Total Number of Visits*

| Countries | Total # of Visits |
|---|---|
| Philippines | 1 |
| Spain | 1 |
| U.K. | 1 |
| **Total= 3** | **Total= 3** |

*Restricted due to COVID-19 travel limitations

Plymouth University has built a wide breadth of disciplinary interests in matters relating to marine and maritime environments. Leading education and research in marine biology, ocean science and marine engineering is complemented by marine and maritime themes across the university. (Image courtesy of Plymouth University, U.K.)

The Manila Observatory is in the Ateneo de Manila University in Loyola Heights, Quezon City, Philippines. (Image courtesy of the Manila Observatory.)

## Research Tech Domains

| |
|---|
| 1. Autonomy |
| 2. Meteorology |
| 3. Atmospheric Chemistry |
| 4. Synthetic Biology |

## PI University–Institute

| |
|---|
| Ateneo de Manila University and Manila Observatory |
| Spanish National Research Council |
| University of Plymouth |

# COLLABORATIVE SCIENCE

In FY2022, ONR Global had

**24** ENGAGEMENTS

across **17** COUNTRIES

**24** RESEARCH TECH DOMAINS

**24** PERFORMER VISITS (UNIVERSITY-INSTITUTE OR CONFERENCE)

Collaborative Science supports international workshops and conferences that align with naval interests.

This international science networking tool can also foster future liaison visits, visiting scientist opportunities and research grants.

In FY2022, ONR Global had 24 collaborative science engagements, becoming a new agility norm in 17 countries.


(Top photo) Science Director (Brazil) Arturo A. Ayón, Ph.D., participated in the first Symposium on Science and Technology in Veracruz, Mexico. During the symposium, Ayón spoke to the attendees about ONR Global grants for basic research projects. (Bottom photo) Ayón (right) made a presentation to Head of the Research and Technological Development Unit of the Mexican Navy, Vice Adm. Leopoldo Díaz González.

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# COLLABORATIVE SCIENCE DATA SUMMARY

## Total Number of Countries Engaged and Total Number of Engagements*

| Countries Engaged | Total # of Engagements |
|---|---|
| Australia | 3 |
| Belgium | 1 |
| Chile | 1 |
| Germany | 1 |
| Greece | 1 |
| India | 1 |
| Italy | 3 |
| Mexico | 1 |
| Poland | 1 |
| Portugal | 1 |
| Singapore | 2 |
| Spain | 1 |
| Sweden | 1 |
| Switzerland | 2 |
| The Netherlands | 1 |
| UK | 1 |
| Vietnam | 2 |
| **Total= 17** | **Total= 24** |

*6.3 percent virtual

## Research Tech Domains

| |
|---|
| 1. Advanced Materials |
| 2. Autonomy and Unmanned Systems |
| 3. Data Science |
| 4. Deep Water Technologies |
| 5. Directed Energy |
| 6. Human Performance |
| 7. Hydrodynamics |
| 8. Machine Learning |
| 9. Maritime Domain Awareness |
| 10. Materials Science |
| 11. Materials Science |
| 12. Nanoscience |
| 13. Nanotechnology |
| 14. Neuromorphic Computing Computational Neuroscience |
| 15. Ocean Energy |
| 16. Oceanography |
| 17. Organic Chemistry |
| 18. Robotics |
| 19. Ship Stability and Safety |
| 20. Signal Processing |
| 21. Space Physics and Weather |
| 22. Space Technologies |
| 23. Spectrum Domain Superiority |
| 24. Sustainment Technology Enablers |
| 25. Underwater Communications |

## Performer (University-Institute)

| | |
|---|---|
| 1. | Athena Labs |
| 2. | EMPA |
| 3. | Gdańsk University of Technology |
| 4. | Georg-August University of Goettingen |
| 5. | Ho Chi Minh City University of Technology |
| 6. | India Institute of Technology, Madras |
| 7. | Institute for Acoustics |
| 8. | Institute for Telecommunications |
| 9. | KU Leuven |
| 10. | Macquarie University |
| 11. | Materials Research Society of Mexico |
| 12. | National University of Singapore |
| 13. | NATO-CMRE |
| 14. | Singapore Space Technology Limited |
| 15. | TU Delft |
| 16. | Universidad Carlos III de Madrid |
| 17. | University of Adelaide |
| 18. | University of Crete |
| 19. | University of Lund |
| 20. | University of New South Wales Canberra |
| 21. | University of Udine |
| 22. | Vietnam Academy of Science and Technology |
| 23. | Virtual Institute for Artificial EM Materials and Metamaterials |
| 24. | Zurich University |

# RESEARCH GRANTS

In FY2022, ONR Global provided

**30** GRANTS

across **21** COUNTRIES

**31** RESEARCH TECH DOMAINS

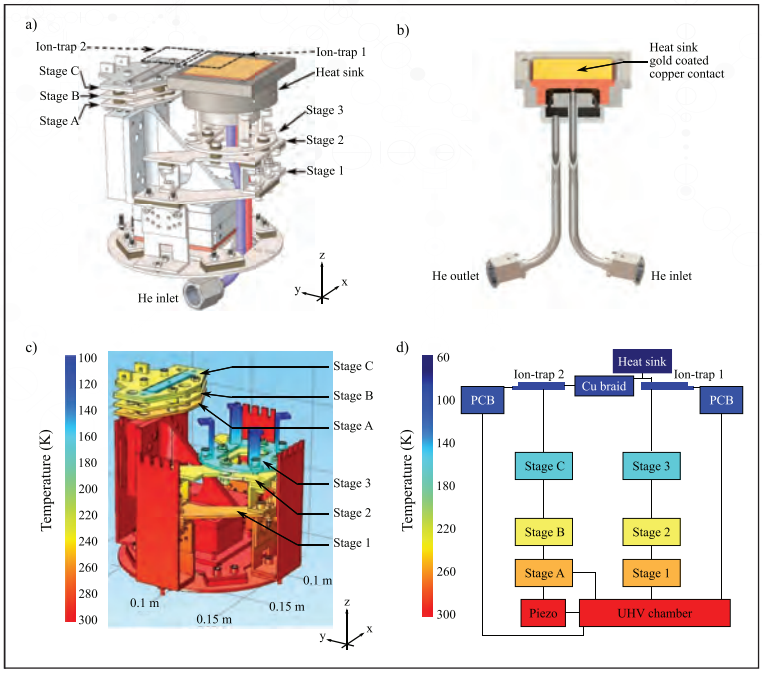
**29** GRANT PARTNERS

Research grants provide direct research support to international scientists to help address naval science and technology challenges. These grants allow for the growth of innovative, international science and technology in ONR and NRE programs.

Research grant funding criteria:

1. The grant must be fundamental research vs. product development, outreach or education, and have technical quality and qualified principal investigators (PIs).
2. Requires naval relevance potential, a documented research approach and cost realism.
3. ONR Global only funds PIs outside of the U.S.
4. Submissions are through GRANTS.GOV, based on ONR's Long Range Broad Agency Announcement. Government organizations are not funded.
5. Publishing in the open literature (unclassified research) is encouraged, while the intellectual property remains with the PI.
6. Deliverable is a final report and/or conference proceeding.

University of Sussex Professor Winfried Hensinger is the recipient of an ONR Global grant to develop a critical piece of technology in his effort toward building a scalable "million qubit quantum computer." This diagram is of the support structure for ion-trap chips used in resulting research and published in "A scalable helium gas cooling system for trapped-ion applications," F.R. Lebrun-Gallagher, N.I. Johnson, M. Akhtar, S. Weidt, D. Bretaud, S. J. Hile, A. Owens, F. Bonus and W. K. Hensinger.

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# NEW RESEARCH DATA SUMMARY

## Countries Where New Grants Were Awarded and Total Number of Grants

| Countries | Total # of Grants |
|---|---|
| Argentina | 1 |
| Armenia | 1 |
| Australia | 8 |
| Brazil | 1 |
| Canada | 1 |
| Chile | 1 |
| Finland | 1 |
| France | 1 |
| Germany | 2 |
| India | 1 |
| Israel | 1 |
| Italy | 1 |
| Mongolia | 1 |

| Countries | Total # of Grants |
|---|---|
| New Zealand | 1 |
| Norway | 1 |
| Singapore | 1 |
| Spain | 1 |
| Sweden | 2 |
| Switzerland | 1 |
| Taiwan | 1 |
| U.K. | 1 |
| **Total= 21** | **Total= 30** |

# Grants Partners

| Grant Partners | # of Grants |
|---|---|
| 1. Instituto Argentino De Radioastrono | 1 |
| 2. A.I. Alikhanjani Anvan Azgajin Gitak | 1 |
| 3. University of Western Australia Centre for Water Research | 1 |
| 4. Macquarie University | 1 |
| 5. Australian National University | 1 |
| 6. University of Tasmania | 2 |
| 7. University Of Technology Sydney | 1 |
| 8. Deakin University | 1 |
| 9. University of New South Wales | 1 |
| 10. Universidade Federal do Rio Grande do Sul | 1 |
| 11. Hôpital du Sacré-Cœur de Montréal | 1 |
| 12. Pontificia Universidad Catolica de Chile | 1 |
| 13. Oulun Yliopisto | 1 |
| 14. Université Paris-Est Créteil Val de Marne | 1 |
| 15. Technischen Universitaet Hamburg-Harburg | 1 |
| 16. Max-Planck-Gesellschaft zur Forderung der Wissensc | 1 |
| 17. Indian Institute of Technology Madras | 1 |
| 18. The Weizmann Institute of Science | 1 |

| Grant Partners | # of Grants |
|---|---|
| 19. Universita` Degli Studi di Ferrara | 1 |
| 20. National University of Mongolia | 1 |
| 21. The University of Auckland | 1 |
| 22. Universitetet i Bergen | 1 |
| 23. National University Singapore | 1 |
| 24. Asociacion de Investigacion Mpc-Materials Physics Cente | 1 |
| 25. Lunds Universitet | 1 |
| 26. Chalmers Tekniska Hogskola | 1 |
| 27. University of Fribourg | 1 |
| 28. National Sun Yat Sen University | 1 |
| 29. University of Nottingham | 1 |
| **Total= 29** | **Total= 30** |


# LONDON

The London Tech Bridge is a technical collaborative hub and open forum between the U.S. Navy and Royal Navy with the goal of fostering connectivity, agility and innovation. It supports dialogue, joint investment and cooperative development between the two navies as they endeavor to advance from Interoperability to Interchangeability. Set in Central London's booming technological ecosystem, spanning academia, industry and government, it is strategically positioned to provide guidance, support and development opportunities for the defense workforce and connected stakeholders, while rapidly harnessing technology for Sailors and Marines.

## Technology Focus Areas:

- Artificial Intelligence and Machine Learning
- Autonomy/Unmanned
- Green Energy
- Directed Energy
- Maintenance and Sustainment
- Advanced Manufacturing

# TECH BRIDGE

## London Tech Bridge's Mission:

- **Connect** Industry, academia, government/ defense departments
- **Collaborate** Build and sustain partnerships that enable joint success
- **Innovate** Discover "dual-use" solutions to stakeholder problem sets
- **Support** Support ecosystem through STEM outreach, Hacking 4 MOD/DOD, end-user feedback and networking facilitation
- **Engage** Leverage location in global "Tech Hub" to expand and diversify local and total network
- **Develop** Grow the U.S. naval workforce's knowledge and abilities to work with U.K. stakeholders

# BUILDING THE NETWORK

## BUILDING THE NETWORK

- Official office ribbon-cutting: June 13, 2022
- Gained over 1,000 LinkedIn followers of the London Tech Bridge Page
- Conducted monthly Tea & Tech (industry engagement events)
- Access to three trade organizations' membership, totaling over 2,000 companies
- Over 100 industry, academia and government engagements



# KEY LEADERSHIP ENGAGEMENT AT THE LONDON TECH BRIDGE

- U.S. Secretary of the Navy
- U.S. Chief of Naval Operations
- RN Second Sea Lord
- U.S. Director, Navy International Programs Office
- U.K. Ministry of Defense Chief Information Officer
- Royal Navy Chief Technology Officer
- U.S. Commander, Navy Regional Maintenance Centers
- Various members of U.S. and U.K. joint staff and congressional delegations


## Links

- Share the following link with non-traditional defense companies in the U.K. to contact the London Tech Bridge:

- Check out our LinkedIn post about one of our monthly industry engagement events, called Tea & Tech, with special guest subject matter expert, Dr. Charles Eddy (ONR Global science director):

TEA & TECH

# ADD

# ENDUM

# FY2022 NEW RESEARCH

30 new research grants were awarded to 21 countries.

