# HISTORY OF THE GATTY MARINE LABORATORY

## IN ST ANDREWS

## SCOTLAND

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Introduction

The study of the sea and its contents has fascinated man since his earliest recorded moments. The middens of numerous archeological sites reveal remains of seafood in the form of shells; illustrations at the Valley of Kings in Lower Egypt show that the Pharaohs were aware of squids and other marine organisms, and the Greeks had a word for it. Many investigators have travelled and reported their findings, and in Britain most children have spent summer holidays by the sea, not perhaps these days in Brighton or Blackpool, but in places where shore collecting can still be done. The effect of oil spills like the Torrey Canyon, of sewage outfalls, and of indiscriminate fishing or seal culling are all matters that arouse great public interest.

The British Isles have fathered many generations of fishermen and of seafarers pursuing commerce and exploration around the world and the island waters. They have reported many events, both commonplace and unusual and all require explanation. Biological investigations beside the sea have been going on now in a determined and planned way for nearly two hundred years. Initially these were conducted as forays to the sea by scientists usually living elsewhere, but eventually it became obvious that more could be done either from boats or from the shore stations at the sea's edge, or even from both together. The problem of whether or not there was life in the deep oceans required powered boats to explore the depths, dragging nets and trawls. But the analysis of the catch was better done ashore. Until the mid-nineteenth century there were many theoretical reasons as to why life did not exist in the abyss and it required concentrated effort to show otherwise. Now man can send himself to these great depths to see what is there, and to collect it and bring it back. The recent advances on hydro-thermal vents and 'black smokers' near the Galapagos and in the Californian offshore area have revealed a completely new biota by personal observation from manned submersibles.

Modern explorations are often large, expensive and need great facilities both physically and in manpower. But they also rely on shore-based scientists who examine catches, experiment on animals from this different environment and who determine their structures by sophisticated techniques usable only on land. The concentration of such people and instruments in one place has become one of the growth points in post-war science as more information has been required on fishing quotas, oil exploration and fouling of boats, but also because of basic interest in ecology,

student interest in the natural world, and the influence of television stimulating general public interest in an unfamiliar environment.

This book describes the background to the foundation of the oldest marine station in Britain as an addition to the activities of the oldest University in Scotland. Academic science underwent a revolution in the Victorian period; the old accepted practices were overthrown as Medicine, Natural Philosophy (Physics), Natural History (now Geology, Botany, Zoology the latter two now equated with Biology) began to use questions to solve problems long believed to be unsolvable and Darwin undermined the whole concept of man's supremacy and his different divine origins as a separate organism divorced from forces that moulded all other parts of nature, with the principle of evolution, both planetary and organismic. The questions were asked in the first place by academically minded persons in the Universities, later by many others following in their footsteps. In those Universities near the sea and in places where enquiring minds gathered the sea attracted attention. In St Andrews, Scotland, one man dreamt of a permanent institution by the sea where, day by day, he could learn more of the creatures of the marine environment, and by correspondence and writing tell others of them. His vision created a new type of laboratory in these islands, shortly followed by others which became more famous and bigger, but none of which have had more significance in Biological Science.

**History of the Gatty Marine Laboratory in St Andrews**

Many of the fine buildings of the Victorian era that grace the centre of St Andrews are the work of the builder John McIntosh. At a time when much of the town was in primitive, almost Mediaeval, condition with unsurfaced roads, the site of the now Madras College occupied by a farm, and the services almost non-existent, the development zeal of the energetic Provost Sir Hugh Lyon Playfair was put into practice. This was achieved through the efforts of such local businessmen as John McIntosh who was responsible for erecting the Town Hall and in helping to establish the city library.

He, with his wife, Eliza, lived in property in South Street and there raised a large family of five daughters and one son. The daughters were, in order of birth Margaret Mitchell M (born 1831), Anne Barclay M (1834), Eliza Mitchell M (1836), Agnes Mitchell M (1840), and Roberta Mitchell M (1843). The single son born into this coterie of sisters was William Carmichael M (who came between Eliza and Agnes in terms of age, born in 1838). Of these children only Margaret the oldest and Roberta, the youngest, ever married. William remained a bachelor all his life, which was long.

The University of St Andrews was already over 420 years old at William's birth. As the oldest University in Scotland, founded in 1413 it had survived periods of fortune and fame as well as times of disturbance and poverty. Among its graduates were many famous men of letters, Churchman and politicians. Education, however, was not quite what it is today and in this period, 30 years or so before the great Education Acts of the 1870s, it was the prerogative of those who could afford it.

