

Preface

The Gatty Marine Laboratory was opened in 1896 and has been continuously occupied except for the period between 1931 and the end of the Second World War. The laboratory has its origins in the government funded St Andrews Fisheries Laboratory which was founded in 1884 occupying a temporary wooden building at the harbour. The first Director, Professor William MacIntosh FRS, conducted pioneering work on the taxonomy of annelids and the early life histories of marine fish over more than 50 years. In 1945-46 the Gatty received an operating budget of £50 and was used as a field station by zoologists and botanists based in the Bute Medical Building in the town centre. The University Court released funds for the installation of a heating system and new seawater pumps in 1947 and in 1948 the first telephone was installed.

Helped by a small but dedicated staff the lecturer in charge Jimmy M. Dodd (later FRS) began to develop the modern laboratory. Under the Directorships of Adrian Horridge FRS and Michael Laverack the laboratory built an international reputation, particularly for physiological studies on marine animals. The original Victorian building was extended three times in the 1960's as the numbers of staff and students increased. When I arrived in 1985 investment was found from internal and external sources to recruit new staff and refurbish the aquarium and laboratories.

Since 1987 the Gatty has been a component Research Institute of the School of Biology (although the name and composition of the School has changed several times). The laboratory built up strong research groupings in fish biology and marine ecology and by the early 1990s received the highest number of research grants in marine biology of any UK department.

In 1997, a major £4.3 million extension to the building was financed by the University Court. The new building provided a modern lecture theatre and teaching laboratory, and research laboratories for immunological and muscle research. The major part of the new build was occupied by the NERC - sponsored Sea Mammal Research Unit which transferred from Cambridge in 1996. Today SMRU has over 60 staff and receives annual funding of £2.9 million from NERC, UK and foreign governments and the EU. Location on the Gatty site gave SMRU access to local seal populations and world class experimental facilities including a 40 m pool for investigating diving and foraging behaviour.

The Gatty academic programme currently involves 8 Faculty, 20 Research Fellows, and 28 PhD students. The most recent new appointment was Dr Andrew Brierley who joined us from the British Antarctic Survey in 2001. Vincent Janik and Patrick Miller who work on social communication in sea mammals in conjunction with SMRU obtained University Research Fellowships from the Royal Society of London in 2002 and 2003 respectively to continue their research on social communication in sea mammals. Vincent Janik will transfer to a permanent academic position at St Andrews when his fellowship finishes. Sascha Hooker was awarded a Dorothy Hodgkin Fellowship from the Royal Society in 2002 and will also join the lecturing staff at the end of her fellowship. We jointly run a NERC-supported MRes Degree with the University of Dundee designed to convert graduates in mathematical and

physical sciences to careers in Environmental Biology. This highly successful course has an annual intake of 15-20 students.

Ian Johnston

St Andrews Fisheries Laboratory (1884-1895)

The latter part of the nineteenth century witnessed the creation of several permanent marine stations in Europe, with France leading the way with laboratories at Concarneau (1857), Arcachon (1867), Roscoff (1872) and Banyuls (1881). One of the most renowned European centres, the Stazione Zoologica, was founded at Naples in 1871 by Dr Anton Dohrn to take advantage of the rich marine fauna of the Bay of Naples. In a lecture in 1882 Professor W C McIntosh, Professor of Natural History at St Andrews bemoaned the lack of a similar facility in Great Britain. "There is no doubt" he stated, "that success would attend such establishments if judiciously managed" and that "there are few sites in this or any other country - so far as known to me - better adapted, on the whole, for a combined Zoological Station and Laboratory than St Andrews. The proximity of the city to the sea, its quietude - so conducive to study - and the valuable library and museum of the University on the one hand; and, on the other, the fine stretch of sand on which so many rare marine forms are thrown by storms, render it pre-eminent in this respect."



At the time of Professor McIntosh's lecture the Practical Zoological Laboratory in the University was being used as a Marine Laboratory. Experiments on the life histories of fishes conducted by McIntosh in connection with Her Majesty's Trawling Commission (1883-84) gave added impetus to the foundation of a dedicated laboratory. In 1884, mainly at the instigation of Lord Dalhousie, the Fisheries Board provided a sum of money to take a lease on a wooden building between the harbour and the beach which had previously been utilised as a fever hospital (Fig. 1).

