



IN MEMORIAM

TRIBUTE TO PATRICK GENTIEN (29 November 1950–March 2010)



Patrick Gentien (Photo S. González-Gil, 2007)

Patrick Gentien was born in Saint Pol de Léon, Brittany, in the northwestern region of France where he spent many years of his professional career. Patrick was a chemical engineer (Hautes Etudes d'Ingénieur (HEI) Lille, 1973) and received his doctorate in oceanography from the University of Brest (1977).

His early professional days (1980–1982) started at the Australian Institute of Marine Science (AIMS) where, in collaboration with the physical oceanographer John Andrews, they discovered episodic upwellings on the central Great Barrier Reef (Andrews and Gentien, 1982). Those findings led to a paradigm shift in the understanding of barrier reef nutrient budgets, and have influenced reef research to this day (Eric Wolanski, pers. comm.). While at AIMS, Patrick also published on fluorescent metabolites, carotenoids, and automated analysis of nutrients in tropical sea waters. His long-lasting collaboration with this institute also included serving as co-editor with Eric Wolanski (AIMS), Malcolm Spaulding (University of Rhode Island, USA) and Dave Prandle (Proudman Oceanographic Laboratory, UK) of the 2002 Estuarine Coastal and Shelf Science special issue “Visualisation in Marine Science”.

Patrick joined IFREMER in 1982 in the department of “Environnement Littoral et Gestion du Milieu Marin” as a research scientist in chemistry and hydrobiology. He soon became the head of the Hydrobiology Laboratory and, ever since, held positions of responsibility, which included Director of CREMA-L'Homeau (La Rochelle) between 2000 and 2005. At the time of his passing he was in charge of the IFREMER “Oceans and Health” programme.

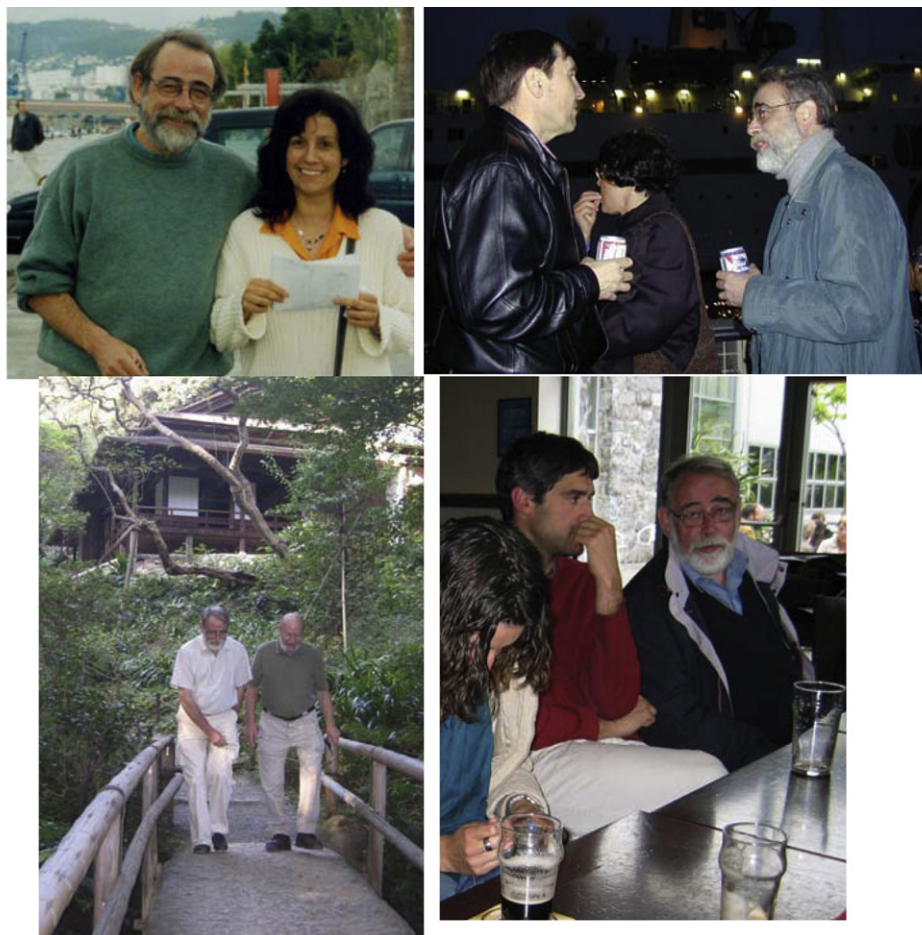
An early task of the hydrology team at Brest was to carry out ecological surveys (1983–1986) off Cap de Flamanville (English Channel) where Electricité de France was building a nuclear power station. In that study, Patrick encountered the regionally dominant, summer bloom species, *Karenia mikimotoi* (*Gyrodinium aureolum*), a major fish-killer in European waters since 1966, and whose ecophysiology became one of his long-lasting scientific interests. His review of the ecology and oceanography of *K. mikimotoi*, published in the NATO-ASI series (Gentien, 1998), was one of his key contributions. Patrick realized early in his career that progress in understanding microalgal blooms required being able to observe them and to measure their properties with the same spatial and time resolution applied to measurements of physical processes. With his engineer's background, his deep knowledge of hydrodynamics and population dynamics, and his fruitful collaboration with Michael Lunven, Patrick passionately pursued the development of sophisticated instruments to detect and measure the in situ properties and behaviour of plankton populations. These efforts were acknowledged with an ICES prize awarded him at the 1993 Annual Science Meeting in Dublin (Gentien and Lunven, 1993; Gentien et al., 1995). Patrick was also a pioneer in the identification of allelopathic substances, recognizing their potential in helping to explain the mechanisms by which HAB microalgae outcompete co-occurring species (Gentien and Arzul, 1990a,b).