William McIntosh entered Madras school in 1843, at the age of five after a short period in a nursery school run by a Mrs Brown. His early education followed a typical pattern for the time of what are known as the three R's Reading, Riting and Rithmetic, or more correctly, English, Writing, and Arithmetic. This was later followed by an introduction to Drawing, Latin and Greek but of Science there was little. What McIntosh had was so-called Physical Geography which included items on the distribution of animals which was expanded by extra-curricular activities in the form of exhibitions and demonstrations by people outwith the school. Amongst these were Principal Sir David

Brewster, physicist and photographer and Professor John Reid (Professor of Medicine and Anatomy, but better remembered for his pioneering studies of marine life).

Ten years at school led to entry into the local University at the age of 15. Entry at such an age now would be counted remarkable but was not so in 1853 when in effect this was an upper school or sixth form extension. The mixture was as before with Greek and Latin continued and Mathematics added. It was only on entry into the third year of university study that matters improved and a smattering of science came into the syllabus. At this stage Physics and Philosophy were lecture topics. The impact of Medicine and Anatomy, now in the hands of George Day after the early death of Reid, was most significant to McIntosh, however, for Day was another who believed in the study of all animals to lead one to an understanding of man. Though he paid attention to the intricacies of human physiology Day spent much time on comparative anatomy. This was reinforced in the fourth year of study by Professor William MacDonald whose course included lectures specifically on Zoology as well as other Natural History subjects. McIntosh's well rounded education concluded in St Andrews with introductions to Chemistry, Political Economy and French.

Nowadays this kind of preparation would be completed at school and indeed the age at leaving University was more or less the same as that at which older pupils now leave school i.e. about 18 or 19. Youngsters also followed physical activities. McIntosh coupled his enthusiasm for the strength and coordination of the human (male) frame with a life-long passion for maintenance of fitness by abstention from alcohol and from such rowdy pastimes as the Gaudeamus sing song, and also excluded himself from feminine company save that of his sisters.

At this stage McIntosh had had a good classical education, had been introduced to science, and become personally involved in natural history through the medium of talking and collecting animals locally. Such endeavours, however, were only just becoming recognised as subjects in their own right. A more acceptable form of pursuing interest in natural phenomena was through the medium of Medicine.

## Chapter 2

The way forward for William McIntosh then was clear. He left St Andrews and enrolled (1857) in Edinburgh as a medical student; he was 19 years of age.

Edinburgh has been renowned as a Medical school for a long while and in the 1850s was in a state for ferment brought about by development of the curriculum, by pressures for reform from the Royal College of Physicians and Surgeons, the expansion of the teaching programme and by the realization that experimental medicine held great progress in medical science and the creation of revolutionary methods of treatment. The middle of the nineteenth century was no less a time of change. This was the period when the young Charles Darwin, also briefly a medical student in Edinburgh, was diverted from a career in the subject by the horrors of limb amputation without benefit of anaesthetic, and with succeeding septicaemia leading to post-surgical deaths as a commonplace. But alterations were occurring; Lister in Glasgow developed antiseptic surgery in the 1860s and Simpson developed anaesthesia by chloroform into a reliable tool. Other research activity carried out in Edinburgh, however, though involving medical personnel was heavily influenced by natural history. The anatomist and naturalist John Goodsir (whose brother, Harry, also a naturalist, died on the ill-fated Franklin expedition to the North-West passage), Edward Forbes (founding father of marine biology in Scotland) and Allman were all active in natural history and it is easy to see the intellectual stimulation that a receptive mind received. When that mind was William McIntosh, already conditioned by John Reid and David Brewster in St Andrews, experienced in beach and shore collecting as a school boy and with a lively interest in the natural world it is easy to see how an abiding and long-life concern with Natural History began and was fostered.

Nonetheless McIntosh soldiered on with his medical studies. He experimented on himself with chloroform which seems to have been used in the way that soft drugs are nowadays, to stimulate and excite, although too much, of course, led to sleepiness and inattention. At no time, however, did alcohol become part of his experimentation as it did with so many of his fellows. His temperance and teetotal habits remained with him throughout his life, and took a militant form in that he was a founding member of the St Andrews student Temperance Society while at that University, and returned to it later in life. This, coupled with his interest in gymnastics, athletics

and such character building activities as the Officer Training Corps leads one to think of him as a rather dry stick.

His sojourn in the medical school was abbreviated by the Senate allowing credit for his previous St Andrews courses, by considerable hard work on his part, and by the support of his teachers especially Goodsir. He completed the course in three rather than four years and graduated on August 1st 1860 at the age of 22.