The building, to be called the St Andrews Fishery Laboratory, was fitted with tanks, pipes, gas-engine and pump, and a fisherman was hired to collect specimens. There were two main rooms about 24 feet long by 16 feet wide, one of which served as an aquarium containing four large tanks fed from an external high-level cistern.

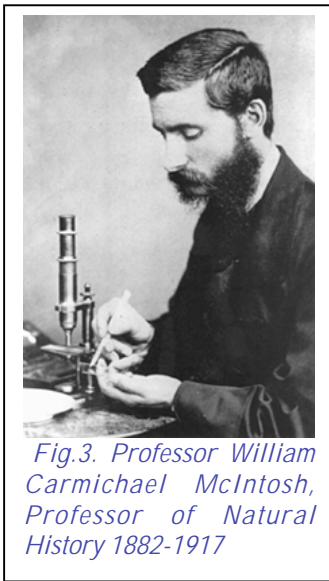
Sea-water was obtained shortly after mid-tide by a vulcanite pipe which extended 60 yards under the sand before emerging into the water. The laboratory had a 21 foot yawl,



the "Dalhousie" (Fig. 2) and a small boat for ferrying people across the harbour.

The old wooden marine laboratory was abandoned in 1896, when the Gatty Marine Laboratory was opened on the East Sands. It burned down in 1905.

William Carmichael McIntosh FRS, FRSE (1838-1931)



The creation of a permanent marine laboratory was the dream of local teenager, William McIntosh (Fig. 3) who went on to become one of the leading zoologists of his generation. His father, John McIntosh, was a prominent businessman who had 5 daughters and a son by his wife Eliza. William McIntosh started his academic career at Madras School in 1843, later entering the University at the age of 15 to follow a well-rounded education in classics, mathematics, French, political economy and the sciences. His life-long interest in natural history and in collecting marine creatures was already established by the time he entered Edinburgh University to study Medicine in 1857. Indeed, whilst at Edinburgh, he carried out experiments and wrote a prize winning thesis on the nervous system and behaviour of the shore crab. After graduating in 1860 McIntosh took up a position as an

assistant physician at Murray's Hospital, a Mental Institution in Perth. The Physician Superintendent, Dr Lauder Lindsay, was a keen botanist, and he had equipped the hospital with a Natural History Museum where McIntosh gave lectures in Zoology for the benefit of the patients. McIntosh published several papers and started experiments on the development of salmon eggs using tanks set up in his bedroom. His museum displays and publications greatly benefited from the artistic talents of his sister Roberta who was to later assist him in many of his most important projects. McIntosh was appointed Superintendent of the new Murthly Mental Hospital, outside Perth, in 1863 thus acquiring the stability and financial resources needed to continue his interests in Zoology. He was never to marry, and something of his single minded pursuit of knowledge can be judged from his assertion that "No man who joined Bonhomie to wine and women could qualify as a true votary of Science". McIntosh was a Founding member of the St Andrews Temperance Society.

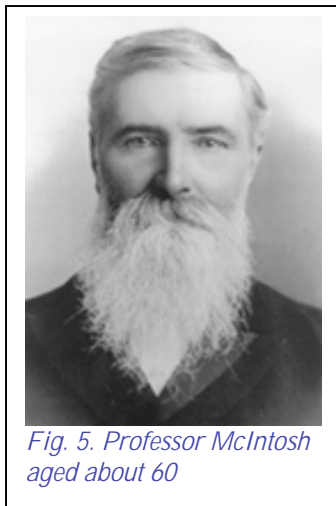
Whilst running the mental hospital McIntosh's studies of marine life continued using material collected at St Andrews. In 1873, *British Annelids Vol. 1 Nemertea* was published by the Ray Society; this was the first of a classic series of monographs, the preparation of which was to occupy most of the rest of his life. McIntosh also was involved in the analysis of material from the Porcupine and Challenger Expeditions which led to a revolution in our understanding of life in the deep sea. Honours

followed his many scientific achievements, including election to Fellowships of the Royal Society of Edinburgh in 1869 and the Royal Society of London in 1877.