## Argentina

- IAR and the Prospects of Low-Frequency Radio Astronomy in South America
  - Instituto Argentino De Radioastrono

## Armenia

- Degradation of Ultra-High Temperature Materials Under Extreme Conditions
  - A.I. Alikhanjani Anvan Azgajin Gitak

## Australia

- Adapting the Transparency of Autonomous Systems to Optimise Human Autonomy Teaming in Command and Co
  - University of Western Australia Centre for Water Research
- Optical Remote Sensing of Subsurface Water Temperature and Salinity
  - Macquarie University
- Cardigans: A Generative Adversarial Network Model for Design and Discovery of Multi Principal Element Alloys
  - Australian National University
- Realization of an Energy Magazine via Supply Side Sequencing
  - University of Tasmania
- Coherent Quantum Emitters in Hexagonal Boron Nitride
  - University Of Technology Sydney
- Manufacturing Carbon Fibers for Battery Electrodes
  - Deakin University
- New Wheels from the Oldest Wheel: Mining Propulsive Insight from the Optimised Evolution of Microbial Swimming
  - University of New South Wales
- Nucleation and Cavitation Physics of a Marine Propulsor
  - University of Tasmania

## Brazil

- Exploring Fault Tolerant Topologies of Neural Networks in New Technologies of All Programmable System on Chip (APSoC) in Harsh Environments
  - Universidade Federal do Rio Grande do Sul

## Canada

- Bio-Behavioral and Morphologic Predictors of Resilience During Cold Weather and Arctic Operations
  - Hôpital du Sacré-Cœur de Montréal

## Chile

- Energy Aware Reinforcement Learning for Control of Autonomous Surface Vehicles Subjected to Uncertain Dynamic Conditions
  - Pontificia Universidad Catolica de Chile

## Finland

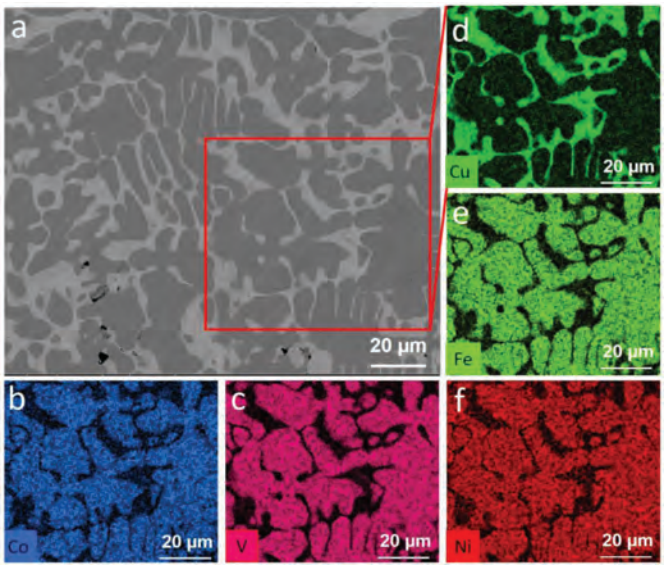
- LiBERATE Liquid-based Reconfigurable Reflector and Antenna Technology for 6G Communications
  - Oulun Yliopisto

## France

- Effect of Al and Cr additions on the Mechanical and Oxidation Behavior of Refractory Medium-Entropy Alloys (RMEAs)
  - Université Paris-Est Créteil Val de Marne

## Germany

- Investigation Of Critical Ice Floe And Iceberg Shapes for Full Scale Ship Ice Collision Simulations
  - Technischen Universitaet Hamburg-Harburg
- Bottom Up Nanowiring of Primitive Neural Networks via Tubulantion Nanotubnet
  - Max-Planck-Gesellschaft zur Forderung der Wissensc




X-ray diffraction (XRD), backscattered-electron (BSE) imaging and energy-dispersive x-ray spectroscopy (EDXS) images that were captured to help validate the cardiGAN research carried out in part by the University of Western Australia. (Image courtesy of cardiGAN and published in the Journal of Material Science & Technology.)

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## India

- Network Structure of Transitions in Thermo Fluid Systems in Nature and Engineering
  - Indian Institute of Technology Madras

## Israel

- Building a Model of an Autonomous Self-Replicating Cell on a Chip
  - The Weizmann Institute of Science

## Italy

- Non Collaborative Object Analytics nCOA
  - Universita` Degli Studi di Ferrara

## Mongolia

- Nanomagnetic Materials Design and Characterization of High Energy Product Permanent Magnet
  - National University of Mongolia

## New Zealand

- Detection, Prevention and Physiology of Hypoxia, Hypercapnia and Nitrogen Narcosis in Rebreather diving
  - The University of Auckland

## Norway

- Upper Ocean Response to Atmospheric Events in the Nordic Seas
  - Universitetet i Bergen

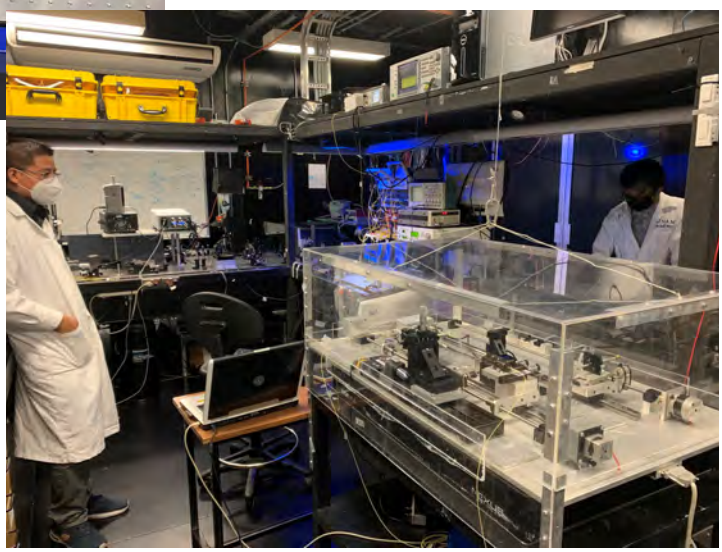
## Singapore

- Living Pseudocapacitor Gels
  - National University Singapore

## Spain

- Microspherical Superlens Windows to the Quantum World
  - Asociacion de Investigacion Mpc-Materials Physics Cente

The Indian Institute of Technology Madras (IIT Madras) is ranked the top engineering institute in India by the Ministry of Education's National Institutional Ranking Framework since its inception in 2016.



Inside the lab in the electrical engineering department at the Pontificia Universidad Catolica de Valparaíso, Chile, where lasers are being used for optical experiments.

## Sweden

- In Vivo CT-based Finite Element Model of Echolocation Beam Formation
  - Lunds Universitet
- Multifunctional Carbon Fibres for Battery Electrodes
  - Chalmers Tekniska Hogskola

## Switzerland

- Mechanochromic Polyurethane Materials Comprising Triarylmethane Mechanophores
  - University of Fribourg

## Taiwan

- Influences of Mesoscale Eddies Impinging to Kuroshio East of Taiwan
  - National Sun Yat Sen University

## United Kingdom

- Normative Cooperation Among Autonomous Agents
  - University of Nottingham

# RESEARCH OUTCOMES AND RESULTS

The results and outcomes of sponsored grants in FY2022 shows ISP's return on investments. These results come in various forms such as:

- Award recognitions
- Knowledge transfers
- Patents
- Publications
- Presentations
- TRL Progression
- Press releases

The ISP science directors listed in this section are the ONR Global technical representative points of contact (POCs) for these research outcomes and results.

## Dr. Chagaan Baatar

✍ **Synaptic and neuronal functionalities on a single oxide fil**
- ▹ Publication (Article): J. del Valle et al. Nano Lett. 22, 1251–1256 (2022)

✍ **Exploring the Fundamental Mechanisms of Light Modulation and Amplification in Halide-perovskite Nanostructures**
- ▹ Publication (Article): Fabricated perovskite-doped (i.e. CsPbBr3) polymer fibers with core diameters from 957 μm to 323 μm) based on injection moulding method and UV curing

✍ **Synaptic and neuronal functionalities on a single oxide fil**
- ▹ Publication: https://arxiv.org/pdf/2208.00600.pdf
- ▹ Publication: Mu Z. et al., Phys. Rev. Lett. 128, 216402 (2022)
- ▹ Publication: https://arxiv.org/ftp/arxiv/papers/2205/2205.08810.pdf
- ▹ Publication: Murzakhanov F. F. et al., Nano Letters 22 (7), 2718-2724 (2022)

✍ **A Fully Certified Quantum Random Generator – Theoretical Part**
- ▹ Publication (Journal): Trejo J.M.A. and Calude C.S., Theoretical Computer Science 862, 3-13 (2021)

✍ **Simulating Chemical Dynamics on Trapped-Ion Quantum Computers**
- ▹ Publication (Journal): Tan T. R. et al, Bulletin of the American Physical Society, 2022
- ▹ Publication (Journal): Navickas T. et al, Bulletin of the American Physical Society, 2022

## Dr. Charles Eddy

✍ **Artificial Intelligence to Simulate Earth's Stratosphere**
- ▹ Award: April 2022 Induction into the U.S. National Academy of Sciences
- ▹ Presentation: Climate Change: From Basic Nonlinear Physics to Policy-Relevant Science.

Presented to Israeli Physical Society (Ben Gurion University, February 21) and Centenary Meeting of the International Union of Pure and Applied Physics (ICTP Trieste, July 2022).

- ▷ Presentation: Invited talk entitled "Stochastic Parametrisation: Its scientific basis and impacts" presented at the ECMWF workshop on model uncertainty (May 22).
- ▷ Book Release: The Primacy of Doubt: From climate change to quantum physics, how the science of uncertainty can help predict and understand our chaotic world. To be published by Oxford University Press in October 2022.
- ▷ Publication: Efforts to for a CERN for Climate Change - captured in "Ambitious partnership needed for reliable climate prediction" Nature Climate Change volume 12, pages 499–503 (2022).

✍ **GaN substrates of the highest structural quality for high-power electronics**

- ▷ Award: Karolina Grabianska – Masahito Yamaguchi Student's Paper Award for her invited paper entitled "On Stress-Induced Polarization Effect in Ammonothermally-grown GaN crystals" at LEDIA'22 Conference held in Yokohama, Japan, April 21-22, 2022
- ▷ Publication: Bockowski M.; Grzegory I. Recent Progress in Crystal Growth of Bulk GaN, Acta Physica Polonica A No. 3 Vol. 141 (2022)
- ▷ Publication: Grabianska, K.; Kucharski, R.; Sochacki, T.; Weyher, J.L.; Iwinska, M.; Grzegory, I.; Bockowski, M. On Stress-Induced Polarization Effect in Ammonothermally Grown GaN Crystals. Crystals 2022, 12, 554.
- ▷ Publication: Sochacki, T.; Kucharski, R.; Grabianska, K.; Weyher, J.L.; Iwinska, M.; Bockowski, M.; Kirste, L. Fundamental Studies on Crystallization and Reaching the Equilibrium Shape in Basic Ammonothermal Method: Growth on a Native Lenticular Seed. Materials 2022, 15, 4621.
- ▷ Presentation: M. Iwinska, Recent progress in crystallization of bulk gallium nitride: wafers for vertical power devices, EMRS-Fall Meeting, Warsaw, Poland, Sept. 19-22, 2022
- ▷ Presentation: M. Bockowski, Defects in ammonothermal GaN crystals and substrates, 19th International Conference on Defects-Recognition, Imaging and Physics in Semiconductors, Tsukuba, Japan, Aug. 29-Sept. 1, 2022


ONR Global PI Professor Tim Palmer (Oxford) is inducted into the U.S. National Academy of Sciences in April 2022 for his pioneering contributions to operational weather and climate forecasting. His ONR Global project is co-funded by Dr. Dan Eleuterio from ONR's Ocean Battlespace Sensing Department.

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Dr. Charles Eddy, ONR Global science director for Power and Energy (right), with PI Dr. Michal Bockowski (UNIPRESS) in the bulk wide bandgap semiconductor gallium nitride (GaN) growth facility outside Warsaw, Poland. These large autoclaves are used to produce the highest-quality bulk GaN in the world, resulting in the highest-quality substrates for GaN devices such as high-power microwave transistors and power switches for high-efficiency power converters. The ONR Global project (co-funded by Capt. LJ Petersen from ONR's Sea Warfare and Weapons Department) aims to advance the material to quality levels able to support vertical GaN power devices and establish standards for GaN substrates.

- ▹ Presentation: M. Bockowski, Innovative approach for changing electrical and optical properties of GaN, 22nd International Conference on Ion Beam Modification of Materials, Lisbon, Portugal, July 10-15, 2022
- ▹ Presentation: M. Iwinska, Growth of Bulk GaN Crystals, Polish Conference on Crystal Growth 2022, Gdansk, June 19-24, 2022
- ▹ Presentation: M. Bockowski, Innovative approach for changing electrical and optical properties of GaN, Ion Implantation and Other Applications of Ions and Electrons 2022, Kazimierz Dolny, Poland, June 27-30, 2022
- ▹ Presentation: K. Grabianska, On Stress-Induced Polarization Effect in Ammonothermally-grown GaN crystals, LEDIA'22, Yokohama, Japan, April 21-22, 2022
- ▹ Presentation: M. Bockowski, GaN-on-GaN technology, Solid State Physics Seminar at Faculty of Physics of University of Warsaw, April 1, 2022
- ▹ Presentation: T. Sochacki, How is an ammonothermal crystal grown? Study of GaN crystal growth on lenticular seed., SPIE Photonics West, San Francisco, USA, Jan. 22-27, 2022
- ▹ Presentation: M. Bockowski, A bumpy road from GaN seeds to substrates - ammonothermal crystal growth technology and wafering procedures, Institute of Global Innovation Research, Tokyo University of Agriculture and Technology, Dec. 22-27, 2021
- ▹ Presentation: T. Sochacki, How is an ammonothermal crystal grown? CIRFE GaN Webinar Series ~ Poland-Japan (Unipress-NU) Seminar on GaN ~ 38th CIRFE Seminar on "Ammono-GaN and HVPE-GaN", Nagoya, Japan, Dec. 7, 2021
- ▹ Presentation: M. Bockowski, GaN-on-GaN technology - challenges and perspectives, Huawei Strategy and Technology Workshop (STW) 2021, Oct. 14-16, 2021
- ▹ Presentation: M. Bockowski, Innovative approach for changing electrical and optical properties of GaN, EMRS-Fall Meeting, Warsaw, Poland, Sept. 19-22, 2022
- ▹ Presentation: M. Iwinska, Carbon in Highly Conductive and Semi-insulating Bulk GaN Crystals, 7th European Conference on Crystal Growth, Paris, France, July 25-27, 2022

- ▹ Presentation: M. Iwinska, GaN Crystals Grown by Ammonothermal Method, 7th European Conference on Crystal Growth, Paris, France, July 25-27, 2022
- ▹ Presentation: T. Sochacki, Fundamental studies on crystallization and reaching the equilibrium shape in basic ammonothermal method: growth on a native lenticular seed, 7th European Conference on Crystal Growth, Paris, France, July 25-27, 2022
- ▹ Presentation: T. Sochacki, Evolution of the growth mode and its consequences during bulk crystallization of GaN, 7th European Conference on Crystal Growth, Paris, France, July 25-27, 2022
- ▹ Presentation: M. Bockowski, Carbon in highly conductive and semi-insulating bulk GaN crystals, Polish Conference on Crystal Growth 2022, Gdansk, June 19-24, 2022

✍ **Perovskite Crystals: In situ microscopic and nonlinear studies**

- ▹ Award: 2021 Physical Review Letters Editor's Choice, Featured in Physics (Phys. Rev. Lett. 127, 167601 (2021))
- ▹ Award: President elect of the IEEE Ultrasonics, Ferroelectrics and Frequency Control Society (since Jan. 1, 2022)
- ▹ Presentation: "Spontaneous and field-induced symmetry breaking in relaxors and centrosymmetric dielectrics" presented at European Materials Research Society Fall Meeting, Warszawa, Poland, Sept. 19-22, 2022
- ▹ Publication: Vasiljevic, M.; Kollár, M.; Spirito, D.; Riemer, L.; Forró, L.; Horváth, E.; Gorfman, S.; Damjanovic, D. "Forbidden" Polarisation and Extraordinary Piezoelectric Effect in Organometallic Lead Halide Perovskites.Adv Funct Materials 2022, 2204898.
- ▹ Publication: Ignatans, R.; Damjanovic, D.; Tileli, V. Individual Barkhausen Pulses of Ferroelastic Nanodomains.Phys. Rev. Lett. 2021, 127 (16), 167601.