One highly significant feature of McIntosh's final qualifications lay in the subject of his prize winning thesis for the M.D. degree. This is entitled 'Observations and experiments on the Carcinus maenas'. In common parlance this indicated that his medical thesis was on the common shore crab! He was interested in the nervous system of the animal and the behavioural responses that were engendered by the stimulation of the animal with such substances as chloroform, ammonia vapour, sulphuric acid, cyanic acid, arsenious acid, morphia, iodine, lead acetate, strychnine and various others. Some of these materials were just being understood by the medical profession as potent influences on the nervous system of human beings, as poisons, emetics, stimulants, narcotics and medicaments and McIntoshs intent perhaps was to ascertain whether shore crabs might be alternative experimental material from which one could draw conclusions with relevance to human treatment. The thesis falls into two parts; descriptions of the nervous system, it's gross structure and the effect of various lesions on the animal's behaviour, and secondly, the actions of the various drugs and chemicals on the overt activity of the crab.

Not surprisingly his crabs did not survive such insults very well; various frothings at the mouth, paralysis, wavings of legs etc leads one to doubt the significance of many of his findings, though he does remark at one point (MD thesis page 49) that 14 minims of potassium cyanide injected into a crab led to gradual decrease in motion, crawling languidly after 30 minutes; after 70 minutes it's motion was dull and limbs feeble and the animal died in three hours. McIntosh compares this rather feeble action of the poison on the crab with the observation that he had poisoned a powerful dog in one minute by pouring cyanide down it's throat! One wonders what the RSPCA and other animal protection societies would have to say about this today. His experimental method, and his analysis would leave much to be desired at the present time, but one must accept

that our attitudes towards science and medicine have changed radically since the 1850s when such fields were just coming out of the pragmatic and ancient practices of hundreds of years because of the bold questions asked and answered by McIntosh's teachers and his colleagues.

In fact his thesis is disappointing not for the reasons outlined above, but because he gives us only observations, and there is no attempt to deduce anything from the results. He does not explain why certain dissections or bisections of nerves should produce changes in crab behaviour due to interruption of various nervous pathways nor why or how some chemicals change activity in the nervous system and hence alter movement. It does, however, reinforce our knowledge of his interest in marine animals which already dominated his life, even in the context of a professional commitment to medicine.

## Chapter 3

The contrast in training required of William McIntosh and todays undergraduate is marked. The consequent expectations have also changed. McIntosh completed his M.D. at the age of 22; today's medical student might reasonably expect to be around 25 or 26, being 18 or more years old when he leaves school, and this is followed by up to 7 years training in medical school. A year's housemanship and perhaps for some a period on a post-doctoral fellowship (especially if they are keen on research) brings a start date for a job closer to 30 than 20. There is then the question of what job and at what level.

McIntosh may have been fortunate but in July 1860 he was hired as assistant physician to Dr Lauder Lindsay at the Murray's Royal Hospital in Perth. This paid £40 per annum together with board and lodging. Murray's was a lunatic asylum with 200 patients, and McIntosh was expected to be in control of almost all aspects of the running of the Hospital and to correct the omissions of his predecessor in maintaining the records of the place. This was an interesting reflection of the likeness between McIntosh and his superior Lindsay. The Physician Superintendent Lindsay was an excellent medical man with an absorbing hobby; he was a botanist and he delegated much of his responsibility to McIntosh for everyday affairs in the Institution so that he could pursue his plant studies. He perfectly understood therefore McIntosh's own enthusiasm for natural history.

McIntosh's reasons for accepting the post then must have been coloured by the sympathetic views of Lindsay. He also had been told that the Hospital sported a Natural History museum and the general interest in such studies was expanded when McIntosh was asked to give a series of lectures on Zoology for the benefit of the patients. His own original studies continued through the medium of additions to the museum partly due to the collecting activities of his family in St Andrews. These Zoological activities were carried out in addition to his normal days work, but his energy was such that he continued to be productive and published several papers around this time on a variety of subjects. He became involved in fish production, visiting a fish hatchery at Stormontfield, establishing tanks of his own with running water in his bedroom to study the development of salmon eggs.

His ambitions in Natural History grew and when Lindsay suggested a Zoological Conversazione McIntosh arranged the museum display together with preserved and live specimens obtained from St Andrews for the education of the Perth public. They arrived in sizeable numbers to see this novelty, and the series continued in later years. The occasion was also notable for another feature, the display of drawings made by McIntosh and his younger sister Roberta. Roberta McIntosh was a most accomplished illustrator and watercolourist whose talent exceeded that of her brother and who was to become important to him when he started on his magnum opus as a scientist 'The British Annelids'.

McIntosh's stay at Perth was not a long one. He achieved a great deal and had come to the attention of his superiors and the authorities in the health service. A splendid custom designed and built mental hospital was established at Murthly, outside Perth, and when the appointment of a Superintendent was mooted McIntosh had an established reputation, plenty of support from the medical, scientific and local communities and after a vetting by the Chairman of the Perth District Lunacy Board McIntosh was elected to the position.