After several failed attempts to gain an academic position, McIntosh was finally appointed Professor of Civil and Natural History in his home town at the age of 44 in 1882. The following year he was recruited to the Trawling Commission which was chaired by Lord Dalhousie and included Thomas Henry Huxley as a member. At that time, traditional sail-powered yawls and small boats which fished using baited hooks were being joined by steam boats which could drag heavy trawls. The Trawling Commission was charged with assessing the impact of these technological advances. At St Andrews, McIntosh set about analysing trawl contents from the east coast of Scotland and rearing fish to describe their developmental stages (Fig. 4).



He discovered that the eggs of most commercially important fish floated and that therefore the spawning grounds were not destroyed by trawling. The Commission proposed the setting up of a 3 mile limit reserved for line fisherman and scientific trawling. At the time there still was a significant fishing fleet operating from the harbour at St Andrews. The fishermen were so incensed by the outcome of the Trawling Commission that on the 6th March 1885 they marched to McIntosh's home in Hope Street and burned an effigy in a noisy demonstration.



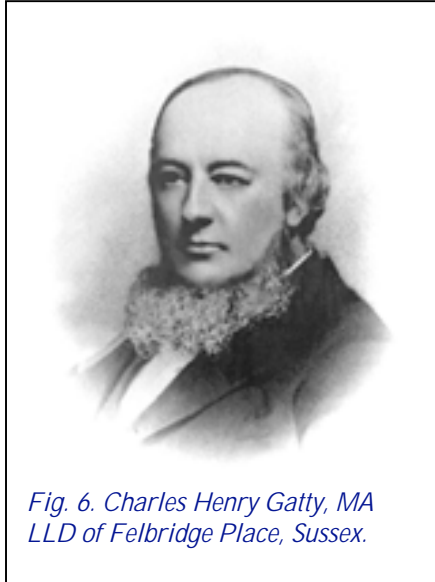
In 1884 McIntosh's dream of a permanent marine laboratory was realised with the opening of the St Andrews Fisheries Laboratory with support from the Fisheries Board of Scotland. St Andrews University had then only about 200 students. Research in marine biology, however, flourished with the opening of the Gatty Marine Laboratory in 1896. This was a purpose built stone building with much improved facilities.

McIntosh enjoyed a long and productive career (Fig. 5) producing more than 350 scientific publications before finally retiring from his Chair at the age of 76 in 1917. His successor, Sir D'Arcy Wentworth Thompson, moved from Queen's College Dundee to take over the Chair of Natural History. D'Arcy had little use for the Gatty which was closed by the Court in 1918. McIntosh, however, could not accept that his scientific career was over and he continued to occupy a room at the Gatty, supporting his own work and organising Open Days and Conversaciones for the public with his sister Agnes. The last of 7 volumes of British Annelids was published by the Ray Society in 1923. McIntosh caught a chill and died on 1st April 1931. His lasting legacies are his published works and the Gatty Marine Laboratory.

Gatty Marine Laboratory

The Early Years (1896-1933)

Charles Henry Gatty FRSE, FLS, FGS (Fig. 6) was a country gentleman of considerable means who lived at Felbridge Place, East Grinstead, Sussex.



*Fig. 6. Charles Henry Gatty, MA
LLD of Felbridge Place, Sussex.*

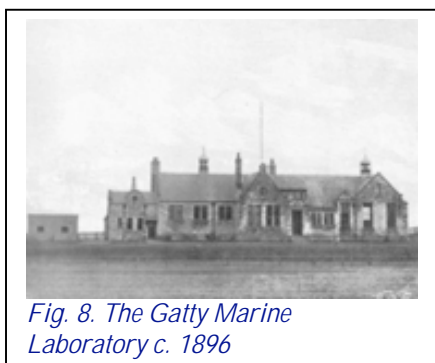
The Founder of the Laboratory, he served as a magistrate and was a local councillor, but devoted much of his spare time to the study of Natural History. Gatty was active in the Ray Society and hence made the acquaintance of McIntosh during the latter's sojourns in London. Following a visit to the Fisheries Laboratory in the old fever hospital he decided to promote marine biology at St Andrews by donating £1,000. The sum was later increased to £2500 at the prompting of McIntosh. Planning for the new building began in 1894 and it was opened by Lord Reay on October 30, 1896 in the presence of over 700 guests.