✍ **New Ideas for Advanced Relativistic Magnetrons**

- ▹ Knowledge Transfer: Brief to 2022 ONR CDEW/DEW Portfolio Review
- ▹ Knowledge Transfer: Brief to Michigan State University
- ▹ Knowledge Transfer: Brief to University of Michigan
- ▹ Publication: Y. Bliokh, J. G. Leopold, and Ya. E. Krasik, "Squeezed state of an electron cloud as a "quasi-neutral" one-component plasma", Phys. Plasmas 28, 072106 (2021).
- ▹ Publication: J. G. Leopold, M. Siman-Tov, S. Pavlov, V. Goloborodko, Ya. E. Krasik, A. Kuskov, D. Andreev, and E. Schamiloglu, "Experimental and numerical study of a split cathode fed relativistic magnetron", J. Appl. Phys. 130, 034501 (2021).
- ▹ Publication: J. G. Leopold, Ya. E. Krasik, Y. Hadas and E. Schamiloglu, "An axial magnetron fed by a split cathode and magnetically insulated by a low power solenoid", IEEE Trans. on Electron Devices 68, 5227 (2021).
- ▹ Publication: Ya. E. Krasik, J. G. Leopold, Y. Hadas, Y. Cao, S. Gleizer, E. Flyat, Y. P. Bliokh, D. Andreev, A. Kuskov, and E. Schamiloglu, "An advanced relativistic magnetron operating with a split cathode and separated anode segments", J. Appl. Phys. 131, 023301 (2022).
- ▹ Publication: Y. P. Bliokh, Ya. E. Krasik†, J. G. Leopold, "Observation of the diocotron instability in a diode with a split cathode", submitted to Physics of Plasmas, 2022.
- ▹ Presentation: J. G. Leopold1, Ya. E. Krasik, M. Siman Tov, S. Pavlov, V. Goloborodko, Y. Bliokh, D. Andreev, A. Kuskov and E. Schamiloglu, "A relativistic magnetron with no pulse shortening and small footprint pulsed magnetic field generating system", IEEE PPC-2021 (Virtual, December 2021).

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- ▷ Presentation: J. G. Leopold, M. Siman Tov, S. Pavlov, V. Goloborodko and Ya. E. Krasik, A. Kuskov, D. Andreev, and E. Schamiloglu, "Experimental and numerical studies of a compact relativistic magnetron fed by a split cathode", ICOPS 2022, Seattle, May 22-26, 2022
- ▷ Presentation: Ya. E. Krasik, J. G. Leopold, O. Belozerov, S. Pavlov, Y. Hadas, Y. Cao, S. Gleizer, E. Flyat, Y. P. Bliokh, K. Kuchuk, D. Andreev, A. Kuskov, and E. Schamiloglu, "An Advanced Relativistic Magnetron with a Segmented Anode and Fast Magnetic Field", EAPPC & BEAMS 2022, Aug. 18-22, 2022, Seoul, South Korea
- ▷ Presentation: J. Leopold, Yu. Bliokh, Ya. Krasik, Y. Hadas, S. Gleizer, Y. Flyat, Y. Cao, D. Andreev, A. Kuskov, E. Schalomiglu, "Diocotron Instability in the Electron Flow of a Split Cathode Magnetron Source", EAPPC & BEAMS 2022, Aug. 18-22, 2022, Seoul, South Korea.

✍ **Nanostructured metamaterials for High-Tc Superconductivity**

- ▷ Award: 2022: Griffith Medal, Institute of Materials, UK (IOM3).
- ▷ Award: 2022: MRS India Silver Jubilee Medal.

✍ **Multifunctional Carbon Fibers for Battery Electrodes**

- ▷ Award: Composite Award 2022, by IOM3, UK. For the paper: Characterisation of tape-based carbon fibre thermoplastic discontinuous composites for energy absorption, by Sachin Francis, Thomas Bru, Leif E Asp, Maciej Wysocki & Christopher Cameron
- ▷ Presentation: Asp LE, Duan S. On a structural battery composite electrode – effects of state of lithiation on mechanical performance, US-Japan and Euro-Japan Joint Conference on Composite Materials, July 21, 2022, Sendai, Japan.
- ▷ Presentation: Johansen M, Schlueter C, Tam PL, Asp LE, Liu F. Influence of N configuration in carbon fibres on electrochemical capacity revealed with hard X-ray photoelectron spectroscopy, Gordon Research Conference on Multifunctional Materials and Structures, Sept. 25-30, 2022.
- ▷ Presentation: Carlstedt D, Asp LE, Onori S, Chang FK, Computational modeling of structural batteries, Gordon Research Conference on Multifunctional Materials and Structures, Sept. 25-30, 2022.

✍ **Exploring the Fundamental Mechanisms of Light Modulation and Amplification in Halide-perovskite Nanostructures**

- ▷ Award: Editor's Pick for C. H. Kang, O. Alkhazragi, L. Sinatra, S. Alshaibani, Y. Wang, K.-H. Li, M. Kong, M. Lutfullin, O. M. Bakr, T. K. Ng, and B. S. Ooi, "All-inorganic halide-perovskite polymer-fiber-photodetector for high-speed optical wireless communication," Optics Express 30(6), 9823-9840 (2022).
- ▷ Award: Best Paper Award at the Optical Fiber Communication (OFC) Conference, San Diego, USA, March 2022.
- ▷ Award: Research Excellence Award (Chun Hong Kang), KAUST's CEMSE Division, November 2021
- ▷ Publication: C. H. Kang, O. Alkhazragi, L. Sinatra, S. Alshaibani, Y. Wang, K.-H. Li, M. Kong, M. Lutfullin, O. M. Bakr, T. K. Ng, and B. S. Ooi, "All-inorganic halide-perovskite polymer-fiber-photodetector for high-speed optical wireless communication," Optics Express 30(6), 9823-9840 (2022).
- ▷ Publication: Y. Wang, H. Wang, O. Alkhazragi, Z. O. F. Mohammed, L. Gutiérrez-Arzaluz, C. H. Kang, T. K. Ng, and B. S. Ooi, "Two-dimensional hybrid organic-inorganic perovskite nanosheets for Gb/s visible-light communication," IEEE Photonics Technology Letters 34(14), 753-756 (2022).

- Publication: J.-X. Wang, Y. Wang, I. Nadinov, J. Yin, L. Gutiérrez-Arzaluz, O. Alkhazragi, T. He, T. K. Ng, M. Eddaoudi, H. N. Alshareef, O. M. Bakr, B. S. Ooi, and O. F. Mohammed, "Aggregation-induced fluorescence enhancement for efficient X-ray imaging scintillators and high-speed optical wireless communication," ACS Materials Letters 4(9), 1668-1675 (2022).
- Publication: J.-X. Wang, Y. Wang, I. Nadinov, J. Yin, L. Gutiérrez-Arzaluz, G. Healing, O. Alkhazragi, Y. Cheng, J. Jia, N. Alsadun, V. S. Kale, C. H. Kang, T. K. Ng, O. Shekhah, H. N. Alshareef, O. M. Bakr, M. Eddaoudi, B. S. Ooi, and O. F. Mohammed, "Metal-organic framework in mixed-matrix membranes for high-speed visible-light communication," Journal of the American Chemical Society 144(15), 6813-6820 (2022).
- Publication: Y. Wang, J.-X. Wang, O. Alkhazragi, C. H. Kang, Z. O. F. Mohammed, T. K. Ng, and B. S. Ooi, "Color-converting phosphor with metal-organic frameworks based mixed-matrix membrane for high-speed ultraviolet-light optical wireless communication," in International Workshop on Ultraviolet Materials and Devices (IWUMD), Jeju, Korea, May 23-26, 2022.
- Publication: C. H. Kang, O. Alkhazragi, L. Sinatra, S. Alshaibani, Y. Wang, K.-H. Li, M. Kong, M. Lutfullin, O. M. Bakr, T. K. Ng, and B. S. Ooi, "Wide-field-of-view perovskite quantum-dots fibers array for easing pointing, acquisition and tracking in underwater wireless optical communication," in Optical Fiber Communication Conference (OFC) 2022, San Diego, California, USA, March 6–10, 2022.
- Publication: C. H. Kang, O. Alkhazragi, L. Sinatra, S. Alshaibani, K.-H. Li, M. Kong, M. Lutfullin, O. M. Bakr, T. K. Ng, and B. S. Ooi, "All-inorganic halide-perovskite-polymer luminescent fibers for high-bitrate ultraviolet free-space optical communication," in IEEE Photonics Conference (IPC), Vancouver, British Columbia, Canada, Oct. 18–21, 2021.
- Presentation: Y. Wang, J.-X. Wang, O. Alkhazragi, C. H. Kang, Z. O. F. Mohammed, T. K. Ng, and B. S. Ooi, "Color-converting phosphor with metal-organic frameworks based mixed-matrix membrane for high-speed ultraviolet-light optical wireless communication," in International Workshop on Ultraviolet Materials and Devices (IWUMD), Jeju, Korea, May 23-26, 2022
- Presentation: C. H. Kang, O. Alkhazragi, L. Sinatra, S. Alshaibani, Y. Wang, K.-H. Li, M. Kong, M. Lutfullin, O. M. Bakr, T. K. Ng, and B. S. Ooi, "Wide-field-of-view perovskite quantum-dots fibers array for easing pointing, acquisition and tracking in underwater wireless optical

Geoptic Inc. (UK) team member Professor Lee Thompson (left) and lead Dr. Chris Steer (center) with ONR Global Science Director Dr. Charles Eddy (right) next to UUV to be employed in an Arctic Circle muon-based navigation (in GPS-denied environments) demonstration for the 2021 ONR Global Global-X Challenge. Project is co-funded by ONR Global and U.S. Army - DEVCOM-PAC.

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communication," in Optical Fiber Communication Conference (OFC) 2022, San Diego, California, USA, March 6–10, 2022.

- ▷ Presentation: C. H. Kang, O. Alkhazragi, L. Sinatra, S. Alshaibani, K.-H. Li, M. Kong, M. Lutfullin, O. M. Bakr, T. K. Ng, and B. S. Ooi, "All-inorganic halide-perovskite-polymer luminescent fibers for high-bitrate ultraviolet free-space optical communication," in IEEE Photonics Conference (IPC), Vancouver, British Columbia, Canada, Oct. 18–21, 2021.
- ▷ Press Release: Media Coverage by Innovation News Network – "Perovskite nanocrystals revolutionize photodetector technology"
- ▷ Press Release: Media Coverage by Alpha Galileo – "Fiber glow brings more go for underwater communications"
- ▷ Press Release: Media Coverage by KAUST Discovery – "Fiber glow brings more go for underwater communications"

ONR Global Commanding Officer Capt. Matt Farr (center) and Science Director Dr. Charles Eddy (right) discuss a test rig for vortex-flow energy-conversion devices with WITT-Energy (U.K.) lead engineer, Dr. Will Boult (left).