At 25 McIntosh was in control of his destiny. He had an assured post with a good salary (£200 p.a.), comfortable quarters, a horse and carriage and coachman, a position in Society, and the opportunity to use his time to his maximum advantage as a scientist. This proved to be a most important time in McIntosh's life. He left Murray's in July, 1863 and joined Murthly in December of that year. The hospital was in action and receiving patients on April 1st 1864 and for the next 18 years until 1882 McIntosh controlled the affairs of a large mental hospital, and laid the foundation for an international reputation in Zoology.

No one can doubt that McIntosh's life was full and busy. Examination of his memorabilia in the University Library at St Andrews reveals that the hospital at Murthly provided a full gamut of experience, with crises, problems, entertainment, social interaction, and at the same time a stable financial and workable platform for his passion, Zoology. Victorian science was a period of quest, and question. Darwin is but one name amongst many, some equally or more famous in their day, some as influential but forgotten, others well remembered even now. Each searched to advance his

field, some got it right and others got it wrong but the energy exerted was not to be denied and the times were ripe for the industrious to profit from his labours. And labour McIntosh did.

It must not be forgotten, however, that he relied considerably upon his supportive family back in St Andrews. They had considered emigration at one point, to New Zealand, but then the building business improved and with successive contracts proving profitable the family moved to a bigger house in Queen's Gardens and settled again to life in St Andrews. It will be remembered that there were five sisters as well as his mother and father all keenly interested in his progress and anxious to help. Each visit by one or other to Murthly was accompanied by pots of sea water, often containing the latest finds from the local shores. His diary is laden with entries recording this assistance.

Two sisters, however, deserve more than casual mention. When McIntosh moved to Murthly as Superintendent it was obvious that his time was devoted fully to his career as Medical Doctor and Zoological Scientist. His income was, in terms of the day, ample if not generous, and to ensure his household was run properly and in the absence of a wife to assist him his sister Agnes, two years younger than himself, accompanied him in his move. Thus began a family collaboration that lasted over 60 years. Agnes' name appears throughout McIntosh's social interactions from then on and he undoubtedly considered her his companion in everything that brought him into contact with the world outside science, and even inside it when that involved hosting guests.

His biggest family debt in science was undoubtedly to his youngest sister Roberta. As remarked she was an accomplished artist, and on her visits to Murthly, as well as William's holidays in St Andrews she applied herself to drawing his many specimens. She must have shared his enthusiasm for marine creatures and her drawings are among the finest produced in Victorian natural history books. McIntosh relied heavily upon her talent. His own drawing made to complement lectures and demonstrations lack the fineness and vitality of Roberta's. His holidays were spent in such seaside localities as North Uist and the Channel Islands. Always the sea and it's animals attracted his attention, and his sisters shared his life and his science.

## Chapter 4

So far McIntosh's career and life had been one of continuing success with academic Honours and a rapidly concluded apprenticeship followed by a lucrative position. Now he entered upon his life's work, but was it what was expected by his paymasters and the world at large?

McIntosh applied himself with vigour to the care of his charges in Murthly. Always a believer in the merits of physical efforts and exercise he organised sports, football, and the like (not the newly evolved rugby from which he dissociated himself) and ensured that his patients were incorporated into the local scene as much as possible. His indefatigable lecturing and meetings arranged for the benefit of town and hospital alike were well appreciated and attended as were the band and its concerts.

But not everything was plain sailing. The annual reports of the Commissioners contain details of the running of the asylum and McIntosh received his due for the way in which the inmates were kept busy at chores within the Institution; laundering, mending, cleaning, blacksmithing, woodworking, shoe repairing, tailoring and so on. But there were glimpses of criticism also, especially in the matters of diet, heating and attendance at night. Eventually, following a winter of severity during which a larger than usual number of patients died, a visitation was carried out by one of the leading Commissioners, Sir James Coxe, who had known McIntosh since student days, and was a member of the Royal commission that framed the 1857 Act regarding asylum treatment for patients. He chose a time when McIntosh was absent in London.

The result was a highly critical report (1874) in which the standard of hygiene, clothing, diet, heating were all called into question. The number of deaths was said to be too high. McIntosh, however, defended himself and his policies stoutly and eventually the whole affair passed over with benefit to the Hospital for the arguments were used to improve the standard and amount of accommodation as well as to provide piped water. His relationship with his patients seems to have been understanding and kind within his own personal experience. His scrap books are full of cuttings regarding the Hospital and the inmates.

On one occasion he was confronted by a strike amongst the patients. They had read of a strike in the Clydeside shipyards and asked for more money for looking after the garden flower beds. Faced with this demand on a tour of the gardens McIntosh took half a crown (2/6 in old currency or 12½p at the present time) and gave it to the spokesman. On his return some two hours later he was surprised to have the money returned on the grounds that the strikers could not agree amongst themselves how to share it out.