McIntosh published a booklet on the steps leading to the foundation of the new Gatty Marine Laboratory in September 1896. He stated that "the new building the style of which is a simple treatment of English Renaissance, occupies a site on the sand-dunes formerly covered with whins and abounding in rabbits - which form the margin to one of the fields on the farm of St Nicholas, the property of the University, and the foundation is only about 12 feet above high-water mark." The new building contained a Director's room (Fig. 7), a library, a specimen room, a research laboratory with compartments for 6 workers, a small chemical room and an aquarium.



*Fig. 7. Gatty Director's Room
1910*

The aquarium was 30.5 feet by 30 feet and had three high level windows on each side fitted with "cathedral glass". On the eastern side there were four large tanks of concrete and glass, supported on massive walls of concrete which, in turn, rested on a special three feet thick foundation of concrete which was independent of the masonry of the building.



*Fig. 8. The Gatty Marine
Laboratory c. 1896*

McIntosh was delighted with the improved facilities. In his booklet he, for instance, wrote "in no department of the new Laboratory is the contrast to the condition of things in the old Laboratory greater than in the library. The perfect quietude, the purity of the air, the easy access to books and papers, the conveniences for work, and the whole tone of the place impress those, who,

for more than twelve years, had but the single apartment for research and consultation, for heating paraffin and making sections, for writing their manuscripts and making their drawings. All this too, had occasionally to be done under a trickle of water, or in summer, under drops of tar from the room, and in high winds, in an atmosphere obscured by smoke. As a consequence, books, instruments, drawings, and the varied "belongings" of the workers suffered extensively. Here they are in perfect safety, and all these discomforts at least are left in the old Laboratory." (Fig. 8).

The work of the laboratory and its reputation continued to expand as the first decade of the new millennium passed. Tragedy almost struck, however, at 2 a.m. on the 23rd June 1913. A fire was spotted by a fisherman, David Cunningham, who observed smoke and flames rising from the vicinity of the Gatty above a thick sea mist. He returned to the harbour and alerted the coastguard who verified that the Gatty was indeed on fire. He had to walk half a mile to the gas works to phone the fire brigade who finally arrived at 5.00 am. By 6.30 am the fire had been put out. The damage was not as great as it might have been because the heat of the fire had melted some of the seawater pipes and burst a tap which had helped to localise the fire. Although total repairs were estimated at £500, McIntosh's drawings and experimental notes escaped unharmed.

In the aftermath of the fire it was discovered that a window had been broken after having been covered with soft soap and brown paper and that the fire had been started deliberately with a dozen tins of inflammable liquid - a case of arson! Two notices were found at the door which gave an apparent clue to the motive behind the crime "Take heed of the women's rebellion" and "We need to be goaded, like oxen we are, into a trot". Although these messages indicated that the arson was the work of the suffragettes, perhaps because of McIntosh's perceived indifference to women, a vigorous denial and condemnation of the act was issued by 'The St Andrews Branch of the National Suffragette Societies'. The case was never solved and the Gatty had a lucky escape. The charred timbers from the fire are still visible in the attic to this day.

McIntosh was already seventy-six years old at the outbreak of the Great War in 1914. As hostilities continued, the personnel at the Gatty gradually diminished until by 1917 only the Professor and his servant, Wallace Brown, were left. That year McIntosh retired, with the Gatty formally closing in the following year. McIntosh continued to work in the Gatty until his death in 1931 without any facilities or even any heating, to combat the chill of the winter months.

Gatty Marine Laboratory

The Post-War Years (1946-1969)

At the end of the Second World War the Gatty was largely abandoned except for an occasional visit from a janitor and cleaner. In January 1946 a severe storm damaged the sea wall outside the laboratory and threatened the sand dunes and very existence of the building. An emergency committee was established and in April that year a scheme was adopted to reconstruct the embankment with funds in equal measure from the Town Council and the University. The work was completed in the summer of

1949 and those sea defences still protect the laboratory from the ravages of North Sea storms today.