✍ **Radiation effects on WBG Semiconductor Devices**

- ▷ Presentation: Q. Wang, "AlGaN/GaN based High Electron Mobility Transistor (HEMT) for Power Electronic and RF Applications" presented at COMPOUND SEMICONDUCTOR WEEK 2021 held in Ann Arbor, MI, May 9-13, 2021.
- ▷ Presentation: Q. Wang (invited) 'R&D activities on WBG semiconductor devices at RISE' at a workshop organized by Korea-Nordics Science & Technology Cooperation Center (KNTEC), June 2021
- ▷ Presentation: Q. Wang, webinar on nanofabrication at RISE, April 2022.
- ▷ Press Release: Press releases by IEEE photonics society newsletter 2021 October issue page 16: Qin Wang Awarded a Research Grant by the U.S. Office of Naval Research Global on Effects of Radiation on Wide Bandgap Semiconductor devices

✍ **Geodesic Luneburg lenses for high power applications**

- ▷ Publication: Fully Metallic Antennas for Millimeter Wave Applications, Dr. Qingbi Liao
- ▷ Presentation: Numerical Aspects of the Application of Ray-Tracing to Geodesic Lenses (EuCAP 2022)
- ▷ Presentation: Ray-Tracing Model of Elliptic Geodesic Lens Antennas (APS/URSI 2021)
- ▷ Presentation: Non-Rotationally Symmetric Geodesic Lens Antenna Modelled Using a Ray-Tracing Model (APS/URSI 2021)

✍ **Geometry of information flow and uncertainty quantification for robust neural network architectures in deep learning**

- ▷ Award: Re-appointment as Alan Turing Faculty Fellow
- ▷ Presentation: August 2022, NUS, Singapore, Math Colloquium, Information inequalities and path-based uncertainty quantification in data-driven models.
- ▷ Presentation: June 2022, UMBC, US, Applied Math Colloquium, Uncertainty quantification in machine learning and stochastic flows.
- ▷ Presentation: April 2022, SIAM Conference on Uncertainty Quantification, Atlanta, US. Information Theory, Data Assimilation and Stochastic Models for Multiscale Nonlinear Systems.
- ▷ Presentation: December 2021, AGU Fall Meeting, New Orleans, US. Applied Mathematics Perspectives on Prediction, Uncertainty Quantification, Machine Learning and State Estimation.
- ▷ Publication: Branicki, M., Uda, K., (2022) Path-based Divergence Rates and Uncertainty in stochastic flows. SIAM J. Apple. Dan. Sys., 70+ pp.
- ▷ Publication: Branicki, M., Uda, K., (2022) Lagrangian Uncertainty Quantification and Information Inequalities in Stochastic Flows. SIAM J. Uncertainty Quantification, 70+ pp.
- ▷ Award: Alan Turing Institute - Government Communications Headquarters (GCHQ) grant: "Hidden geometry of data-driven models and uncertainty quantification in machine learning"

## Dr. Christopher Konek

✍ **Indirect excitation and luminescence activation of Tb doped indium tin oxide and its impact on the host's optical and electrical properties**

- ▷ Article: Indirect excitation and luminescence activation of Tb doped indium tin oxide and its impact on the host's optical and electrical properties – IOPscience

✍ **Pure two-qubit states carried by single-photons: unrestricted generation and entanglement diagnosis by single-qubit tomography.**

- ▷ Article Title: Role of weak values in strong measurements Journal: Physical Review A 105, 042202 (2022 )Authors: Francisco De Zela
- ▷ Article: Constraints between concurrence and polarization for mixed states subjected to open system dynamics Journal: Physical Review A 105, 063710 (2022) Authors: Yonny Yugra, Carlos Montenegro and Francisco De Zela
- ▷ Article: Relationship between entanglement and polarization in tripartite states Journal: Journal of Optics Authors: Carlos Montenegro, Yonny Yugra and Francisco De Zela
- ▷ Article: Experimental display of generalized wave-particle dualityJournal:Optics ExpressAuthors:Max Jara, Jean-Paul Marrou, Mariano Uria, Carlos Montenegro and Francisco De Zela
- ▷ Presentation: IC MSQUARE, 11thInternational Conference on Mathematical Modeling in Physical Sciences. Virtual, on-line conference, Sept. 5-8, 2022

✍ **Early Warning Signal in Social-Critical Episodes**

- ▷ Presentation: "Social Crises and Climate Change"Speaker: J.P. Cárdenas, Miguel A. Fuentes, G. Vidal.Place and Date: Viña del Mar, Chile. Aug. 8, 2022

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- ▹ Article: Digital Outburst: The Expression of a Social Crisis through OnlineSocial NetworksJuan Pablo C´ardenas, 1,2 Carolina Urbina, 3 Gerardo Vidal, 2, 4Gast´on Olivares, 1, 2 and Miguel Fuentes

✍ **Quantifying the effect of sleep on motor response trials**

- ▹ Article: Is Balance Control Affected by Sleep Deprivation? A Systematic Review of the Impact of Sleep on the Control of Balance

## Dr. Clint Novtony – Mr. William Nickerson

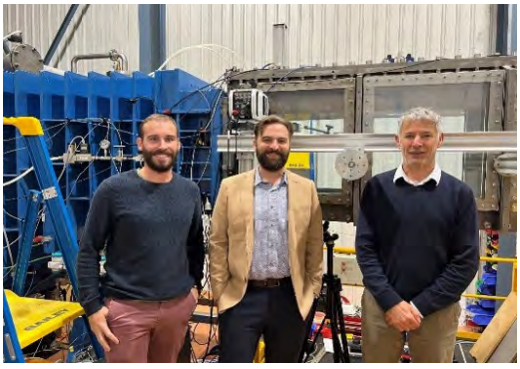
✍ **Effect of Seawater Absorption on the Explosive Blast Resistance of Naval Composites Explosive Blast Response of Naval Composites in Arctic Conditions**

- ▹ Publication: "Simultaneous Large Optical and Piezoelectric Effects Induced by Domain Reconfiguration Related to Ferroelectric Phase Transitions" Peter Finkel, Markys G. Cain, Thomas Mion, Margo Staruch, Jakub Kolacz, Sukriti Mantri, Chad Newkirk, Kyril Kavetsky, John Thornton, Junhai Xia, Marc Currie, Thomas Hase, Alex Moser, Paul Thompson, Christopher A. Lucas, Andy Fitch, Julie M. Cairney, Scott D. Moss, Alan Gareth Alexander Nisbet, John E. Daniels, Samuel E. Lofland, Advanced Materials, Volume 34, Issue 7, February 2022, p. 2106827.

✍ **Optimization of Carbon Fiber Surfaces for Advanced Surfaces**

- ▹ Publication: "A comparison of mechanical properties of recycled high-density polyethylene/ waste carbon fiber via injection molding and 3D printing" Ameya Borkar, Andreas Hendlmeier, Zan Simon, James D. Randall, Filip Stojcevski, Luke C. Henderson. Polymer Composites, Volume 43, issue 4, April 2022, p. 2408.
- ▹ Publication: "Carbon fiber sizing agents based on renewable terpenes" Sujit S. Pawar, Sally A. Hutchinson, Daniel J. Eyckens, Filip Stojcevski, David J. Hayne, Thomas R. Gengenbach, Joselito M. Razal, Luke C. Henderson, Composites Science and Technology, Volume 220, March 2022, p. 109280.
- ▹ Publication: "Carbon fiber polypropylene interphase modification as a route to improved toughness", James D. Randall, Filip Stojcevski, Nemanja Djordjevic, Andreas Hendlmeier, Bhagya Dharmasiri, Melissa K. Stanfield, Daniel B. Knorr, Ngon T. Tran, Russell J. Varley, Luke C. Henderson, Composites Part A: Applied Science and Manufacturing, Volume 159, August 2022, p.107001.
- ▹ Publication: "Assessing the properties of Poly(dicyclopentadiene) reinforced with discontinuous carbon fibers" David J. Hayne, Matthew A. Singleton, Brendan A. Patterson, Y. Athulya Wickramasingha, Jennifer M. Sietins, Daniel B. Knorr, Filip Stojcevski, Luke C. Henderson, Composites Part A: Applied Science and Manufacturing, Volume 155, April 2022, p. 106839.
- ▹ Publication: "Inverse Vulcanisation of canola oil as a route to recyclable chopped carbon fibre composites" Filip Stojcevski, Melissa K. Stanfield, David J. Hayne, Maximilian Mann, Nicholas A. Lundquist, Justin M. Chalker, Luke C. Henderson, Sustainable Materials and Technologies, Volume 32, July 2022, p. e00400.

- Publication: "Using surface grafted poly(acrylamide) to simultaneously enhance the tensile strength, tensile modulus, and interfacial adhesion of carbon fibres in epoxy composites" Bhagya Dharmasiri, James D. Randall, Melissa K. Stanfield, Yanting Ying, Gunther G. Andersson, Dhriti Nepal, David J. Hayne, Luke C. Henderson, Carbon, Volume 186, January 2022, p.367.
- Publication: "Enhanced Interfacial Integrity for Chain Growth Polymer Carbon Fiber Composites via Surface-Initiated Polymerization" Siuan He and Tiffany R. Walsh, ACS Applied Materials & Interfaces, Volume 14, Issue 23, June 2022, p. 27157.
- Publication: "Surface modification of carbon fiber as a protective strategy against thermal degradation" Y. Athulya Wickramasingha, Bhagya Dharmasiri, James D. Randall, Yanting Yin, Gunther G. Andersson, Dhriti Nepal, Ben Newman, Filip Stojcevski, Daniel J. Eyckens, Luke C. Henderson, Composites Part A: Applied Science and Manufacturing, Volume 153, February 2022, p. 106740.
- Publication: "Multifunctional polymeric surface coatings of carbon fibre electrodes for enhanced energy storage performance" Bhagya Dharmasiri, Melissa K. Stanfield, James D. Randall, Ken Aldren S. Usman, Si Alex Qin, Joselito M. Razal, Egan H. Doeven, Paul S. Francis, Daniel J. Eyckens, Yanting Yin, Gunther G. Andersson, Luke C. Henderson, Chemical Engineering Journal, Volume 447, June 2022, p. 137560
- Publication: "Aromatic tetra-glycidyl ether versus tetra-glycidyl amine epoxy networks: Influence of monomer structure and epoxide conversion" Samuel R. Swan, Claudia Creighton, James M. Griffin, Bekim V. Gashi, Russell J. Varley, Polymer, Volume 239, January 2022, p.124401.
- Publication: "Prediction of chain-growth polymerisation of vinyl ester resin structure at the carbon fibre interface" Siyuan He and Tiffany R. Walsh, Composites Science and Technology, Volume 218, February 2022, p. 109168.
- Publication: "Mixed Surface Chemistry on Carbon Fibers to Promote Adhesion in Epoxy and PMMA Polymers" James D. Randall, Daniel J. Eyckens, Essi Sarlin, Sarianna Palola, Gunther G. Andersson, Yanting Yin, Filip Stojcevski, and Luke C. Henderson, Industrial & Engineering Chemistry Research, Volume 61, Issue 4, February 2022, p. 1615.
- Publication: "Examining the Role of Aryldiazonium Salts in Surface Electroinitiated Polymerization" Melissa K. Stanfield, Melvin Dilger, David J. Hayne, Nicholas S. Emonson, Anders Barlow, Nathan R. B. Boase, Lawrence R. Gahan, Elizabeth H. Krenske, Jean Pinson, Daniel J. Eyckens, and Luke C. Henderson, Langmuir, Volume 38, Issue 16, April 2022, p. 4979.
- Publication: "Investigating interfacial adhesion and open-hole compressive (OHC) strength correlations for CFRPs via variations in sizing and oxidative surface treatment" Filip



Dr. Clint Novtony visiting the University of Tasmania, Australia and RMIT.

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Stojcevski, David J. Hayne, Timothy B. Hilditch, Luke C. Henderson, Composites Part A: Applied Science and Manufacturing, Volume 150, November 2021, p. 106587.

- ▷ Publication: "Cure Kinetics and Network Development of a Very High Tg Naphthalene-Based Epoxy Amine Network" Samuel R. Swan, Claudia Creighton, Bekim V. Gashi, James M. Griffin, and Russell J. Varley, ACS Applied Polymer Materials, Volume 3, Issue 11, November 2022, p. 5717.
- ▷ Publication: "Practical atomistic models of carbon fiber surfaces with tuneable topology and topography" F. Vuković, T.R. Walsh, Composites Science and Technology, Volume 216, November 2021, p. 109049.
- ▷ Publication: "Carbon fibre surface chemistry and its role in fibre-to-matrix adhesion" Daniel J. Eyckens, Filip Stojcevski, Andreas Hendlmeier, James D. Randall, David J. Hayne, Melissa K. Stanfield, Ben Newman, Filip Vukovic, Tiffany R. Walsh, and Luke C. Henderson, Journal of Materials Chemistry A, Issue 47, December 2021, p. 26528.

✍ **Trans-Jacket Fibre Bragg Gratings for In-Situ Health Monitoring of Defence Platforms in Harsh Environments**

- ▷ Publication: "Trans-Jacket Fibre Bragg Gratings for In-Situ Health Monitoring of Defence Platforms in Harsh Environments" Naizhong Zhang, Claire Davis, Chiu Wing Kong, Suzana Turk, Materials Research Proceedings, Volume 18, p 45-52, 2021.

✍ **Multi-Optrode Array for Neural Interfacing**

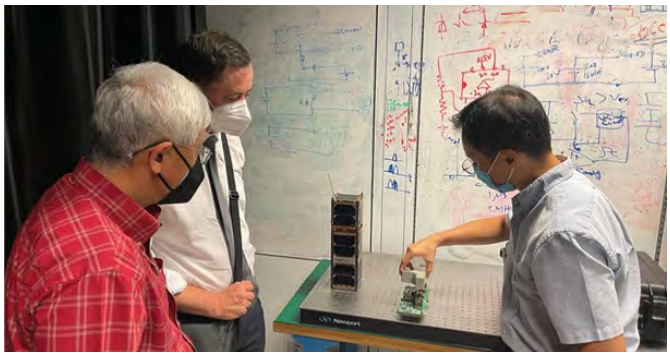
- ▷ Publication: "Liquid-crystal optical electrodes for neural interfacing" François Ladouceur, Nigel Lovell, and Amr Al Abed, Conference on Lasers and Electro-Optics, Technical Digest Series, May 2022, paper SF2M.3.

