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Physiology and neurobiology in the Graham Kerr Building

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The study of animal physiology in the Graham Kerr Building (GKB) began with the work of James D. Robertson (universally known as "JD") (in post 1946-1982). His careful analyses of the blood composition of invertebrates and lower vertebrates led him to develop a hypothesis of chordate evolution (Robertson, 1957). In the 1960s he was joined by Peter Spencer Davies (1962–1999), who developed methods to measure the energy budgets of corals in relation to their symbiotic relationship with photosynthetic algae (zooxanthellae). This work paved the way to understanding how environmental changes impact coral reef growth. Later, Alan Taylor (1978–2014) joined the physiology group, bringing expertise in measuring respiration rates of a range of aquatic invertebrates, especially those with a burrowing life-style.

Research on brain and behaviour began with Otto Loewenstein, then Graham Hoyle from 1939 onwards (Yonge in Downie, 2024). In the 1960s Peter Usherwood (1960-1974) established a new line of research using electrophysiological techniques to study the neuronal and pharmacological processes in large insects such as locusts, before leaving for a chair at the University of Nottingham. However, through the 1970s the electrophysiology (later called neurobiology) group actually enlarged through the arrival of Jon Barnes (1966-2006), Martin Burns (1970-2000) and Douglas Neil (1975–2012). Their studies now included work on decapod crustaceans, with Jon examining the control of walking in crabs and crayfish, Douglas investigating swimming in lobsters and shrimps, and Martin providing expertise in electronic instrumentation and data logging to underpin these investigations.

In the 1970s the Physiology and Electrophysiology groups each gained their own laboratory facilities in the GKB, but these disrupted the original layout of the Zoological Museum. The Roof Laboratory for physiological studies was constructed over the skylights of the Museum, and an Electrophysiology Unit (EPU) was established by Peter Usherwood in what had been one of the side galleries of the Museum. These two laboratory facilities were managed by two of the Department's most reliable technicians, Cathy McLagan and Don Little, respectively. To improve the facilities for holding marine animals in the Department, mainly for physiological studies, a circulating seawater system was established in the GKB in the late 1970s, with a large (8,000 gallon) holding tank in the yard, filter and header tanks installed in the loft space above the main Lecture Theatre (LT1), and gravity-fed supplies of seawater to the main laboratories and to two refurbished marine aquaria in the basement.

Unfortunately, on the night of Friday 19th February 1988 a severe fire broke out in the Roof Laboratory, apparently due to an electrical short-circuit. The prompt action of the Glasgow Fire Service prevented it from spreading to the rest of the building, but there was severe fire damage to the laboratory facilities and to the physiological equipment housed in the Roof Laboratory. Fortunately, the laboratory record books that contained valuable experimental data survived. However, as a result of the amount of water needed to douse the flames, there was extensive collateral water damage to the Museum below, including the EPU. The Roof Laboratory space was eventually refurbished as a series of smaller laboratory spaces to house facilities for molecular and cellular research, while the physiologists were re-housed in other parts of the GKB.

Physiological methods were later applied by Peter and Alan to a wider range of animals, particularly through their collaborations with fish biologists both in the GKB and elsewhere. Meanwhile, Martin designed electronic equipment for many other purposes than neurobiology, including the remote data logging of the temperature and the weight of eggs in bird nests, to assist the researches of the ornithology group.

Martin and Peter eventually left the university to pursue careers in instrumentation research and development. However, they left a legacy of numerous sophisticated practical exercises that have continued to be performed by level-3 students in Animal Physiology classes up to the present day. Following the formation of the Institute of Biomedical and Life Sciences in 1994, when the Zoology Department became the Division of Environmental and Evolutionary Biology (DEEB), Jon Barnes transferred to the Centre for Cell Engineering, having changed his research focus to the biomechanics of adhesion in the toe pads of amphibians (Jon died in spring 2024 as this article was under preparation). Douglas Neil had a brief sojourn in the Division of Neuroscience and Biomedical Systems, before returning to DEEB, and Alan Taylor became heavily involved in the administration of the Institute. Around this time, the EPU was converted to an open area housing a large computer cluster for use by undergraduate and postgraduate students.

Douglas's research developed from studies of the neuronal control of the swimming performance of commercially important crustaceans such as lobsters (*Homarus gammarus*) and langoustines (*Nephrops norvegicus*), to examining their muscle properties, and eventually to relating these to the quality and

preservation of the seafood products derived from them. From the mid-1980s he was also involved with colleagues in the GKB, particularly Professor Keith Vickerman, and with Jim Atkinson at the University Marine Biological Station Millport (UMBSM), in an interdisciplinary study of a parasitic infection of langoustines in the Clyde Sea Area (Fig. 1). A review paper and two data archives from this extensive 30-year study have now been published (Molto-Martin *et al*., 2024).

Fig. 1. Grant Stentiford, then with Douglas Neil's research group, making an assessment of the extent of infection of langoustines (*Nephrops norvegicus*) in 2001. Professor Grant Stentiford is now Chief Scientist at the Centre for Environment, Fisheries and Aquaculture Science (Cefas), Weymouth, which is an Executive Agency of DEFRA. (Photo: D.M. Neil)

Most recently, physiology in the GKB has moved in a new direction, following the appointment of Colin Selman who studies the mechanisms underlying the process of ageing, particularly in mammals but also, in collaboration with Pat Monaghan, in birds.

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