The Gatty received an operating budget of £50 in 1945-46 and was used as a field station by botanists and zoologists based in the Bute Medical Building in the town centre. In 1947 Graham, the Professor of Botany, succeeded in getting permission for a new appointment to engage in research on marine algae. Dr Helen Blackler was appointed to a lectureship and became the first permanent resident at the Gatty since McIntosh's death 16 years previously. Not to be outdone D'Arcy Thompson sought approval for a matching post in Zoology and Dr Jimmy M Dodd was appointed to the Gatty as "Lecturer-in-charge" in the same year (Fig. 9).



*Fig. 9. Professor J M Dodd
FRS, Director of the Gatty
Marine Laboratory 1947*

The Gatty was in a sorry state after being abandoned for so long and the only equipment was a large number of one gallon collecting jars and baskets.

Over the next few years Dodd began to make an impact and gather new students. The University Court released funds for improvements to the building with the installation of a heating system, new pumps, and in 1948, the first telephone. In 1947 an Easter course in marine biology was started which was opened to students from other Scottish Universities in 1949. The same year the 'Argonaut' was obtained for trawling and collecting plankton. She had a small deckhouse and a central well with seats for 12 students. Unfortunately the 'Argonaut' was not a very seaworthy boat and her lack of keel caused her to roll horribly making her hard to steer in heavy seas. Nevertheless, the success of the Easter course and the growing activities of the laboratory persuaded the University Court to approve an extension to the original laboratory in 1949 to provide more space for teaching. The new extension on the south side, which was clad in stone to match the original building, was started in 1950 and finished in August 1951. In addition to a single large teaching laboratory, there was a dark room, histology room and an underfloor equipment store.

D'Arcy Wentworth Thompson FRS died in June 1948. It was only at the second attempt that the University succeeded in finding a worthy successor to fill the vacated Chair of Natural History. The successful candidate was Mr H G (Mick) Callan, a promising young cell biologist then working at the Institute of Genetics, Edinburgh (Fig. 10).



*Fig. 10. Professor H G Callan
FRS 1953*

Callan was an experimentalist and an enthusiastic supporter of the concept of a marine laboratory at St Andrews. He had held the position of Oxford Scholar at the Stazione Zoologica at Naples in 1939 and there had fallen in love with Amaryllis, the younger daughter of the Director, Reinhart Dohrna, a German citizen. Callan was with the British forces advancing northwards past

Naples in 1944 when he took the opportunity of ensuring her safety and marrying her.

In 1951, Jimmy Dodd was joined at the Gatty by his wife Margaret, a fellow endocrinologist. Over the next few years, they helped to lay the foundations of modern comparative endocrinology, in particular carrying out experiments on the thyroid and pituitary glands of *Xenopus* and dogfish, and the mechanisms which enabled brown trout to transfer between fresh-water and sea-water. Dodd had some success in raising outside funds and during the 1950's an enthusiastic team of researchers was built up and the beginning of that special camaraderie which still characterises the laboratory today became evident. The atmosphere was informal and friendly and long hours and weekend working were the norm. Among the many students at that time were Ian Howie (recently Professor of Zoology at Trinity College, Dublin), Mohammed Hyder (recently Professor of Zoology at the University of Nairobi) and Tony Perks (Professor of Physiology at the University of British Columbia). He was awarded a DSc for his contributions to endocrinology by the University in 1994.

In 1956 Adrian Horridge was appointed to a lectureship in Zoology starting a tradition in studies of simple nervous systems at St Andrews. Horridge who had been supervised by Carl Pantin at Cambridge had been working at the Stazione Zoologica in Naples. The friendship between Callan and Pantin was instrumental in what turned out to be a very fortuitous appointment for the Gatty and the University. Horridge took 15 months unpaid leave in 1958-9 at the University of California to work with Ted Bullock on a two-volume book entitled the "Structure and Function in the Nervous Systems of Invertebrates". The book was to become one of the classics of neurobiology and Horridge made numerous contacts in the USA, many of whom came to work at the Gatty in the 1960s.