✍ **Structural Integrity of Composite and Adhesively Bonded Aircraft Structures from the Perspective of Multiaxial Cyclic Loading**

- ▷ Publication: "Thoughts on the durability and damage tolerance assessment of adhesively-bonded joints" Rhys Jones, Anthony J. Kinloch, John G. Michopoulos, Daren Peng, Theoretical and Applied Fracture Mechanics, Volume 119, June 2022, p. 103319.
- ▷ Publication: "Crack growth in adhesives: Similitude and the Hartman-Schijve equation" R. Jones, A.J. Kinloch, J. Michopoulos, A.P. Iliopoulos, Composite Structures, Volume 273, October 2021, p. 114260.
- ▷ Knowledge Transfer: Transfer to Naval Research Laboratory, ONR Code 35, and NAVAIR Patuxent River.

✍ **Advanced in situ X-ray and Neutron Scattering to Reveal Structural and Microstructural Response Mechanisms of Modern Single Crystal Electro-mechanical Materials**

- ▷ Publication: "Simultaneous Large Optical and Piezoelectric Effects Induced by Domain Reconfiguration Related to Ferroelectric Phase Transitions" Peter Finkel, Markys G. Cain, Thomas Mion, Margo Staruch, Jakub Kolacz, Sukriti Mantri, Chad Newkirk, Kyril Kavetsky, John Thornton, Junhai Xia, Marc Currie, Thomas Hase, Alex Moser, Paul Thompson, Christopher A. Lucas, Andy Fitch, Julie M. Cairney, Scott D. Moss, Alan Gareth Alexander Nisbet, John E. Daniels, Samuel E. Lofland, Advanced Materials, Volume 34, Issue 7, February 2022, p. 2106827.



ONR Global Chief Scentist (West) Dr. Weilin Hou at Chulalongkorn University, Thailand (top left photo), the National University of Singapore (top right photo) and (right photo) the Thailand Defense Science and Technology Department.

## Dr. Clint Novotny

- **The role of extreme unsteady velocity fluctuations in helicopter landing on Ships**
  - Publication: "Turbulence characteristics of the ship air-wake with two different topside arrangements and inflow conditions" Heri Setiawan, Kevin Kevin, Jimmy Philip, Jason P.Monty. Ocean Engineering, Volume 260, September 2022, p. 111931.
- **Biomechanical and Biophysical Biomarkers of Musculoskeletal Injury: A Machine Learning Approach to Injury Prediction and Performance Enhancement**
  - Publication: Fain, AuraLea C.; Hindle, Benjamin; Andersen, Jordan; Nindl, B.; Bird, Matthew; Wills, Jodie A.; and Doyle, Tim (2022) "TRANSFERABILITY OF A PREVIOUSLY VALIDATED IMU SYSTEM FOR LOWER EXTREMITY KINEMATICS," ISBS Proceedings Archive: Vol. 40: Iss. 1, Article 44.

## Dr. Derrick Marcus Tepaske

- **Bio Inspired Blast Resistant Marine Sandwich Structures**
  - Publication (Journal): Elastic and viscoelastic flexural wave motion in woodpecker-beak-inspired structures (June 2021)
  - Publication (Journal): Nonlinear modeling of d33-mode piezoelectric actuators using experimental vibration analysis (August 2021)

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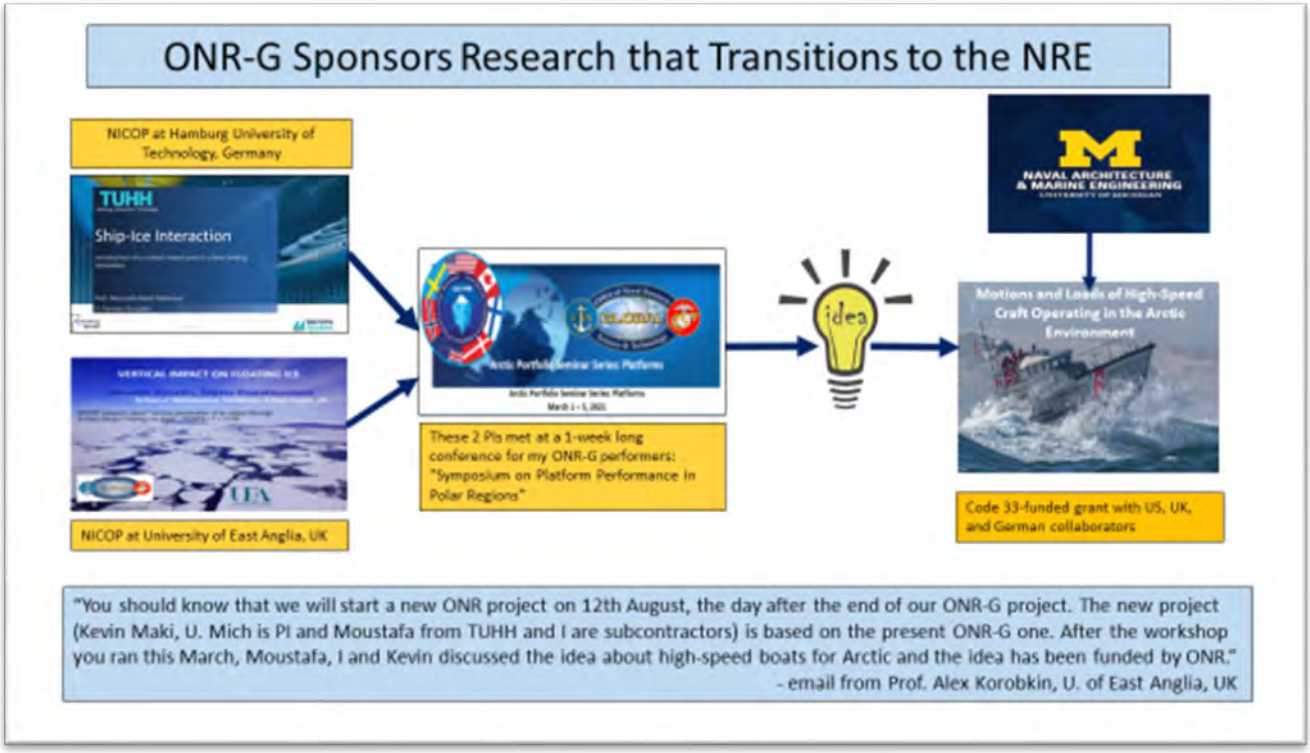
Chief of Naval Research Rear Adm. Lorin Selby visiting the lab spaces at Nanyang Technological University in Singapore.

- **Transformer-Less Topologies and Control Techniques for Medium-Voltage Battery Energy Storage Systems**
  - Publication (Journal): "Effect of Capacitor Voltage Ripples on Submodule Active Power Control Limits of Cascaded Multilevel Converters," IEEE Transactions on Industrial Electronics, 2021.
  - Presentation: "Comparison of Battery Fault Tolerance of Modular Multilevel Converters with Half-Bridge and Full-Bridge Submodules", IEEE ECCE, 2021.
  - Presentation: "Passivity Control in Modular Battery Energy Storage Systems," IEEE ECCE, 2021.
  - Presentation: "Discontinuous Modulation of Cascaded H-Bridge StatComs Considering Capacitor Voltage Oscillations", IEEE ECCE, 2021.
  - Publication (Journal): "Unbalanced Active Power Distribution of Cascaded Multilevel Converter-Based Battery Energy Storage Systems," IEEE Transactions on Industrial Electronics, (Under review).
  - Publication (Journal): " Discontinuous Modulation of a Cascaded H-Bridge StatCom," IEEE Transactions on Power Electronics, (Under review).
  - Publication (Journal): " Operating Limits for Low-Capacitance Cascaded H-Bridge Static Compensators," IEEE Transactions on Power Electronics, (Under review).
- **Thermoacoustic instability as pattern formation in a system far from equilibrium**
  - Publication (Journal): Critical transitions and their early warning signals in thermoacoustic systems (July 2021)
- **Understanding the complex microstructure of Additively Manufactured Alloys (AMAs) and its relationship to durability**
  - Publication (Journal): Element-resolved electrochemical analysis of the passivity of additively manufactured stainless steel 316L (August 2021)

- **Towards clinical trial of HARPER* for Internal Fixation (*Healing Assessment Routine Protocol for Early Return to Service)**
  - Publication (Journal): Modal Frequencies Associations with Musculoskeletal Components of Human Legs for Extracorporeal Bone Healing Assessment Based on a Vibration Analysis Approach (January 2022)
  - Publication (Journal): Experimental Investigation of Vibration Analysis on Implant Stability for a Novel Implant Design (February 2022)
- **A Universal Hardware-In-Loop Platform for Hybrid AC/DC Microgrids**
  - Publication (Journal): Subsynchronous oscillation analysis using multisynchrosqueezing transform and dissipating energy flow method (2022)
  - Publication (Journal): Peak Power Estimation of Vanadium Redox Flow Batteries Based on Receding Horizon Control (2022)
  - Publication (Journal): Design of A Two-Stage Control Strategy of Vanadium Redox Flow Battery Energy Storage Systems for Grid Application (2022)
  - Publication (Journal): "A Multi-physics Model of Vanadium Redox Flow Battery for Grid Control", IEEE PES GM2022, Denver Colorado, July 17-21, 2022

## Dr. Elena McCarthy

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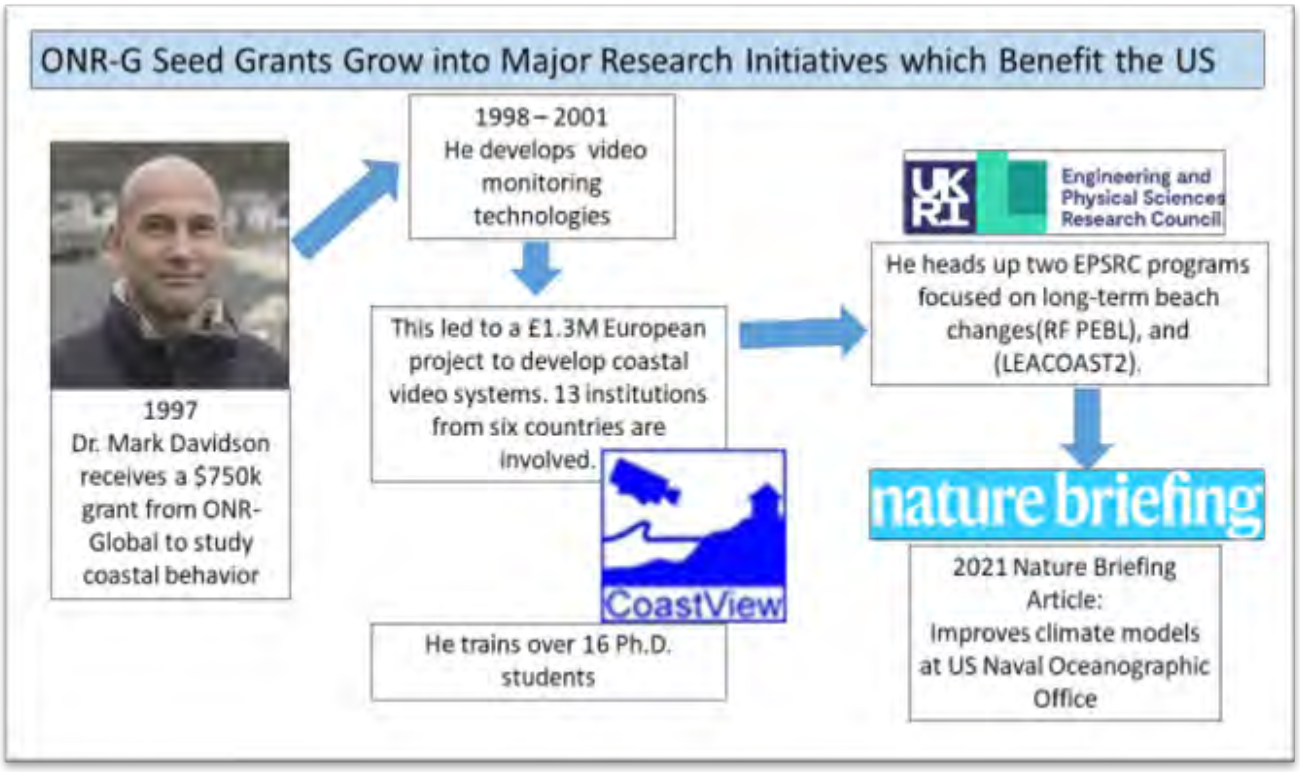


## CDR Joel Feldmeier

- **Optimizing cognitive performance by mimicking slow-wave sleep in the awake brain**
  - Publication: Sale, Martin V., and Anastasiia Kuzovina. "Motor training is improved by concurrent application of slow oscillating transcranial alternating current stimulation to motor cortex." BMC Neuroscience (2022): 23(1):45. doi: 10.1186/s12868-022-00731-x.
- **Gas narcosis in hyperbaric environments**
  - Publication: Vrijdag, Xavier CE, et al. "Does hyperbaric oxygen cause narcosis or hyperexcitability? A quantitative EEG analysis." Physiological Reports 10.14 (2022): e15386.
  - Publication: Vrijdag, Xavier CE, et al. "EEG functional connectivity is sensitive for nitrogen narcosis at 608 kPa." Scientific reports 12.1 (2022): 1-12.
- **Neurobiology of Decision Making**
  - Publication: Leunissen, Inge, et al. "Effects of beta-band and gamma-band rhythmic stimulation on motor inhibition." Iscience 25.5 (2022): 104338.

