

Cees Kamminga
1932–2002



We mourn the sudden loss of our beloved colleague and dear close friend, who suffered a fatal heart attack on 1 November 2002. To his colleagues and friends, Cees was known as a prolific researcher, whose scientific conduct, energy and passion were uniquely paired with personal warmth and kindness.

Cees Kamminga was born in Delft, The Netherlands, on 24 May 1932. He received his BSc in Electrical Engineering in 1954 from the Polytechnic School, Rotterdam. From 1954 to 1958

he was a member of the technical staff of the Applied Physics Organisation (TNO), The Hague, where he worked on microwaves and radar techniques. Upon receiving his MSc in Electrical Engineering from the Delft University of Technology in 1966, he joined its Information and Communication Theory Group, and later became an Associate Professor at the faculty of Electrical Engineering in 1985. He defended his Doctoral Dissertation on dolphin sonar sounds in 1994 at the same institution.

As a physicist, Cees played a major role in the field of dolphin sonar. His interest in dolphin sonar was fueled when Cees met René-Guy Busnel at the French *Laboratoire de Physiologie Acoustique du CNRS de Jouy-en-Josas* in 1966. Busnel had organized the first conference on animal sonar systems held in Frascati, Italy, in the same year, at a time when little was known about the dolphin's world of sound and ultrasound, whose capacities, as it turned out, so amazingly exceed the performance of human-made sonar facilities. Cees later recalled the initial difficulties in getting biologists (who were first interested in the bio-acoustic behaviour of dolphins and porpoises) and physicists to work together. This experience had a profound impact on Cees and so it was not surprising that he led the way towards an integrated multi-disciplinary approach in studying sonar and sensory systems of cetaceans.

Cees' major research interests include multidisciplinary applications in the area of bio-sonar signal processing and the use of computer-tomography techniques in understanding the dolphin sound production system. Over his long career he studied over 22 species of odontocetes, both in experimental conditions and open waters. He worked in many locations around the world, with countless colleagues and students who themselves came from various countries and scientific backgrounds. He published over 20 papers on dolphin sonar alone, many of which have become classics in cetacean sonar research.

He was the first modern European who looked at echolocation from a signal processing point of view, modeling cetacean sonar signals by using primarily the *Gabor Model*, which proved to be valid for practically all the species recorded over the past 30 years, from *Phocoena phocoena* to *Physeter macrocephalus*. But even after a lifetime dedicated to the study of cetacean sonar signals, Cees was the first to challenge the significance of his findings and sought to apply new knowledge to emerging questions of

how to prevent dolphins from being entangled in fishing nets, or from colliding with ships.

Cees also did not shy away from critically debating conflicting results in the pursuit of scientific truth and knowledge. He was passionate about cetacean research beyond his own field of expertise, always seeking other points of view. He had this rare humility, only reserved to the true scientist, to reconsider his own results under the light of a different perspective, and to pressing on in the quest of understanding the biological significance of sonar signals and the associated cognitive processes. He freely shared his experience and knowledge with colleagues and students alike and served on the Board of the European Association of Aquatic Mammals in 1988, and as its President in 1990 and 1991.

Cees Kamminga was an extraordinary human being, full of energy and optimism, and always ready for a new adventure. His joys in life were easy and many; his family, friends, a glass of wine with his students . . . simply because it was the beginning of spring and the sun was shining outside. To know Cees was to feel enriched in every way, inspired by a fathomless curiosity, and touched by his humility and wonderful sense of humour. Those who were fortunate to be associated with him have many fond memories that will reverberate forever.

Life and cetacean research must and will continue. As Cees used to say: 'En avant!' Let's go for it!

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