

A tribute to Professor Emeritus Nick G Pace: Underwater acoustics, from theory to experiments

The international underwater acoustics community mourns the passing of Professor Emeritus Nick G Pace. Nick had retired from the University of Bath but he was still very active in advising young and old colleagues throughout the world.

By Dr Philippe Blondel (University of Bath) and Professor Gary Heald (Defence Science and Technology Laboratory and Chair of the IOA Underwater Acoustics Group).



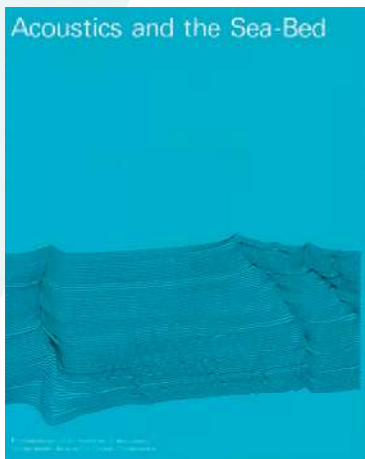
Above: Nick as we all remember him; happiest doing experiments. Here, he is testing his new bistatic sonar offshore Elba Island, Italy, while detached at the NATO Undersea Research Centre

Born in 1945, Nick studied at St Peter's School in York, where his teachers described him as 'a keen chap'. He kept in touch with his school friends over the decades, and they fondly remember his early passion for science and his leadership, as Head Boy and Head of House. Shared adventures included 'liberating' bread loaves in the kitchens to feed always hungry teenagers or smoking the odd (and illicit) cigarette at 'Cup Cake Corner'. Like all who worked with Nick in the following decades, they remember his willingness to share knowledge, ask questions and work hard, showing great humanity throughout.

Nick's career

Nick received a BSc in physics from the University of Durham in 1967, and he finished his PhD in 1970, also at Durham, on 'Ultrasound propagation and binding in solids' (<https://tinyurl.com/Nickphd>) under the supervision of George A Saunders. His first published article was in *Nature* in 1967, and it was still being cited in 1996. In 1970, Nick joined the Geophysics Group recently formed by Professor W Deryck Chesterman at the University of Bath. He set up new research into acoustic scattering

from seabeds, natural and artificial, and this soon branched out into many domains of underwater acoustics, from the deep oceans to pipelines and even sewers. Nick's main research encompassed a wide range of topics including propagation of sound in shallow water and fluctuations in the ocean. He worked on many types of sonar, including echo sounders, sidescan sonar, multibeam echo sounders and parametric sonars. In more recent years his research had included developments in synthetic aperture sonar, which offers high-resolution sidescan images from the seabed, provided the variability can be compensated, multi-aspect sonars, providing 'surround sound' details of seabeds and targets, and multi-frequency acoustic imaging of discontinuities below complex seabeds (for which he co-signed a patent in 2021, with his former student, Jacques Guigné). Many of Nick's articles¹ are still cited now, for example Pace and Dyer (1979) about seabed classification. He also wrote patents, technical reports for government agencies and leading industries, and books. Nick was frequently called upon to conduct research for the Admiralty Scientific branches of the MoD (AUWE, ARE, DRA, DERA) where he was well known and highly respected.



In 1995, Nick was detached from Bath to the NATO Undersea Research Centre for three years. He was so good that his contract was extended by two years. And then he was offered the position of Head of the Mine Counter Measure Department, where he supervised a large team of world-class researchers and expert engineers and technicians, working on the acoustics of the marine environment, using ships and underwater robots. He came back to Bath for good in 2005, where he became a professor. His research was recognised with the IOA's Tyndall Medal in 1990. Nick was also awarded the prestigious titles of Fellow of the Institute of Acoustics and Fellow of the Acoustical Society of America.

