



The Royal Institute of Navigation Fellowships and Awards 2020

The Annual General Meeting made the leap to digital this year as COVID-19 prevented us from meeting in person. We didn't have the chance to celebrate the new Fellows and award winners in person, so we'd like to take the opportunity now to congratulate them...

Fellowships 2020

John Betz



John has been awarded Fellowship in recognition of technical leadership in development, compatibility, and interoperability of the Global Navigation Satellite Systems. John's notable achievements include:

- Invented and developed the Binary Offset Carrier (BOC) spreading modulation that is now used in every satnav system
- Co-developed the generalized theory for code tracking accuracy for arbitrary spreading modulations and non-white interference
- Led the team of scientists and engineers designing the modulation and acquisition of the M-code signal, the modernized GPS military signal now transmitted by 21 GPS satellites
- Designed the acquisition aid embedded in the M code signal, and contributed to development of the DirAc integrated circuit that has been successfully produced and tested to perform direct acquisition of the M code signal
- Technical lead for the United States in collaboration with each of the world's satnav systems helping to establish system and signal designs that achieved compatibility and interoperability
- Conceived the Multiplexed BOC spreading modulation and its implementation in Time Multiplexed BOC and Composite BOC
- Was a technical lead of the U.S. Department of Defense's GPS Enterprise Modernization Analysis of Alternatives
- Involved in various efforts to explore exploring advanced PNT techniques and technologies and their application
- Development and application of technologies to increase the security and robustness of military and civilian satnav receivers.

Fellowships 2020 cont...



Bob Bradfield

Bob has been awarded Fellowship in recognition of production of over 520 electronic 'Antares Charts' of the West Coast of Scotland, enabling safer navigation in these areas

by small craft.

Official charts of the West Coast of Scotland are not published at an adequate scale to meet the needs of

yachtsmen in and around most anchorages, partly because the underlying surveys are not sufficiently detailed or accurate.

Bob has carried out more than 520 of his own surveys and published a series of very large-scale electronic charts that are viewed, typically, on a tablet or phone and on which is displayed a GPS-derived position.

These are now widely used by West Coast yachtsmen and have been adopted as the basis for the plans in the CCC Imray Sailing Directions.

Bob wrote an article about his work for the March/April 2020 edition of Navigation News – see pages 10-12 of that edition to read more about his great work.



Jane Russell has been awarded Fellowship in recognition of exceptional work in writing and editing pilotage publications for small craft users. Jane's notable achievements include:

- Editor/author of numerous Pilotage Foundation titles, both printed book and web publications, all focussed on small craft navigation and pilotage since 2005
- Directly responsible for overseeing content in all of the Pilotage Foundation's publications since 2012
- Editorial work and input from a small craft navigator's perspective, wherever needed for Imray since 2018
- Author of The Atlantic Crossing Guide, 6th (2010) and 7th (2017) editions (Adlard Coles Nautical) which drew on first-hand experience, collaborations and further research to expand coverage from simply 'there and back' to include routes via West Africa, routes across the Caribbean Sea to Panama, coastal

and intra-coastal routes on the US coast and the so-called 'Viking' route via Newfoundland, Greenland and Iceland

- Creator and author of the web publication Arctic and Northern Waters (2011), which brought together, for the first time, the available information about high latitude sailing and ice navigation relevant to small craft, including transiting the North West and North East Passages
- Worked very closely with the author and contributors to the 3rd edition of Pacific Crossing Guide, restructuring the whole to improve passage planning, extending the researched information in the meteorological section to include much more detail about El Niño, La Niña and related phenomena and their impact on navigation, and including completely new sections on atoll formation, navigating in and around atolls and the use of satellite imagery as a possible passage planning tool in coral waters where chart offsets are common

Get to know Jane in this edition's Q&A on Page 8!

Q&A
Jane Russell



Fellowships 2020 cont...

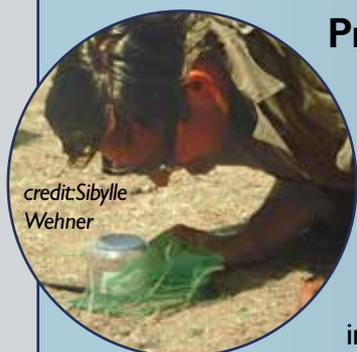


Prof Marek Ziebart.

Marek has been awarded Fellowship in recognition of outstanding contributions to the science of space navigation. Marek's notable achievements include:

- Significant contribution to the IGS International GLONASS Experiment (IGEX), by developing and demonstrating the effectiveness of a high precision, analytical approach for modelling the effects of solar radiation pressure on the orbits of GLONASS spacecraft
- Vice Dean for Engineering at University College London (UCL) Research from 2010 to 2014
- Long running and successful collaboration with NASA Jet Propulsion Laboratory and NASA Goddard Space Flight Center
- Appointed to the governing board of the IGS in 2010 in recognition of sustained contributions and leadership in the area of orbit modelling for POD in GNSS
- Chair of the IGS Space Vehicle Orbit Dynamics Working Group since 2011
- Developed (with the support of two PhD students) a physics-based radiation force modelling strategy for the precise orbit determination of the JASON-1 satellite (NASA's flagship space-based sea level measurement probe), which was adopted by