Throughout this period McIntosh went on with his Zoology. The year he was investigated by Commissioner Coxe, 1873, also saw publication of his first major work, a well illustrated volume on the British Annelids, Vol 1 Nemertea published by the Ray Society. Visitors came from all round the country and abroad to see McIntosh; his energy was prodigious. From a century on it seems astonishing that he accomplished so much in what was supposed to be a hobby, albeit a most professional one.

In 1867 McIntosh became involved with the British Association and attended its meeting in Dundee. Among the many scientists at this gathering was Albert Gunther, assistant to Dr J.E. Gray, Director of the British Museum of Natural History, and an expert in fishes. Roberta's drawings were on display, Gunther was attracted to the young lady and an invitation to Murthly brought him into the McIntosh ambit. This was followed (1868) by a holiday of all parties in the Channel Isles and the engagement of Gunther and Roberta. Marriage took place in November 1868. Shortly afterwards a crucial event in McIntosh's life took place. Roberta became pregnant, and in May 1869 after a son was born fell mortally ill with puerpural fever. Roberta died. She was buried in St Andrews, and the baby son taken there also. Albert Gunther eventually had to go to court to regain his son, and a rift occurred that was not healed for 30 years. William thus lost at one swoop, a professional friend, and brother-in-law, a colleague, his youngest sister and his illustrator.

Professionally he rubbed shoulders with the giants of the day Ray Lankester, T.H. Huxley, Wyville Thompson to name but three. With Lankester he shared a passion for comparative anatomy and taxonomy, with Huxley an involvement with fisheries and production, and with Thompson a liking for marine life. Thompson led the Porcupine expedition and, later, the Challenger; voyages

that revolutionised our view of the deep sea. But McIntosh did not join these shipborne adventures though he helped analyse the results.

## Chapter 5

One might imagine that the Superintendency of a substantial mental hospital would satisfy many ambitions. If this is coupled with another parallel and equally successful professional hobby this would be enough for two men let alone one, but despite his efforts at Murthly there can be no doubt that McIntosh felt his metier and strength was in Zoology. This must have been reinforced by the many friendships, professional contacts and visits that he both received and gave.

Stimulated by election to the Royal Society of Edinburgh in 1869 McIntosh (now aged 32) applied for the Chair in Zoology in Edinburgh in 1870. His old teacher Allman had retired, he was supported by many colleagues and the time seemed right for a change, but the authorities did not agree and he was passed over in favour of Wyville Thompson, previously in Belfast, Thompson, eventually to become world famous for his leadership, of the Challenger expedition, four years long, was also a marine biologist and a teacher. McIntosh's long association with medicine did not help his cause.

Papers on a variety of subjects continued to come from McIntosh's pen, many, but not all, on annelids and other worms. He described the unusual pterobranch Hemichordate Cephalodiscus for the first time, a specimen from the Challenger. His prowess grew and was recognised by many. Then the fulfilment of his dreams seemed imminent. The Chair of Civil and Natural History at the University of St Andrews became vacant. Another of his previous teachers Professor MacDonald had died in 1875. McIntosh proposed in his application the establishment of a marine laboratory; but it was not to be, for the post went to Alleyne Nicholson, a man of wide experience including teaching as well as research.

Frustration continued to haunt McIntosh in his research for a University post. In 1878 Professor James Nicholl died in Aberdeen and his position was filled by Cossar Ewart. At this time Darwinism was still debated and rumours went round that McIntosh supported Darwin's arguments (and Darwin incidentally supported McIntosh's candidature) which was not a favourable thing amongst influential voices, especially those of the Church. Ewart did not apply until McIntosh's reputation suggested he would not be appointed. This even though in the previous year 1877

McIntosh became a Fellow of the Royal Society of London. Ewart subsequently became a competitor in the field of fish productions and development.

In 1882 Wyville Thompson in Edinburgh died partly as a result of his privations on the Challenger. The University again went about finding a Professor; Ray Lankester, pre-eminent amongst Zoologists and well-known south of the border was appointed. It should be remembered that in these days such appointments resided in the hands of Patrons; in St Andrews this was the Marquis of Ailsa, the Chair in Aberdeen was a Regius appointment from the Crown, and so was that in Edinburgh. This meant the power lay in the hands of the Secretary of State for Scotland, at this time Lord Rosebery. Lankester, being invited, suggested he taught in the summers and returned to London in the winter as he did not relish Scotland at that time of year. Such a condition was not acceptable and Lankester resigned without taking up the position.