## Mr. Hoa Nguyen

- **Object Detection and Recognition using Knowledge Growing System**
  - Publication: Arwin Datumaya Wahyudi Sumari, Rosa Andrie Asmara, Dimas Rossiawan Hendra Putra, Ika Noer Syamsiana, "Prediction Using Knowledge Growing System: A Cognitive Artificial Intelligence Approach," 2021 International Conference on Electrical and Information Technology (IEIT), Sept. 14-15, 2021, Malang, Indonesia. DOI: 10.1109/IEIT53149.2021.9587367
  - Publication: Arwin D. W. Sumari, Rosa A. Asmara, Dimas R. H. Putra, Ika N. Syamsiana, "A fast object recognizer with a very small number of information using human cognitive-inspired computation model," Proc. SPIE 12124, Unmanned Systems Technology XXIV, 12124, May 31, 2022. https://doi.org/10.1117/12.2618805
- **Stochastic modeling of ship dynamics in irregular waves by explainable artificial intllegence and free-running model tests**
  - Publication: Kim, K., Kim, H., Choi, S., Na, K.I., Lee, H. and Seo, J., "Development of Ship Dynamics Model by Free-Running Model Tests and Regression," Journal of the Society of Naval Architects of Korea, 59.3 (2022): 173-182
- **Detect, Explore and Neutralize NEW threats using advanced Machine Learning**
  - Publication: Siu, C., Traish, J., Xu, R.Y.D., "Dynamic Coordination Graph for Cooperative Multi-Agent Reinforcement Learning," Proceedings of Machine Learning Research, 157:438-453, Nov. 17-19, 2021. https://proceedings.mlr.press/v157/siu21a.html
- **Covert State Discovery and Multi-Agent Reinforcement Learning for Human-Autonomy Teaming**
  - Publication: Yu-Cheng Chang; Yu-Kai Wang; Nikhil R. Pal; Chin-Teng Lin, "Exploring Covert States of Brain Dynamics via Fuzzy Inference Encoding," IEEE Transactions on Neural Systems and Rehabilitation Engineering ( Volume: 29), DOI: 10.1109/TNSRE.2021.3126264, https://ieeexplore.ieee.org/abstract/document/9606652
  - Publication: Jia Liu, Avinash Kumar Singh, Chin-Teng Lin, "Predicting the Quality of

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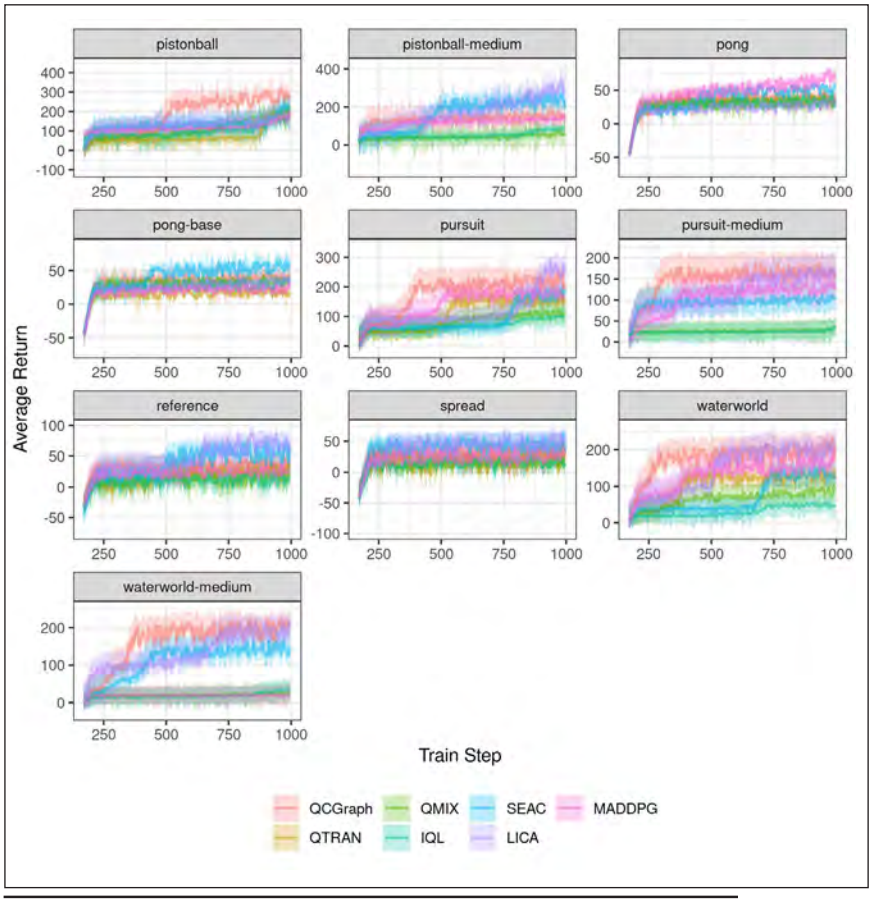
Spatial Learning via Virtual Global Landmarks," IEEE Transactions on Neural Systems and Rehabilitation Engineering ( Volume: 30), DOI: 10.1109/TNSRE.2022.3199713.

- Publication: Alka Rachel John et al., "Unraveling the Physiological Correlates of Mental Workload Variations in Tracking and Collision Prediction Tasks," IEEE Transactions on Neural Systems and Rehabilitation Engineering, vol. 30, pp. 770-781, 2022, DOI: 10.1109/TNSRE.2022.3157446.
- Publication: Lin, CT., Wang, YK., Huang, PL. et al., "Spatial-temporal attention-based convolutional network with text and numerical information for stock price prediction", Neural Comput & Applic 34, 14387–14395 (2022). https://doi.org/10.1007/s00521-022-07234-0.
- Publication: Y. -C. Chang et al., "Interpretable Fuzzy Logic Control for Multirobot Coordination in a Cluttered Environment," IEEE Transactions on Fuzzy Systems, vol. 29, no. 12, pp. 3676-3685, December 2021, DOI: 10.1109/TFUZZ.2021.3111446.
- Publication: C. -T. Lin et al., "Effects of Multisensory Distractor Interference on Attentional Driving," IEEE Transactions on Intelligent Transportation Systems, vol. 23, no. 8, pp. 10395-10403, August 2022, DOI: 10.1109/TITS.2022.3149884.
- Publication: W. Ding, Y. Ming, Z. Cao and C. -T. Lin, "A Generalized Deep Neural Network Approach for Digital Watermarking Analysis," in IEEE Transactions on Emerging Topics in Computational Intelligence, vol. 6, no. 3, pp. 613-627, June 2022, DOI: 10.1109/TETCI.2021.3055520.
- Publication: Jia Liu, Avinash Kumar Singh, and Chin-Teng Lin, "Using virtual global landmark to improve incidental spatial learning," Scientific Reports 12, 6744 (2022). https://doi.org/10.1038/s41598-022-10855-z
- Publication: Weiping Ding, Yurui Ming, Yu-Kai Wang, and Chin-Teng Lin, "Memory augmented convolutional neural network and its application in bioimages," Neurocomputing, Volume 466, 27 November 2021, Pages 128-138, https://doi.org/10.1016/j.neucom. Sept. 12, 2021




A chart showing performance over a variety of benchmark environments, as documented in the publication Siu, C., Traish, J., Xu, R.Y.D., "Dynamic Coordination Graph for Cooperative Multi-Agent Reinforcement Learning,"

- Publication: Liu, J., Singh, A.K., Wunderlich, A. et al., "Redesigning navigational aids using virtual global landmarks to improve spatial knowledge retrieval," npj Science of Learning 7, 17 (2022). https://doi.org/10.1038/s41539-022-00132-z

- ▷ Publication: Elgharabawy, A.; Prasad, M.; Lin, C., "Preference Net: Image Recognition using Ranking Reduction to Classification," Preprints 2021, 2021120140, DOI: 10.20944/preprints202112.0140.v1.
- ▷ Publication: C. -T. Lin, J. Liu, C. -N. Fang, S. -Y. Hsiao, Y. -C. Chang and Y. -K. Wang, "Multi-stream 3D Convolution Neural Network with Parameter Sharing for Human State Estimation," IEEE Transactions on Cognitive and Developmental Systems, DOI: 10.1109/TCDS.2022.3153676.
- ▷ Publication: Singanamalla SKR, Lin CT, "Spike-Representation of EEG Signals for Performance Enhancement of Brain-Computer Interfaces," Frontiers in Neuroscience, April 4, 2022; 16:792318. DOI: 10.3389/fnins.2022.792318.
- ▷ Publication: Yang J, Wang YK, Yao X, Lin CT, "Adaptive Initialization Method for K-Means Algorithm," Frontiers in Artificial Intelligence, 2021 Nov 25; 4:740817. DOI: 10.3389/frai.2021.740817.

✍ **Distributed Symbolic-Non-Symbolic Context-Aware Swarm Logics**

- ▷ Publication: Hussein A. Abbass1, Eleni Petraki and Robert Hunjet, "JSwarm: A Jingulu-Inspired Human-AI-Teaming Language for Context-Aware Swarm Guidance," Frontiers in Physics, July 14, 2022, Sec. Interdisciplinary Physics, https://doi.org/10.3389/fphy.2022.944064
- ▷ Publication: E. Debie, H. Singh, S. Elsayed, A. Perry, R. Hunjet and H. Abbass, "A Neuro-Evolution Approach to Shepherding Swarm Guidance in the Face of Uncertainty," 2021 IEEE International Conference on Systems, Man, and Cybernetics (SMC), 2021, pp. 2634-2641, DOI: 10.1109/SMC52423.2021.9659082.

✍ **Event-Based Sensing in the Underwater Environment**

- ▷ Publication: Germain Haessig, Damien Joubert, Justin Haque, Yingkai Chen, Moritz Milde, Tobi Delbruck, Viktor Gruev, "Bio-inspired Polarization Event Camera," Cornel Univ. arXiv:2112.01933 [cs.CV], https://doi.org/10.48550/arXiv.2112.01933

✍ **Using a novel machine-learning framework for accurate flow and noise predictions at high Reynolds numbers**

- ▷ Publication: Shubham Shubhama, Richard D. Sandberg, Stéphane Moreau, Hao Wu, "Surface pressure spectrum variation with Mach number on a CD airfoil," Journal of Sound and Vibration, Volume 526, May 26, 2022, 116762, https://doi.org/10.1016/j.jsv.2022.116762.

✍ **The biomechanics of miniature active venom delivery systems**

- ▷ Publication: Qiuxiang Huang, Li Wang, Sridhar Ravi, Fang-Bao Tian, John Young and Joseph C. S. Lai, "Benchmarking A Coupled Finite Element–Immersed Boundary–Lattice Boltzmann Method Solver for Simulations of Collapsible Tube Flows," Australasian Conference on Computational Mechanics, Dec. 13-15, 2021, https://www.researchgate.net/publication/357202571
- ▷ Publication: Q. Huang, S. Mazharmanesh, F.-B. Tian, J. Young, J.C.S. Lai, and S. Ravi, "CFDsolver validations for simulating passively pitching tandem wings in hovering flight," 24th International Congress on Modelling and Simulation (MODSIM2021), December 2021, DOI: 10.36334/modsim.2021.A2.huang, https://www.researchgate.net/publication/357046514
- ▷ Publication: E. C. Yeo and Q. Huang, "Numerical Study of Passively Pitching Flapping Wings in Hovering Flight," AIAA Region VII Student Conference, November 2021, https://www.researchgate.net/publication/356382521

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- ▹ Publication: Qiuxiang Huang, Zhengliang Liu, Abhijith Moni, Sridhar Ravi, Fang-Bao Tian, John Young and Joseph C. S. Lai, "Reducing Velocity Error and its Consequences by an Iterative Feedback Immersed Boundary Method," 15th World Congress on Computational Mechanic and 8th Asian Pacific Congress on Computational Mechanic, August 2022, DOI: 10.23967/wccm-apcom.2022.098
- ▹ Publication: Qiuxiang Huang, Zhengliang Liu, Li Wang, et al., "Streamline penetration, velocity error, and consequences of the feedback immersed boundary method," Physics of Fluids 34, 097101 (2022); https://doi.org/10.1063/5.0101584

✍ **Vision Enhancement using Eyetracked Augmented Reality**

- ▹ Publication: Kenan Bektas et al., "Telelife: A Vision of Remote Living in 2035," CHI Conference on Human Factors in Computing Systems Extended Abstracts, April 29-May 5, 2022, https://doi.org/10.1145/3491101.3516505.
- ▹ Publication: R. Takahashi, S. Shirai, J. Orlosky, Y. Uranishi and H. Takemura, "A Japanese Character Flick-Input Interface for Entering Text in VR," 2021 IEEE International Symposium on Mixed and Augmented Reality Adjunct (ISMAR-Adjunct), 2021, pp. 251-253, DOI: 10.1109/ISMAR-Adjunct54149.2021.00058.
- ▹ Publication: G. Zhao, J. Orlosky, S. Feiner, P. Ratsamee and Y. Uranishi, "Mitigation of VR Sickness during Locomotion with a Motion-Based Dynamic Vision Modulator," in IEEE Transactions on Visualization and Computer Graphics, 2022, doi: 10.1109/TVCG.2022.3181262.

