Vernon Squire

Vernon Squire arrived in New Zealand in October 1987, when he took up the Chair of Applied Mathematics at the University of Otago. Since his arrival, he has played a significant role in promoting applied mathematics at Otago and throughout New Zealand.

Vernon studied for his BSc (Hons) degree in applied mathematics at the University College of Wales, Aberwystwyth, the location chosen primarily to get as far away from suburban London where he grew up. He then completed Part III of the Cambridge Mathematical Tripos-a one-year course now known as the Certificate of Advanced Study in Mathematics-in the Department of Applied Mathematics and Theoretical Physics. After this course Vernon chose to pursue his PhD at the Scott Polar Research Institute (SPRI), opting to do this on a whim in George Batchelor's office when the Director of SPRI rang up looking for a potential PhD student who didnÕt mind the idea of working in the polar regions. The famous research institute SPRI is part of the University of Cambridge and only teaches at graduate level. At the time, prior of the collapse of the Soviet Union, one of the battlegrounds in a possible confrontation between the superpowers was the Arctic Ocean. For this reason there was considerable research interest in all aspects of sea-ice, and in polar oceanography and meteorology. Vernon's PhD was about the interaction of ocean waves and sea-ice, modelled as a thermorheologically simple material, and this and the work that developed from it has remained one of his primary research interests ever since.

Vernon's PhD research marks the point at which advanced mathematics was first applied to modelling the interaction of ocean waves and sea-ice. One of the significant features that Vernon introduced was the effect of flexure, especially the flexure of ice floes (smallish pieces of sea-ice). At SPRI most students were encouraged to take part in experimental programmes in the belief that hands-on experience should guide the development of models. Vernon became active in the experimental program during his PhD, working in northern Canada and from a Royal Navy submarine in the Greenland Sea, and he was to continue this blend of theoretical and experimental work for many years.

After completing his PhD in 1978, Vernon stayed on at SPRI as a research associate and later acquired a University of Cambridge established position. Although there were no undergraduates housed in the Institute, he was involved in service teaching undergraduates, teaching MPhil students, and supervising PhD students. He also continued his experimental and theoretical research program, travelling to the Arctic and Antarctic over extended periods. Using strain gauges deployed on ice floes, he showed experimentally that the inelastic flexure of ice floes was a significant factor in their response to waves and, accordingly, had to be included in all models. He also contributed to detailed measurements of ocean wave propagation and attenuation through a field of sea-ice floes in the Bering Sea, using a helicopter to hop from floe to floe. These measurements, published over 15 years ago in Nature, still remain the most detailed study of this phenomenon. Ver

non also worked on icebergs and, with his research student Monica Kristensen, made measurements from the top of several Antarctic tabular bergs in the context of the way they break up. At the time money was available to support such research, as icebergs were believed to be a potential fresh water source for countries with warmer climates if only they could be transported. The paper that eventuated from this work, also published in Nature, had the unfortunate effect of closing off the supply of money, as it reached the obvious conclusion that bergs were unlikely to survive the passage north.

Vernon's work on moving loads on ice began in 1983 when he collected some data on a frozen lake in Norway, helped by a visitor to SPRI from New Zealand, Dr Bill Robinson. The data were compelling and inspired Vernon to find a theoretical model to explain them. Subsequently, in 1985, Bill invited Vernon and Pat Langhorne to New Zealand to do some more experiments, this time on the sea ice near Scott Base. The team even managed to persuade

the US military to fly over their strain gauges so that the waves induced by low flying aircraft could be measured. The grin on Pat's face as she controlled the incoming C130 Hercules with instructions like "left a wee bit, up a wee bit" will never be forgotten by those present. A cover photo of a Hercules accompanied the subsequent article, which appeared in the journal Nature, and a research monograph has also been written on the subject area with Vernon as lead author.

While at SPRI, Vernon met his wife Pat Langhorne, who was originally involved in sea-ice research but who had subsequently become a research fellow at Newnham College working on afterburners in jet engines. But, some time around 1986 Vernon and Pat decided to leave Cambridge and move to Dunedin, New Zealand. After the 1985 trip Vernon was thinking seriously about working in New Zealand, and a small announcement in the Cambridge Reporter of a vacant position at Otago changed their lives. At this time, the Mathematics and Statistics Department at Otago was largely focused on teaching. From his arrival Vernon was active in promoting a research culture and this was even apparent to me as an undergraduate in his classes. Vernon emphasised the importance of research funding and attracting research students. He was also wise enough to negotiate two postdocs as a condition of his appointment. One of these postdocs was Colin Fox, who has subsequently become an active sea-ice researcher in his own right, amongst his many other talents. The other was Ross Vennell, who now has a position in the Marine Science Department at Otago.

Since arriving in New Zealand, Vernon has not pursued experimental research as actively, especially since the birth of his two sons Jonathan and Dougal. However, he has continued his theoretical work. Subsequent to his arrival, he made the first accurate numerical solutions of wave-ice floe interaction problems. This was accomplished with Colin Fox for a semi-infinite ice sheet and with myself for finite ice. Vernon and I were then able to extend these models from two to three dimensions. Most recently Vernon has been working with Tony Dixon and they have applied coherent potential scattering theory to wave scattering by ice floes and other materials with random inclusions. Vernon has also continued to study moving loads on ice, the book mentioned above having been completed while at Otago. He has also been Head of Department since 1996.

As I have mentioned, a focus of Vernon's research has been to incorporate the effect of flexure in ice floe models properly. Recently there has been a huge research interest in flexible floating bodies because of the construction of floating runways and vast supertankers. This has meant that many of the research topics that Vernon has worked in have suddenly become popular. There are now many papers in which his research is discussed and extended, which are published in ocean engineering journals without even mentioning sea-ice. It must give Vernon some satisfaction to be able to look back on the growth of this research area that he was largely responsible for founding.

Mike Meylan