Patrick at sea in the Chilean fjords (Photo A. Clément, 1998); the Galician Rías (Photos B. Reguera, 2003 and S. González-Gil, 2005) and the Irish shelf (S. González-Gil, 2007).

Patrick's ultimate goal was to describe the physical and chemical characteristics of the microenvironment (the niche) where a determined microalgal population thrived. *Karenia mikimotoi* characteristically forms thin layers (another lasting interest of Patrick) in the pycnocline, as well as produces surface blooms. Vertical migrations of up to 15 m range take place when stratification is not too marked, but during increased and persistent stability, non-migratory populations descend and aggregate in the pycnocline. The question of thin-layer bloom dynamics was one of many HAB enigmas and unresolved ecological behaviour that challenged Patrick. He often came to ingenious explanations, such as when he combined the cellular allelopathic properties and micro-turbulence of the bioconvection cells to explain how *K. mikimotoi* overcame auto-inhibition (Gentien et al., 2007). Blooms of *Dinophysis* leading to massive and long-lasting shellfish harvesting closures due to diarrhetic shellfish toxins was another major problem he had to face in Brittany. Using his high-resolution instruments to hunt these cryptic, patchy and unpredictable dinophysoids throughout the Bay of Biscay and to locate their water column refugia when they

apparently had disappeared was another of Patrick's passions. One of his favourite stories was about a cruise where, after scanning a grid of more than 50 stations in the Bay of Biscay, a dense population of *Dinophysis acuminata*, with an intense reddish pigmentation was found in deep waters. He argued that this population, retained within an eddy, was sufficient to inoculate the region and that modelling the landward transport of this eddy would be the key to forecasting the onset of DSP outbreaks (Xie et al., 2007). During the last 10 years, and with the same (improved) equipment and colleagues, Patrick participated in multiple cruises in the Baltic Sea (Kononen et al., 2003), Galician Rías (Velo-Suárez et al., 2008, 2010), Irish Sea (Farrell et al., 2010; Raine et al., 2010), and even in Chilean fjords (Lunven et al., 2002), always looking for finely resolved, micro-layered aggregates, thin layers of dinoflagellates, and the special hints that would explain the presence of a species bloom in a given place. His most recent passion was to apply non-disruptive high-tech laser instruments to sophisticated laboratory experiments on *Dinophysis* behaviour and on *Alexandrium*-parasite interactions.