At this juncture the University of Edinburgh turned to McIntosh, not to fill the Chair but to conduct a summer school as an interim appointment. There was a natural assumption on his part that this would later lead to a full appointment. McIntosh obtained permission from the Murthly authorities that this course of events was agreeable to them, made his preparations, wrote lectures, collected specimens together and in April went to Edinburgh to organise his stay. As he talked with the Secretary of the Senate about his course a telegram arrived from Rosebery. He had appointed Cossar Ewart from Aberdeen. The start day was May so McIntosh lost Chair and course

Ewart tried to persuade McIntosh to take up his vacant post in Aberdeen, but without success. Then fate took a hand. Alleyne Nicholson, appointed in 1875 to St Andrews, now moved to Aberdeen in Ewart's place and numerous colleagues, led by McIntosh's erstwhile colleague in Edinburgh while students together, Professor Bell Pettigrew exhorted the Senate to petition the patron, the Marquess of Ailsa to appoint McIntosh. This had total support from everyone concerned and McIntosh bent to demand. Since University College, Dundee was now in action some teaching might be expected there (as indeed it still was when the present writer was appointed to St Andrews in 1960) and education for women was becoming a significant issue McIntosh was allowed to decide what to do about these matters for himself, and he signally failed to be very sympathetic.

In 1882 then McIntosh became Professor of Civil and Natural History the University in his home town of St Andrews. He and his sister Agnes moved to 2 Abbotsford Crescent (built by their father John, and fortunately vacant at the time). McIntosh continued some of his duties in Murthly for the next year but dealt with important matters in St Andrews as well. McIntosh claims in an account of the Gatty Marine Laboratory published in 1896 that the idea of a Marine Laboratory began in 1854 (when he was 16). He had now reached the time and had the opportunity to fulfil his long cherished dream. He was 44 years old.

## Chapter 6

What has gone before has indicated the career interests of William McIntosh. His life-long pursuit of marine organisms led to the occupation of a Chair in Scotland's oldest University and this was soon to lead to a vigorous growth of study of marine life based firmly on the proximity of the sea.

The value of the sea as a site for study has long been known to natural scientists for in this medium are represented many groups of animals and plants not found elsewhere. In the sea for example are found the humble starfish and its relatives; a large group (Phylum) not to be found in any other habitat, not freshwater, aerial or terrestrial. The Greek and Roman philosophers knew of the importance of the sea, and many people had invested time and resources in its study, but all had relied upon occasional visits to the sea, and not upon occupation of a building day after day to observe the changes that occurred by season, year and decade. The opportunity to obtain and maintain live specimens in seawater is problematical at a distance from the sea and so long term studies raise considerable difficulties. A permanent, land-based, stable building next to the sea in some well-chosen place therefore offers much to the practising scientist.

Well-chosen is a necessary corollary for it is necessary to ensure that seawater is of good quality and that natural productivity supplies the kind of material required. Many early studies relied upon interested parties visiting the sea on holiday, taking fisherman's cottages and collecting from the vicinity, but these are essentially short term activities. Sven Loven in Sweden, for example, realised as early as 1839 that Kristineberg had a faunistic richness that provided chances not available elsewhere. A permanent building, however, did not materialise until 1877.

Possibly the oldest permanent marine station is that at Concarneau, France, founded in 1859; Ostend in Belgium had operated as a summer-time laboratory from 1843 but there was no permanency about the place. Arcachon on the Bay of Biscay coast of France near Bordeaux started in 1867 when the local scientific society built the first laboratory, and France led the way in such institutes. Very soon there were other laboratories in Roscoff (1872), Banyuls (1881) on the Mediterranean and there have been others since. The prime marine station in Europe was that at

Naples, founded in 1871 by Anton Dohrn, chosen for its fauna before the days of Mediterranean pollution, fuelled by an upwelling current offshore. Other laboratories were begun around the world, in the U.S.A., in Japan, in Russia, Germany, Holland and now there are many scattered in all parts of the globe.

As soon as McIntosh came to St Andrews he was implicated in marine studies. In 1883 he was recruited onto the Trawling Commission under the Chairmanship of Lord Dalhousie. Thomas Henry Huxley wrote enquiring whether McIntosh would analyse the results of trawls off the East coast of Scotland. The experience McIntosh had with rearing small fish, and examining the developmental stages of various fish, to be extended and expanded in the next few years in St Andrews coincided with a considerable argument amongst fisheries experts and fishermen. The traditional ways of fishing were from sail power yawls and small boats using long lines carrying many baited hooks. Steam power was now appearing which meant more independence from the weather, more power to pull nets, and an ability to fish on the bottom dragging trawls. Many line fishermen were convinced that this would bring ruin for it was believed that trawls destroyed spawn and spawning grounds, as well as young immature fish which were thought to live on or close to the bottom. Various outbreaks of violence and interference with fishing gear led to ugly incidents and the Commission was set up to resolve the differences of opinion. McIntosh remarks that the line fishermen cheered him out of harbour on one of his early voyages, but they might not have done had they known the results of his work at the time. They anticipated he would support their view. It was not to be.