- the International DORIS Service as an operational standard for POD processing
- Appointed member of the NASA/CNES Ocean Surface Topography Science Working Group in 2004
- Elected to the governing board of the International DORIS Service in 2015
- Led a project to design a planetary navigation system for Mars under contract for ESA in 2010
- Recently completed a lecture tour for NATO on space domain awareness
- At ION, he & his students have won multiple best paper awards
- Developed the Vertical Offshore Reference Frame concept for the UK Hydrographic Office (2006-2012), which is now used as a national standard for the definition of Chart Datum in UK home waters, and subsequently developed a global model for use by the Royal Navy
- Led the work at UCL to develop the GNSS height corrector surface for the UK and the Republic of Ireland used by the Ordnance Survey (UK) and Ordnance Survey Ireland as the de facto national height datum
- Developed the exploitation of large scale VRML city models for the modelling and prediction of GPS multipath
- Member of the Expert Panel which wrote the Government Office for Science Blackett Review 'Satellite-derived Time and Position: A Study of Critical Dependencies' (2019)



credit: Sibylle Wehner

Prof Dr Rüdiger Wehner

has been awarded Fellowship in recognition of his outstanding contributions to the scientific study of the navigational abilities of insects; notably the desert ant (*Cataglyphis fortis*) which has

become a model organism in the neuroethological study of animal navigation.

Rüdiger is Professor emeritus at the Brain Research Institute of the University of Zürich, Switzerland. He was the long-term Director of the Institute of Zoology at the same University, Permanent Fellow at the Institute for Advanced Study in Berlin, Germany, Andrew Dickson White Professor (at Large) at Cornell University, USA (1987-1993), and Alexander von Humboldt Awardee at the University of Würzburg, Germany (2008-

2010). He is a neuroethologist focussing his research on visually guided behaviour of insects, especially the Saharan desert ant *Cataglyphis*, which he has made a model organism for studies of insect navigation. Later, he added the southern African and central Australian desert ants, *Ocymyrmex* and *Melophorus*, respectively, to these studies. Alongside his work in the lab, during four decades he has performed field work in the Sahara, the Namib Desert and central Australia. For several years he was Adjunct Professor at Macquarie University, Sydney. Rüdiger Wehner has published (together with Walter Gehring) the leading German zoology textbook *Zoologie*, now in its 8th edition. He is member of the German Academy of Science, Leopoldina, in which he has served as a Senator (2005-2015), Foreign Honorary Member of the American Academy of Arts and Sciences, USA, Foreign Member of the American Philosophical Society, USA, Honorary Member of the German Zoological Society, and other international societies. Among his awards are the Karl Ritter von Frisch Medal, the Science Prize of the German Zoological Society, the Marcel Benoist Prize, the Carus Medal of the Leopoldina, and several honorary doctorates.

Awards 2020



Harold Spencer-Jones Gold Medal – In recognition of an outstanding contribution to navigation Tristan Gooley

Tristan has been awarded this prestigious Gold Medal for his promotion of the art, science and practice of natural navigation, inspiring people of all ages.

Tristan Gooley is an avid outdoorsman and true champion of the practice of human navigation. He styles himself as 'The Natural Navigator'; a term he has adopted to describe the art of finding one's way on land, sea or even in the air using nature, including the sun, moon, stars, weather, land, sea, plants and animals. His approach to the subject is not to treat it as a survival skill, but as a means to enrich journeys and connect with the world around us.

In researching and advocating this concept of natural navigation, Tristan has travelled widely around the world. He has led expeditions in five continents, climbed mountains in Europe, Africa and Asia, sailed small boats across oceans and

piloted small aircraft to Africa and the Arctic. He has walked with and studied the methods of the Tuareg, Bedouin and Dayak in some of the remotest regions on Earth. Yet despite the overriding tenet of using the signs in nature for finding his way he does not forsake modern technology, recognising that systems such as GPS have their uses as a backup or in emergency situations.

He is an excellent communicator, possessing the rare gift of being able to inspire and enthuse his audiences. He has run a number of courses through his natural navigation school, which he established in 2008, and he has had eight books published, with titles as diverse as 'Wild Signs and Star Paths', and 'How to Read Water' to widespread critical acclaim. As well as podcasts and blogs, he has written for newspapers and journals on both sides of the Atlantic, and has appeared frequently on TV and radio. He has delivered talks, presentations and lectures to a range of different audiences: young and old, academics, hobbyists, professionals, and the merely curious. Beyond this, he has reached an audience beyond core navigators, inspiring and educating the general public through his books and talks. It is perhaps unique for an individual to have such a wide appeal – at the same time enhancing navigation awareness and skills among a very wide audience while also honing and developing skills of even the most experienced navigators. Most recently, Tristan studied and classified a previously uncategorised path type - the 'smile path'. Turn back to page 4 to learn more about smile paths.