Nick's scientific legacy

Nick's scientific legacy also included encouraging people to share their science and to work together, in particular through IOA conferences in Bath (in 1983, 1993 and 2005, on his return from Italy). We carried this over in 2015, with a special session in his honour, where former students and collaborators came to show how much he did, and how much they enjoyed working with him. His care towards people was also found in many other ways, finding exotic ways of funding students to enable them to finish their degrees, directing them towards positions where they would thrive and excel. It is impossible to cite all the testimonies readily sent by his former colleagues and students, but here is a selection:

- **Professor Jacques Guigné** (PhD, 1986; DSc, 2014) is now CEO of Acoustic Zoom, in Canada. He remembers long walks along the Kennet and Avon canal with Nick,

Left:
The first IOA conference organised by Nick (in 1983) was an international success, fondly remembered by all participants for its science and also for its networking. Nick organised other international conferences at Bath each decade

who worked with him on "stubborn physics problems", or enjoying a swimming pool in stifling heat at a conference in Crete, while creating industry game-changers for seismic imaging. The work Jacques started during his PhD with Nick also led to an experiment flown on the International Space Station.

- **Professor Sir Duncan Wingham** (PhD, 1984) is Executive Chair of the Natural Environment Research Council in the UK. His fondest and most immediate memory was being invited to his PhD supervisor's home for dinner. Very impressed, and afraid of any social faux-pas, Duncan was greeted at the door by Nick holding the hand of a small child, windmilling her around in circles and telling his new student: "After you've had several, you realise they're quite robust" (needless to say, Duncan felt immediately at ease).
- **Dr William (Bill) Grimley OBE** was a director of AUWE. Throughout his career and life, he maintained a strong interest in the physics and engineering of sonar and underwater acoustics. He enrolled for an MSc at Bath with Nick as his supervisor. Following his retirement, Bill registered for a PhD on bistatic sonar, through the Open University, which was awarded in 1996 when he was already in his 80s. He frequently visited Nick to discuss his research.
- **Professor Gary Heald** (PhD, 2000) remembers Nick as an enthusiastic supervisor, equally at home with the development of underwater acoustics theory, controlled tank experiments and gathering data at sea. Nick was delighted when Gary suggested doing tank experiments over different sediment types to validate the theoretical aspects of his research. The four large trays containing silt, sand, gravel and cobble are still in place in the Nick Pace Lab at Bath and have seen frequent use ever since. When Nick moved to Italy, they set up collaboration between Gary's research team in DERA and

Nick's team. There were frequent visits to Italy where, alongside some ground-breaking research, Nick and Françoise's hospitality was a regular feature.

- **Professor Ziyad al-Hamdani** (PhD, 1984) at the Geological Survey, Denmark, remembers that Nick was: "one of a kind for me and we built up a very nice relationship which continued after my graduation", concluding: "Nick's science and knowledge will stay for many generations to come."
- **Dr Philippe Blondel** (who started at Bath in 1999 as a postdoctoral researcher with Nick) remembers asking Nick for a quick equation on bistatic scattering patches on rough seabeds, and getting in return 20 pages of handwritten equations, showing how complex the theory was, and which parts were the most important in experiments. He also remembers Nick guiding him with gusto through Italian menus and wine lists, concluding successful experiments at sea with the ideal type of debriefing.
- His NATO colleagues in Italy remember the wonderful dinners organised by Nick and Françoise, "la chef du chef", "the boss of the boss", as they called her. They also remember being taught how to make "proper English sausages". **Dr Eric Pouliquen**, Head of Innovation at the Headquarters Supreme Allied Commander Transformation (NATO) remembers that "Nick loved every second of his tour in Italy, certainly in part for the great food and wine but above all for the fun he had at work. He instilled a great spirit in his team and loved to share his knowledge with younger scientists and make an impact in this new field of science."

Nick transformed many lives in his professional journey, helping people realise their potential and helping science progress at the same time. Nick is a role model of what a true scientist is. And he is also a role model of what a true friend is. ☺

References

- 1 https://scholar.google.co.uk/citations?hl=en&user=Nv04cZUAAA&view_op=list_works&sortBy=pubdate