✍ **Improving the characterization and understanding of global contribution to environmental impacts of plastic debris in aquatic environments**

- ▹ Publication: Trinh, B.-S., Dam, V., Pham, B. L., & Pham, H., "A separation of plastic debris in Saigon river sediment using a microplastic sediment separator," Science & Technology Development Journal - Science of The Earth and Environment, 5(SI1), SI137-SI146. https://doi.org/https://doi.org/10.32508/stdjsee.v5iSI1.588

✍ **Recurrent Neural Network Model for High Dynamic Range Contrast Control for Obstacle Avoidance**

- ▹ Publication: Alexander J. White, Chou P. Hung, and Chung-Chuan Lo, "HDR luminance normalization via contextual facilitation in highly recurrent neuromorphic spiking networks", Proc. SPIE 12124, Unmanned Systems Technology XXIV, 121240E (May 31, 2022); https://doi.org/10.1117/12.2623789

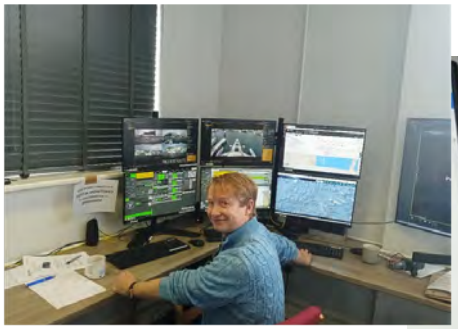
✍ **Robust data mining to learn meaningful patterns from numeric data which can be misleading**

- ▹ "Publication: Chiranjibi Sitaula, Sunil Aryal, Yong Xiang, Anish Basnet, Xuequan Lu, "Content and context features for scene image representation,"" Knowledge-Based Systems, Volume 232, 2021, 107470, https://doi.org/10.1016/j.knosys.2021.107470."

## Dr. Kyle Gustafson

✍ **LOAD Project – Long-term analysis of Suspended Particulate Matter concentrations Affecting port areas in Developing countries**

- ▹ Article: Patos Lagoon, Brazil, Suspended Particulate Matter (SPM) data compendium



Science Director Dr. Jay Marble at the controls while with the Mayflower Autonomous ship launch team in Plymouth, U.K.

- ▹ Article: The effect of agricultural intensification and water-locking on the world's largest coastal lagoonal system
- ▹ Article: The Use of Microplastics as a Reliable Chronological Marker of the Anthropocene Onset in Southeastern South America
- ▹ Article: Long-Term Variability on Suspended Particulate Matter Loads From the Tributaries of the World's Largest Choked Lagoon

✍ **Charge Transfer Plasmon Metamolecules for Infrared Optical Therapy**

- ▹ Article: High performance blended nanofluid based on gold nanorods chain for harvesting solar radiation
- ▹ Article: High Performance Gold Dimeric Nanorods for Plasmonic Molecular Sensing

✍ **Search for vulnerabilities of fundamental origin in Quantum Key Distribution**

- ▹ Article: Testing how different levels of entanglement affect predictability in practical setups

✍ **3rd LAMLA Workshop - Listening for Aquatic Mammals in Latin America - Advancing bioacoustics and passive**

- ▹ Article: Use of recurrence plots for identification and extraction of patterns in humpback whale song recordings

✍ **Cognitive Radio Single Board Computer for Organic Sensing**

- ▹ Article: Analysis of Web-Based IoT through Heterogeneous Networks: Swarm Computing over LoRaWAN

✍ **On the permeability of the Malvinas Current**

- ▹ Article: SAM-driven variability of the southwestern Atlantic shelf sea circulation

✍ **Triggered Anti-Fungal Hydrogels for the Treatment of Candida Infections**

- ▹ Article: Enhancing effect of chitosan on methylene blue-mediated photodynamic therapy against C. albicans: A study in planktonic growth, biofilms, and persister cells

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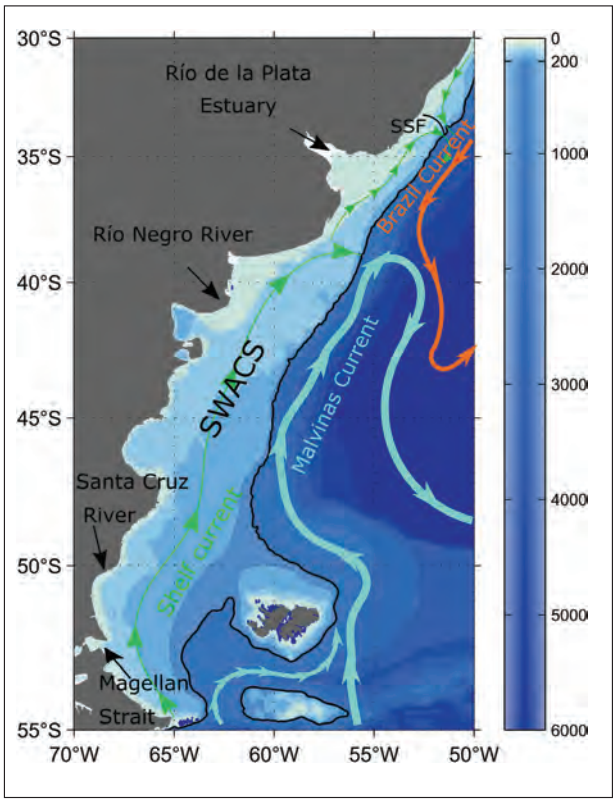
- **Low-Dimensional Superconductivity for Sensors of Electromagnetic Fields**
  - ▹ Article: Band superconductivity in a periodic constricted nanoribbon structure
- **Phytochemistry and Structural Diversification of Secondary Metabolites in the Search for Antimicrobial Compounds**
  - ▹ Article: Psilostachyins as trypanocidal compounds: Bioguided fractionation of Ambrosia tenuifolia chemically modified extract




This graphic illustrates the study region of the article "SAM-driven variability of the southwestern Atlantic shelf sea circulation." The objective of the study is to analyze the interannual variability of the Southwestern Atlantic Continental Shelf (SWACS) circulation and its thermohaline structure.

## Dr. Mamadou Diallo

- **AI for Scientific Discovery: Developing Artificial Intelligence Systems Capable of Nobel-Quality Discoveries by 2050**
  - ▹ Article: Emergence and algorithmic information dynamics of systems and observers
  - ▹ Publication: Hiroaki Kitano. "Nobel Turing Challenge: creating the engine for scientific discovery", npj Systems Biology and Applications volume 7, Article number: 29 (2021).
  - ▹ Presentation: "Posing an AI Scientist Grand Challenge: Artificial Intelligence Systems Capable of Nobel-Quality Discoveries". AI Scientist Grand Challenge Workshop, The Alan Turing Institute, February 2020, London, UK.
- **US-Africa Frontiers of Science, Engineering, and Medicine Symposium**
  - ▹ Presentation: First US - Africa Frontiers of Science, Engineering, and Medicine Symposium in Nairobi, Kenya 12-14 Oct 2022. Presentations from 75 outstanding young scientists, engineers, and medical professionals from the United States (25) and Africa (50), selected from 900 applicants.
- **Distributed high-level scene reasoning with teams of heterogeneous robots (DISCERNERS)**
  - ▹ Promotion: Eduardo Montijano was promoted to Associate Professor at UNIZAR.
  - ▹ Award: Best student paper award for: I Alonso, L Riazuelo, L Montesano, AC Murillo. "Domain Adaptation in LiDAR Semantic Segmentation by Aligning Class Distributions." International Conference on Informatics in Control, Automation and Robotics (ICINCO) 2021. Best student paper award.
  - ▹ Promotion: Hai Zhu, PhD candidate in the group of Javier Alonso-Mora successfully

defended his thesis, supported in part by this project: https://pure.tudelft.nl/ws/portalfiles/portal/104799885/Hai_Zhu_PhD_Thesis.pdf

- Award: Javier Alonso-Mora received an ERC Starting Grant 2021 from the European Research Commision.
- Publication: A Sabater, I Alonso, L Montesano, AC Murillo. "Domain and View-point Agnostic Hand Action Recognition". Robotics and Automation Letters 6 (4), 7823-7830. 2021.
- Publication: C Mahulea, R González, E Montijano, M Silva, "Path planning of multirobot systems using Petri net models. Results and open problems" Revista Iberoamericana de Automática e Informática industrial 18 (1), 19-31, 2021.
- Publication: H. Zhu, F. Claramunt, B. Brito, and J. Alonso-Mora, "Learning Interaction-Aware Trajectory Predictions for Decentralized Multi-Robot Motion Planning in Dynamic Environments", in IEEE Robotics and Automation Letters (RA-L), March 2021.
- Publication: I Alonso, A Sabater, D Ferstl, L Montesano, AC Murillo. "Semi-Supervised Semantic Segmentation with Pixel-Level Contrastive Learning from a Class-wise Memory Bank". Proc of the IEEE/CVF International Conference on Computer Vision 2021.
- Publication: E Sebastián, E Montijano, C Sagüés, "Adaptive Multirobot Implicit Control of Heterogeneous Herds" IEEE Transactions on Robotics, Accepted for 2022.
- Publication: D Morilla-Cabello, L Bartolomei, L Teixeira, E Montijano, M Chli, "Sweep-Your-Map: Efficient Coverage Planning for Aerial Teams in Large-Scale Environments", IEEE Robotics and Automation Letters 7 (4), 10810-10817, 2022.
- Publication: H. Zhu, B. Brito and J. Alonso-Mora, "Decentralized Probabilistic Multi-Robot Collision Avoidance Using Buffered Uncertainty-Aware Voronoi Cells", in Autonomous Robots (AURO), 2022.
- Publication: P Pueyo, E Montijano, AC Murillo, M Schwager, "CineMPC: Controlling Camera Intrinsics and Extrinsics for Autonomous Cinematography" 2022 IEEE International Conference on Robotics and Automation (ICRA), 4058-4064.
- Publication: A Sabater, L Montesano, AC Murillo. "Event Transformer. A sparse-aware solution for efficient event data processing" Proc. of the IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops (CVPRW) 2022.
- Publication: E Sebastian, E Montijano, C Sagues, "Multi-robot Implicit Control of Massive Herds", ROBOT22 to appear.
- Publication: S Casao, Ana C Murillo, E Montijano, "Data Association Tools for Target .Identification in Distributed Multi-target Tracking Systems", ROBOT22 to appear.
- Publication: MA Popovici, I Etayo, E Montijano, D Tardioli, "Distributed Target Assignment with Person Re-Identification", ROBOT22 to appear.


On a liaison visit to Botswana, ONR Global Science Director Dr. Mamadou Diallo and Scientists from the U.S. Army DEVCOM-Atlantic, Army Research Office and AFRICOM visited the Botswana Institute for Technology Research and Innovation (BITRI), Gaborone.

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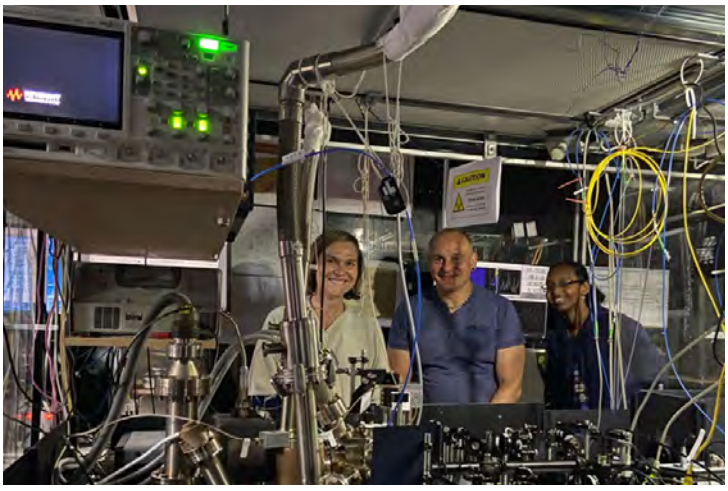
- ▹ Presentation: I Alonso, L Riazuelo, L Montesano, AC Murillo. "Domain Adaptation in LiDAR Semantic Segmentation by Aligning Class Distributions". International Conference on Informatics in Control, Automation and Robotics (ICINCO) 2021. Best student paper award.
- ▹ Presentation: E Sebastián, E Montijano, C Sagüés, "All-in-one: Certifiable optimal distributed kalman filter under unknown correlations" 2021 60th IEEE Conference on Decision and Control (CDC), 6578-6583.
- ▹ Presentation: E Sebastián, E Montijano, "Multi-robot implicit control of herds", 2021 IEEE International Conference on Robotics and Automation (ICRA), 1601-1607.
- ▹ Presentation: S Casao, A Naya, AC Murillo, E Montijano, "Distributed Multi-Target Tracking in Camera Networks", 2021 IEEE International Conference on Robotics and Automation (ICRA), 1903-1909.
- ▹ Presentation: E Montijano, C Mahulea, "Probabilistic Multi-Robot Path Planning with High-Level Specifications using Petri Net Models" IEEE 17th International Conference on Automation Science and Engineering (CASE), 2021.
- ▹ Presentation: A Sabater, L Santos, J Santos-Victor, A Bernardino, L Montesano, AC. Murillo "One-shot action recognition in challenging therapy scenarios". Proc. the IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops (CVPRW) 2021.
- ▹ Presentation: H. Zhu, J. J. Chung, N. R. J. Lawrance, R. Siegwart and J. Alonso-Mora, "Online Informative Path Planning for Active Information Gathering of a 3D Surface", in Proc. IEEE Int. Conf. on Robotics and Automation (ICRA), May 2021.
- ▹ Presentation: A. Ray, A. Pierson, H. Zhu, J. Alonso-Mora and D. Rus, "Multi-robot Task Assignment for Aerial Tracking with Viewpoint Constraints", in Proc. IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS), October 2021.



In a liaison visit, Dr. Martina Barnas (left) stands with Professor Winfried Hensinger (right) at his lab at the University of Sussex, U.K. Hensinger is a recipient of an ONR Global grant to develop voltage-controlled quantum logic with trapped ions. This is a critical piece of technology in his effort towards building a scalable "million qubit quantum computer." Thanks to the successes of his visionary research, Universal Quantum (a spinoff company, co-founded by Hensinger to engineer and commercialize technology based on his research) received substantial, multimillion investments in the past year and in November 2022 was awarded a 67 euro contract from German government to build two quantum computers.