Meanwhile Jimmy Dodd had been collaborating with pharmacologists in Professor Hunter's department at Dundee. Together with Gaddum, an eminent pharmacologist, they had used the isolated heart of a marine mollusc to develop the first bioassay, and most sensitive test available at that time, for the important transmitter substance, 5-hydroxytryptamine (5HT). This research was drawn to the attention of Sir Henry Dale OM FRS, a member of the advisory committee of the Wellcome Foundation, who subsequently visited the Gatty to see for himself the work going on. Sir Henry Dale persuaded the trustees of the Wellcome Foundation to provide a large grant to build an extension for comparative endocrinology and pharmacology. The plans for the new extension were expanded to include a new floor for botany financed by the University Court and the Carnegie Trust of Scotland. Dr Blackler had up until this time occupied one of the 6 small cubicles in the original building for her work on marine algae. Botanical work was expanded by the appointment of an algal physiologist, David Weeks, in 1957, who started electrophysiological work, while in 1959, Dr Allen Matty was appointed as a Lecturer in Comparative Pharmacology. At their meeting in February 1959 the University Court formally appointed J M Dodd as Director of the Gatty and authorised the formation of a management committee to include the Professors of Botany, Zoology and Pharmacology. All the staff based at the Gatty were to retain their appointments in the other departments, an arrangement which was to be resurrected between 1985 and 1992. officially opened by Sir Henry Dale on the 1st June 1960. However, Jimmy Dodd never did get the chance to carry forward the

developments he had initiated as he accepted a Chair at the University of Leeds and left St Andrews in the same year.

Adrian Horridge was appointed Director in 1960 and in the same year Michael Stuart Laverack filled Dodd's position as a lecturer. Under Horridge's leadership the Gatty became a University Department with 6 or 7 members of the teaching staff. A workshop, animal house, electronics workshop, histology, photography and better seawater circulation were added. This was a major burst of activity which allowed it to rival many much larger Research Institutes in international reputation. The Gatty was filled with students and visitors and the pressure for research space led to further extensions to the building (in 1962 and 1966) and the provision of new equipment including an electron microscope. The Wellcome Trust again committed funds for these developments. Horridge and his co-workers brilliantly exploited the newly available technology of electron microscopes and electronic recording equipment to explore the workings of the brain and sensory systems of whole range of marine invertebrates including insects, crustacea, and jellyfish.

There were several additions to the staff and changes in personnel during the 1960s including the arrival of Glen Cottrell, fresh from a postdoctoral position at Harvard. In 1967, Dundee became an autonomous University and Glen Cottrell joined the Physiology Department. Many of the staff, students and postdocs at the Gatty during these years (Fig. 11) went on to gain distinction in academic posts elsewhere, including Malcolm Burrows to a Chair in Zoology at Cambridge, the late Reg Chapman to a Chair in Physiology at Bristol, and Richard Shelton as Officer in-charge of the SOAEFD Freshwater Fisheries Laboratory, Pitlochry. Mick Callan, Adrian Horridge, Jimmy Dodd and Malcolm Burrows were all elected Fellows of the Royal Society of London in recognition of work either completed or started in St Andrews. After 13 years as Director, Horridge, however, resigned in February 1969 to go to a Chair at the Australian National University in Canberra and another important chapter in the history of the Gatty Marine Laboratory drew to a close.



Fig. 11. Staff in The Gatty Marine Laboratory, June 1962

Back row - John H Scholes (RZ), John Stevenson (T), A Patrick (T), Donald F Bailey (RZ), Keith Green (RP) Centre - W jon P Barnes (HZ), John M Armson (RZ), David C Sandemen (SZ), Phillip Taylor (Temp. Asst. Z), Robert Burns (T), Veronique P Taylor (Secretary), Reg Chapman (RZ), B Seshadri (Visitor (India) P, Dave Clark (Fisherman), John Brown (T), J Hope Oliver (T)
Front row - Chris C Thornburn (SP), Marion J Sheltawy (RP), Michael S Laverack (SZ), M C H Blackler (SB), G Adrian Horridge (Z-Director), Margaret E R Lang (SZ), Dorothy J Rutherford (HZ), Allen J Matty (SP), Nancy E Henderson (Visitor, Canada), Fiona E Guinness (SP) Absent - David C Weeks (SB), Amy Katpitia (RB), Patricia Rhys Williams (SB) (Key - Botany, P=Pharmacology, Z=Zoology, H=Honours student, R=Research student, S=Staff, T=Technician)