Duke of Edinburgh's Navigation Award for Outstanding Technical Achievement Focal Point Positioning Ltd

has been recognised for pioneering innovations in motion

modelling and navigation sensor signal processing, enabling next generation mobile positioning, navigation and timing.

Focal Point Positioning was founded in 2015 by Dr Ramsey Faragher, who has been a Fellow of the RIN since 2015. Since then, FocalPoint has pioneered two major innovations in navigation technology: D-Tail is a human-motion-modelling system which has enabled a step change in the accuracy of pedestrian dead reckoning using smartphone inertial sensors, providing a performance similar to modern optical flow tracking devices, and

S-GPS (super-correlation) is a new inertially-aided GNSS signal processing technique, suitable for all dynamic applications including smartphones, that provides significantly enhanced sensitivity (compared to current smartphone GNSS technology), enabling signal tracking to be maintained in exceptionally challenging environments, such as deep indoors.

Ramsey was awarded the 2019 Institute of Navigation Per Engle Early Achievement Award for outstanding innovations in mobile positioning and navigation, and in particular for pioneering the revolutionary super-correlation technology.

Ramsey, as Founder and CEO of Focal Point Positioning, was also awarded the GPSWorld 2019 Leadership Award's Signals Award for the new super-correlator approach to indoor and urban GNSS signal processing.

If you would like to learn more about super-correlation you can visit the Institute's YouTube channel to watch Ramsey's recent webinar '*Enabling the Next Generation of GPS Technology with Super-correlation*'.

Awards 2020 cont...



Michael Richey Medal

For authors of the best paper in the 2019 volume of the Journal of Navigation

COLREGS-Constrained Real-time Path Planning for Autonomous Ships Using Modified Artificial Potential Fields



Hongguang Lyu and Yong Yin

(Dalian Maritime University, P. R. China)

Abstract:

This paper presents a real-time and deterministic path planning method for autonomous ships or Unmanned Surface Vehicles (USV) in complex and dynamic navigation environments. A modified Artificial Potential Field (APF), which contains a new modified repulsion potential field function and the corresponding virtual forces, is developed to address the issue of Collision Avoidance (CA) with dynamic targets and static obstacles, including emergency situations. Appropriate functional and safety requirements are added in the corresponding virtual forces to ensure International Regulations for Preventing Collisions at Sea (COLREGS)-constrained behaviour for the own ship's CA actions. Simulations show that the method is fast, effective and deterministic for path planning in complex situations with multiple moving target ships and stationary obstacles and can account for the unpredictable strategies of other ships. The authors believe that automatic navigation systems operated without human interaction could benefit from the development of path planning algorithms.



J.E.D. Williams Medal

For an outstanding contribution to the affairs of the Institute

David Broughton

David has been awarded the J.E.D. Williams Medal in recognition of his invaluable support to the RIN HQ team through almost daily content updates to RIN website news over many years.

In the past year alone, David has updated over 180 website news items on the RIN website, meaning that the RIN HQ staff have been able to focus on other priorities. David has taken the lead role in writing substantially all obituaries that appear on the RIN website for many years. Much of the content David has sourced has been re-purposed for social media and/or Navigation News content. Without this active support it would be impossible to maintain such a rich news section on the RIN website.



J.E.D. Williams Medal

In recognition of the transformation of the Journal of Navigation.

Nick Randall as Editor-in-Chief (EiC)

Nick served as EiC for 6 years from July 2013. During that time, he grew The Journal of Navigation in many ways. Between 2015 and 2018 the published papers increased from 74 to 92, while submitted papers increased from 216 to 302. Between 2013 and 2017, the impact factor of The Journal of Navigation grew from 0.691 to 1.580, with citations for recent items growing from 76 to 248 over the same period, and over 82 000 full text paper downloads in 2018. Nick also embraced the online tools available from the publisher, Cambridge University Press, and implemented electronic/e-mail review processes across the entire Journal of Navigation ecosystem.

Elections 2020

Vice-President

Martin Foulger has been elected as the new Vice-President of the RIN.

Council

Prof Kate Jeffery and **Andy Proctor** have both been elected to join Council.

Technical Committee

Bob Cockshott has been re-elected as the Chair of the RIN's Technical Committee.

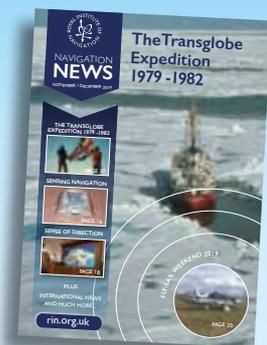


Congratulations once again to all. Finally, thank you to everyone who has engaged with and contributed to the Institute this year – we are made by our members!

Become a RIN Member Today!

Our Membership includes many benefits for less than you would think!

- Ordinary Member (MRIN) £148.00
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- Student (Under 25) £22.00
- Affiliated Club £155.00
- Affiliated College £195.00



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Men and women of the Royal Navy and Royal Marines serve their country, often at times of danger. Established in 1922, the RNBT helps non-commissioned Sailors, Marines and their families (The RNBT Family) throughout their lives.

Your donation will help us to help them.

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