## Dr. Martina Barnas

✍ **Voltage Controlled Quantum Logic with Trapped Ions**

- ▹ News Article: https://student.sussex.ac.uk/news/article/56673-university-of-sussex-spin-out-led-consortium-awarded-millions-to-build-commercial-quantum-computer
- ▹ Press Release: Universal Quantum Wins $66M Contract to Build a Fully Scalable Trapped-Ion Quantum Computer (hpcwire.com)

- **Proposal for deterministic solid state memory**
  - Award Recognition: Professor Mete Atature was awarded 2020 Young Medal for his pioneering contributions to quantum optical phenomena in semiconductors and diamonds, creating exciting applications in quantum technologies.

## Dr. Martina Siwek

- **Health and activity monitoring by wearables in extreme conditions**
  - Publication: Saclova, Lucie, et al. "Reliable P wave detection in pathological ECG signals." Scientific Reports 12.1 (2022): 1-14.
  - Publication: R. Smisek et al., "Wavelet Transform Based Detection of the First-Degree Atrioventricular Block," 2021 Computing in Cardiology (CinC), 2021, pp. 1-4, doi: 10.23919/CinC53138.2021.9662877.
  - Publication: J. Kozumplik et al., "Respiratory Rate Estimation Using the Photoplethysmogram: Towards the Implementation in Wearables," 2021 Computing in Cardiology (CinC), 2021, pp. 1-4, doi: 10.23919/CinC53138.2021.9662674.
  - Publication: Maršánová, Lucie, et al. "Brno University of Technology ECG signal database with annotations of P wave (BUT PDB)." (2021).
  - Knowledge Transfer: Algorithms transferred to Mayo Clinic for integration into the sensor/detector they are designing for ONR Code 34.
- **Advanced Methods for Blind Extraction of Independent Sources from Multi-Sensor Observations**
  - Publication: Koldovský, Zbyněk, Václav Kautský, and Petr Tichavský. "Double Nonstationarity: Blind Extraction of Independent Nonstationary Vector/Component from Nonstationary Mixtures--Algorithms." arXiv preprint arXiv:2204.04992 (2022).
  - Publication: Janský, Jakub, et al. "Auxiliary function-based algorithm for blind extraction of a moving speaker." EURASIP Journal on Audio, Speech, and Music Processing 2022.1 (2022): 1-16.
  - Knowledge Transfer: MATLAB code transfer to Carderock, MD
- **Super-resolution imaging techniques based on spatial coherence**
  - Publication: Mazelanik, M., Leszczyński, A. & Parniak, M. Optical-domain spectral super-resolution via a quantum-memory-based time-frequency processor. Nat Commun 13, 691 (2022). https://doi.org/10.1038/s41467-022-28066-5
  - Publication: Borówka, Sebastian, et al. "Sensitivity of Rydberg-atom receiver to frequency and amplitude modulation of microwaves." arXiv preprint arXiv:2206.11829 (2022).
  - Publication: Lipka, Michał, and Michał Parniak. "Single-photon hologram of a zero-area pulse." Physical Review Letters 127.16 (2021): 163601.
  - Publication: Chandan Datta, Yink Loong Len, Karol Łukanowski, Konrad Banaszek, and Marcin Jarzyna, "Sub-Rayleigh characterization of a binary source by spatially demultiplexed coherent detection," Opt. Express 29, 35592-35601 (2021)
- **Multi-Dimensional Signal Design for Wideband HF Links**
  - Publication: A. L. Moustakas, G. C. Alexandropoulos and M. Debbah, "Capacity Optimization using Reconfigurable Intelligent Surfaces: A Large System Approach," 2021 IEEE Global Communications Conference (GLOBECOM), 2021, pp. 01-06, doi: 10.1109/GLOBECOM46510.2021.9685375.

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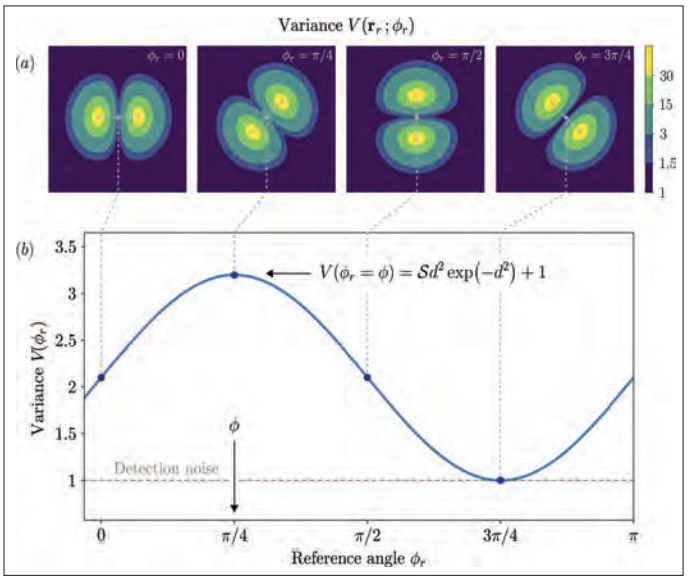


ONR Global-funded super-resolution imaging techniques research at the Faculty of Physics, University of Warsaw, Poland. This graph is a colorful illustration used in the one of the resulting publications, Chandan Datta, Yink Loong Len, Karol Łukanowski, Konrad Banaszek, and Marcin Jarzyna, "Sub-Rayleigh characterization of a binary source by spatially demultiplexed coherent detection."

- ▹ Publication: I. Dagres, A. Polydoros and A. Moustakas, "Performance Analysis of Distributed Beamforming in Wireless Networks: The Effect of Synchronization and Doppler spread," MILCOM 2021 - 2021 IEEE Military Communications Conference (MILCOM), 2021, pp. 957-962, doi: 10.1109/MILCOM52596.2021.9653042.
- ▹ Publication: K. Lotidis, A. L. Moustakas and N. Bambos, "Controlling Epidemics via Testing," 2021 60th IEEE Conference on Decision and Control (CDC), 2021, pp. 2092-2097, doi: 10.1109/CDC45484.2021.9683289.

✍ **Anticipative Point-Mass Method for High-Performance Estimation and Navigation (APHEN)**

- ▹ Publication: J. Matoušek, M. Brandner and J. Duník, "Continuous Nonlinear State Prediction by Finite Volume Method on Logically Rectangular Grids," 2021 60th IEEE Conference on Decision and Control (CDC), 2021, pp. 5890-5895, doi: 10.1109/CDC45484.2021.9683293.
- ▹ Publication: J. Matoušek, J. Duník, M. Brandner and V. Elvira, "Comparison of Discrete and Continuous State Estimation with Focus on Active Flux Scheme," 2021 IEEE 24th International Conference on Information Fusion (FUSION), 2021, pp. 1-8, doi: 10.23919/FUSION49465.2021.9626836.
- ▹ Publication: J. Duník, O. Straka, J. Matoušek and M. Brandner, "Accurate Density-Weighted Convolution for Point-Mass Filter and Predictor," in IEEE Transactions on Aerospace and Electronic Systems, vol. 57, no. 6, pp. 3574-3584, Dec. 2021, doi: 10.1109/TAES.2021.3079568.
- ▹ Publication: J. Duník, L Kral, J. Matoušek, M. Brandner and O. Straka. "Neural Network Enhanced Point-Mass Method withIntegration Rule Selection and Error Correction" in IEEE - in process
- ▹ Knowledge Transfer: Algorithm transferred to U.S. Air Force "Stone Soup" project.

## Dr. Scott Walper

✍ **Controlled Spatial Fabriaction of Metalloprotein Nanostructures for Bio-interfacing**

- ▹ Publication: Lam T.L., McCluskey J.B., Glover D.J. "Harnessing the Structural and Functional Diversity of Protein Filaments as Biomaterial Scaffolds" ACS Applied Bio Materials, 2022

- ▹ Presentation: Lam T.L. & Glover, D.J. "Scaffolding functional molecules in proximity to enhance electrochemical bioactivity" Designer Biology Meeting, Sept. 10, 2021
- ▹ Presentation: Lam T.L. & Glover D.J. "Scaffolding enzymes on electrically conductive molecular chaperones to enhance activity" Synthetic Biology Australasia, Sept. 14, 2021

✍ **Bio-Inspiration for Efficient Mobile Sensor Networks**

- ▹ Presentation: "Descriptive and Normative Models of Collective Brehaviour", Leeds, June 20-24, 2022


Dr. Beatrix Süß (left) and her husband from Technical University of Darmstadt aboard the USS Mount Whitney to celebrate the conclusion of 2022 BALTOPS in Kiel, Germany. This was an international event with naval leaders from multiple countries in attendance, as well as the U.S. chief of naval operations and the U.S. ambassador to Germany.

Pictured is the organizing committee for the joint U.S.-Belgium workshop "Forging the Future - BE-US Joint Effort in Science for a Safer World," a first-of-its-kind workshop organized by ONR Global and DEVCOM in partnership with the Belgian Royal Higher Institute for Defence. The U.S. Army, U.S. Navy and Belgian military hosted the science and technology conference in Brussels, Belgium, in June 2022. They brought together the Belgian research and technology community, and representatives from the Belgium Ministry of Defense and the U.S. Department of Defense.


## Dr. Richard Yamada

✍ **Exploration and Design of High Performance Relaxor Ferroelectrics Based on Microstructure Study (Prof. Shujun Zhang, Wollongong University)**

- ▹ Publication: "Recent Developments in Piezoelectric Crystals"; Zhang et al, Journal of the Korean Ceramic Society; Vol 55, No. 5 pp419-439, 2018
- ▹ Publication: "Giant Piezoelectricity of Sm-doped Pbo3-PbTio3 Single Crystals"; Li et al, Science 364, 264-268, 2019

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- ▹ Publication: "Electric Field effect on short-range polar order in a relaxor ferroelectric system"; Xu et al, Phys Rev B 100, 024113, 2019
- ▹ Publication: "Mechanisms underpinning the ultrahigh piezoelectricity in Sm-doped .705 PbO3-.29PbTiO3: Temperature-induced metastable local structure and field induced polarization rotation"; Zhao et al, J. Appl. Phys. 126 075101, 2019
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✍ **Diamond-doped fiber optic networks for persistent magnetic field sensing**

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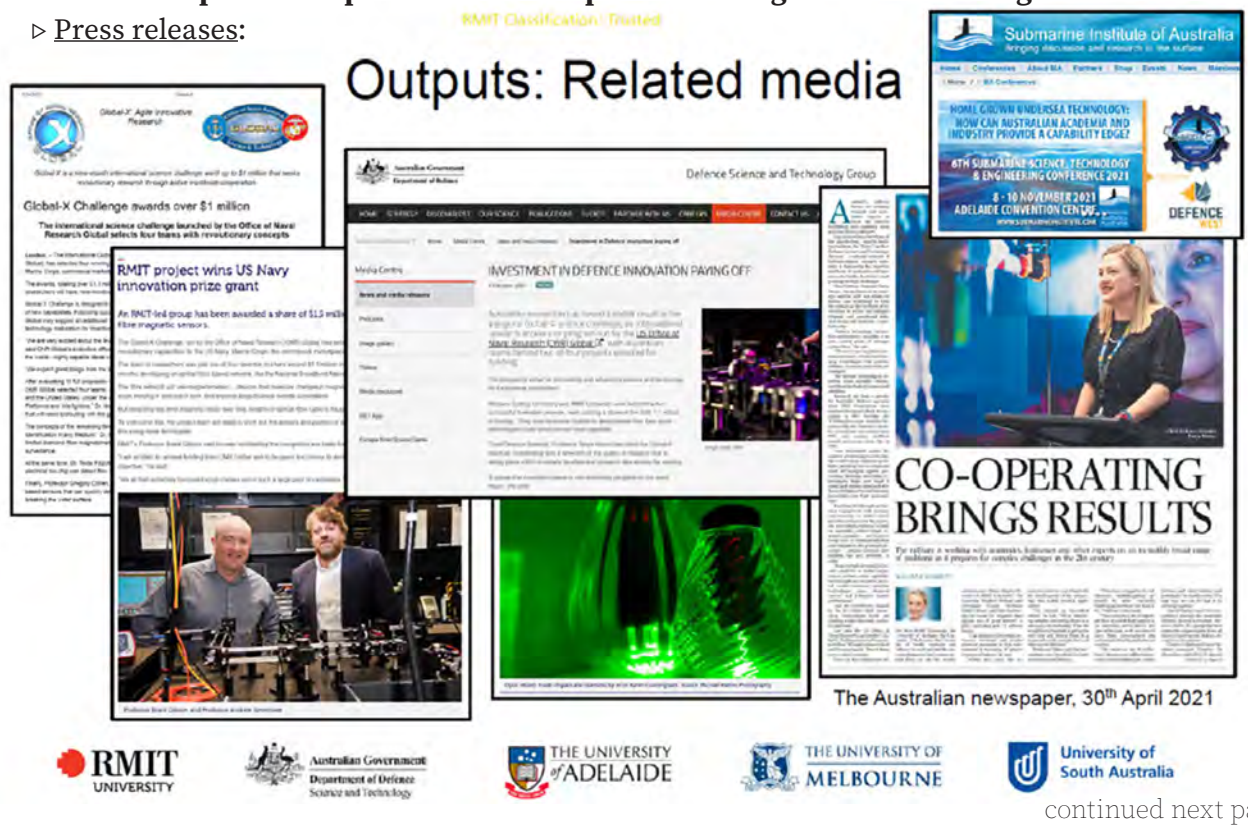


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