Michael Stuart Laverack, Director 1969-1985

Mike Laverack (Fig. 12) was appointed to a Chair in Marine Biology in 1969. At that time there were only five staff; two zoologists (Ian McFarlane and Jim Cobb), one physiologist (Glen Cottrell) and two botanists (David Weeks and Ed Drew who had replaced Dr Blackler on her retirement in 1967). In 1969, the University appointed its first Professor of Psychology, Malcolm Jeeves from the University of Adelaide. Malcolm had been a fellow student with Horridge at St Johns College, Cambridge after the war. His decision to apply to St Andrews was influenced in part by the presence of the strong neuroscience research group built up by Horridge at the Gatty. Jeeves arrived to find that Horridge was about to move on to Australia and that the accommodation on offer was a windowless office in the Department of Arabic! Jeeves, however, visited the Gatty and somehow persuaded Mike Laverack to accommodate him.

Malcolm's was another fortuitous appointment for St Andrews as he went on to build up one of the leading Psychology Departments in the UK (it has received the highest rating in all the Research Assessment Exercises so far carried out). As Psychology developed, a new building was therefore added at the Gatty for experimental work and the basement was converted for use as an animal house. Professor Jeeves resided at the Gatty until 1972, and the animal house continued in use until the early 1980s when the entire Department of Psychology was rehoused in the old University Library.

Malcolm Jeeves was awarded a CBE for his services to Psychology in 1994, and following his retirement he became President of the Royal Society of Edinburgh in 1996.

A Department of Marine Biology was formed in 1979 and Dr Christopher Todd was appointed as the first lecturer. Together with help from external lecturers,

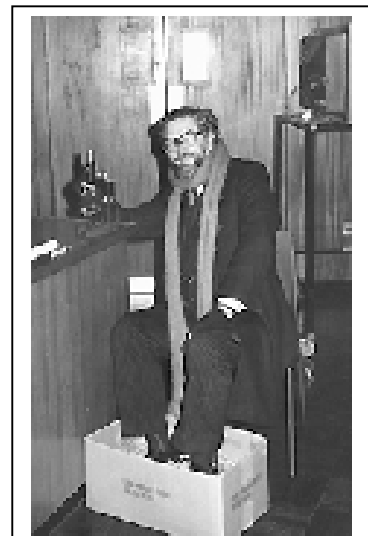


Fig. 12. Professor M S Laverack in the guise of Professor W C McIntosh



Fig. 13. RV Homarus with Mr Hugh Forbes, boatman from 1977-1989

Laverack and Todd built up a thriving course in marine biology. The wooden building constructed for Psychology was converted into a lecture theatre and teaching laboratory with running seawater. A new research vessel, "Homarus" had been purchased in 1975 (Fig. 13) and this with a two-man crew was able to take 8 students at a time to sea. Although a sturdy and capable working boat it had a deep draft, limiting operations from St Andrews harbour so that at times it had to be moored at Tayport or Anstruther. Economic pressures coupled with the high operating costs of the boat, however, caused it to be laid up in 1981 and eventually sold.

In the early 1980s, the Department of Marine Biology was merged with Zoology and the two physiologists (Glen Cottrell and Martin Stanton) withdrew to the Bute as the Gatty began a period of decline. The botanists also left, following the completion of the Sir Harold Mitchell Laboratory for Plant Sciences in 1982. In 1984 H G Callan retired as Kennedy Professor of Natural History. That year, with just 4 Zoologists remaining, and with a considerable sum being required for maintenance and modernisation of the building, the University seriously considered closing the Gatty and selling the valuable waterside site.