Many fertilised fish eggs float. The conclusion of the trawling commission was that spawn was not destroyed or disturbed by trawling, even herring eggs on the bottom survived. The use of powered boats, and large nets did not in themselves interfere with fish production. This was not generally believed; even Huxley had difficulty with it. McIntosh sent a sample of haddock's eggs to London; they sank to the bottom. Huxley enquired why and McIntosh supplied a further sample of live and dead eggs. The dead ones sank, the live ones floated. The first group had died on the way south. The Earl of Dalhousie, chairman of the Commission, also required to be convinced. The facts, however, spoke for themselves.

The Commission made various recommendations based on their findings including the closing of the three mile limit; Dalhousie proposed these areas be maintained for the liners and McIntosh concurred providing the trawlers were allowed to continue working for scientific purposes. The line fishermen themselves were not favourable to the outcome, and one night in March 1885 as he walked the streets of St Andrews the local fishermen shouted threats at him and this was followed by a more serious manifestation of their anger. On March 6 a crowd came to the gate of McIntosh's house in Hope Street, carrying a dummy to which they set fire. This blazed as McIntosh secured his house and it was only after some time that the police and McIntosh's colleagues and students appeared to remonstrate with the numerous crowd. The following night the Students carried out a verbal retaliation on the Fishing folk in North Street and McIntosh was consoled by a telegram from Dalhousie.

Eventually the arguments died down, various fishing folk became aware that the Commission, and McIntosh in particular, was trying to establish the truth, and that trawling in itself was not going to put them out of business. The day of sail, however, was over. Unfortunately so also was the life of the Earl of Dalhousie. He fell ill, went to North America to

convalesce but died shortly after his return. So also did his wife. This double tragedy was felt throughout Scotland, and inspired that great lyric poet William McGonagle to pen some immortal verses in his own inimitable style;

Alas! Lord and Lady Dalhousie are dead, and buried at last,
Which causes many people to feel a little downcast,
And both lie side by side in one grave,
But I hope God in his goodness their souls will save.

He was beloved by men of high and low degree,
Especially in Forfarshire by his tenantry,
And by many of the inhabitants in and around Dundee,
Because he was affable in temper, and void of all vanity.

Twas in the year of 1887, and on Thursday the 1st December,
Which his relative and friends will long remember
That were present at the funeral in Cockpenchurchyard,
Because they had for the noble Lord a great regard.

Those that sent wreaths were but very few,
But one in particular was the Duke of Buccleuch,
Besides Dr Herbert Spencer, and Countess Roseberry, and
Lady Bennett.
Which no doubt were sent by them with heartfelt regret.

(ask for permission from Duckworth's 1980 edition).

These are just a selection from among the numerous verses.

Another significant event around the time of McIntosh's move to St Andrews was the International Fisheries Exhibition held in Edinburgh (1882). Also at this time (1882) the Fisheries Research Board for Scotland was founded and a Scientific Investigation Committee established

under the Chairmanship of Cossar Ewart. The time was ripe for advances in marine science and a marine laboratory seemed an obvious development. William Herdman, Professor at Liverpool had started a seasonal laboratory at Puffin Island in Wales but this failed (later to be replaced by a permanent building in Port Erin, Isle of Man). The Edinburgh Fisheries Exhibition made a profit and McIntosh attempted to obtain support for his idea of a marine lab in St Andrews by asking for £300 from the exhibition profits. The authorities did not see fit to grant this request, instead they made funds available to John Murray, one of Wyville Thompson's associates on the Challenger to work from Granton on a floating barge, and using Murray's own yacht the 'Medusa' to collect specimens.

Nonetheless it delighted McIntosh that he was able to claim that St Andrews boasted the first marine station in Britain. Competition, jealousies, and drive all show themselves in the history of marine laboratories in Britain. McIntosh served on various committees advising on fisheries science, and knew what was happening elsewhere, and was determined he would be an early starter.

## Chapter 7

The late 1800's saw a great surge in social change, medicine, science, education, and other human activities. As mentioned in Chapter 2 medicine made great progress and associated with this improvement were realisations that hygene and treatment went together. Among the various changes that occurred were some in the field of custom built hospitals. The recognition of infectious disease and the treatments necessary included the isolation of patients suffering from diphtheria, scarlet fever, smallpox and other such bacterial and viral complaints.