Patrick with colleagues: top, with B. Reguera during the Vigo ICHA 1997 Conference and with D. Anderson at a GEOHAB-SSC meeting in Shanghai, 1999 (Photos D.M. Anderson); bottom, around a Japanese garden with T. Smayda, Yokohama 2006 (Photo M. Lion) and with M. Souriseau at the GEOHAB Modelling WS in Galway, 2009 (Photo E. Berdalet).

Beginning in the early 1990's, Patrick became deeply involved in international cooperation on harmful algal bloom research and management, while retaining his responsibilities at IFREMER. For the last 15 years, he was the face of France at the ICES–IOC Working Group on HAB Dynamics (Chair 1996–1999); the Scientific Steering Committee of GEOHAB (Global Ecology and Oceanography of Harmful Algal Blooms IOC–SCOR, www.geohab.info) (founding Chair, 1999–2003), and the IOC Intergovernmental Panel on Harmful Algae Blooms. His unique way of conducting species-specific targeted cruises and models (models for species of interest) was widely applied in diverse ecosystems and European projects, networks and research plans (LIFEHAB, NEMEDA, HABIT, and the recently started ASIMUTH), often in cooperation with US researchers. In all of these initiatives, Patrick was an essential member as he was able to speak to biologists and to physical/modellers in their respective “languages”, and because he had a great capacity to synthesize and convert into a single question intricate discussions on physical–biological interactions.

worrying to fulfil his last international commitment: convening (with D.M. Anderson and G. Lacroix) the ICES Theme Session N on Oceanography and Ecology of HABs: physical/biological interactions, climate change, and other current issues (ICES Annual Science Meeting, Nantes, September 2010). He played a key role in promoting cooperation between physical oceanographers and biologists directed towards the understanding of physical–biological interactions and the modelling of HAB populations because he could communicate at ease with experts from these two disciplines.

Had Patrick still been with us, he would probably have been a prominent contributor to this Harmful Algae special issue with his unique views on *Karenia*, *Dinophysis* and *Alexandrium* physical–biological interactions. Patrick was a deep-thinking person, with whom it was a pleasure to discuss many topics – scientific and philosophic – and from whom you always learned new things. Those of us who worked with and knew him had the opportunity to enjoy his provocative and pungent comments, insights, oftentimes



Patrick himself: enjoying a sushi meal and giving a conference at the PICES meeting 2006 (Photos M. Lion); meditating at sea (S. González-Gil, 2007)

Patrick passed away on Sunday, 9 May 2010, in Locmaria-Plouzané. He had been fighting lung cancer for three months but, still, his sudden death caught us all by surprise. He well knew that he suffered a fatal illness, but far from worrying about himself, he kept in touch until the very end with his projects and collaborators, and continued work whenever the chemotherapy and accompanying exhaustion gave him a break. By the time of his death he was

contrariness, and his always generous attitude and willingness to share original ideas and go to the core of scientific problems. Without ego or ostentation, with a demand for excellence, openly impatient with scientific slovenliness and with brilliance he gave us good science, sound and refreshing counsel, and true friendship. He incarnated the spirit found in the Japanese verse “up and down the barley rows// a butterfly// stitching, stitching goes”. That was

Patrick – he helped all of us to become better scientists and individuals – that, too, is his legacy.

Beatriz Reguera and Ted Smayda

Patrick Gentien Publications

2010

Alves de Souza, C., Le Floch, E., Mostajir, B., Pecqueur, D., Rochelle-Newall, E., Roques, C., Vasseur, C., Vidussi, F., Sourisseau, M., Gentien, P., Fouilland, E., Guillou, L., 2010. Experimental effect of river discharge addition on parasite–host dynamics between Amoebophryidae (MALV II) and their dinoflagellate hosts in Mediterranean coastal Waters. International Council for the Exploration of the Sea CM 2010/N:15

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