St Andrews did not introduce a proper sewage treatment plant until the 1970's preferring, like many other seaside towns, to discharge it's sewage into the sea directly, or at least after only comminution. It did, however, recognise the perils of epidemics of the serious killing transmittable diseases and constructed a special isolation hospital on the East Bents, a site now occupied by a putting green and alongside the inner harbour of the Kinnessburn. This grassy area is simply a stabilised dune separating the lower reaches of the river from the sea. At the time, 1880, there was no short pier protecting the entrance to the harbour, nor lock gates.

This small fever hospital was built of wood, was about 60' long with two main rooms 24' by 16' in size. Hurriedly put together it suffered from exposure to the elements and never being used for its intended purposes was not properly maintained. It was intended as a temporary erection according to the minutes of the Police Commissioners of the Burgh of St Andrews (equivalent to the later Town Council and Watch Committee). In 1884 it became the first Marine laboratory in Britain.

The entry in St Andrews Town Council minutes 7 Police Commissioners for January 14th 1884 included an item headed 'Temporary Hospital on East Bents'. "A letter from Professor McIntosh to the Provost was read, wishing to know what rent the Commissioners would accept for the temporary hospital on the East Bents in view of it's being used in connection with a Fish hatchery apparatus. Dr. Pettigrew (McIntosh's colleague on Senate, Professor of Medicine) moved that the Commission accede to the terms of Dr McIntosh's letter and fix a rent to be charged for the erection with the proviso that in the event of the temporary Hospital being required on occasion of

an outbreak of fever, Professor McIntosh shall undertake to vacate it within a period to be fixed, which was seconded by Mr Hutton and agreed to."

This was followed by discussion of what arrangements for rent should be made, or whether the building should be sold and a Committee was formed to organise these matters and decide on the length of time to be asked for in the case vacation was necessary in an epidemic. The sub-committee was composed of Bailies Welsh, Hall and Laverock (no relation to the present author) and Messrs Pettigrew, Murray, George Bruce (later remembered for the construction of the Bruce embankment near the Old Course), Aikman, Downie and Bennett with the latter as convener and five to be a quorum. In his account of the origins of the laboratory McIntosh remarks that the place was in use even before any fittings were in place so it seems that even as he wrote for permission his work was already in progress.

The First Annual Report of the Fisheries Research Board for Scotland indicates that the Board were anxious to increase knowledge of food fish development and that St Andrews was a suitable place for a marine station. The Treasury sanctioned the application of £335 for fittings and other expenses and a start had been made. The Second annual account carried an Appendix F from McIntosh dated 1st June 1844 (sic 1884) in which he states as an opening paragraph that 'A brief note only can be supplied from the station as present, since it is not yet fitted up and organised. The gas engine, pipe, tanks and other apparatus will, however, soon be in position.'

The sub-committee of St Andrews Police Commissioners had worked fast. Following their selection the group had met the following day (January 15th 1884) with everyone present. The Convener had invited McIntosh to be present, but he replied that simply for the benefit of the Research Board he wished to know the rental of the building. He did not choose to come in person. The committee then resolved that the rent should not exceed £15 per annum. The full Police commissioners then heard that a letter (dated 10th April 1884) had been received from the Research Board to the effect that the Board rent the Hospital at the above sum. Mr Murray's motion that the building be let, and agreement reached over the matter of notice to quit in the event of an epidemic, was passed, but it wasn't all plain sailing for although Bailie Hall move acceptance of the offer, Mr Keiller Bruce moved an amendment that the Research Board be told to suspend operations until a

satisfactory arrangement be made and this was carried but a vote on the original motion was conclusive and there was no interruption in the work already in progress. Eventually on the 30th May 1884 it was agreed with the Fishery Research Board that the rent was £15 per year and that in the event of necessity a portion of the building would be vacated. It remained unclear as to how any patients would get on in the damp and possibly noisy conditions pertaining in the other part of the building.!

McIntosh later complained that the building was never water-tight, and the wall, though of double construction cavity filled with sawdust, was never wind proof and he experienced considerable inconvenience thereby. He occupied this space for twelve years. Seawater was obtained from the sea via a vulcanite pipe buried in the sand and opening through a perforated nozzle. It was pumped just after the half tide (flood) into a granite tank east of the engine house. The gas engine pumped water into a high level tank, the sea pipe was shut off and water flowed by gravitation through the tanks of the laboratory. Boat samples were obtained from a small yawl the 'Dalhousie' 21' in length but the SS 'Garland' collected further afield. A small boat was used to ferry people across the harbour to the town side, on high tides.

It is clear from this account that McIntosh was already in action before the Commissioners actually reached agreement with the Research Board and he used old apparatus from the fish hatchery days to begin with. January 1884 then marks the beginning of a permanent marine laboratory in St Andrews, though it rejoiced in the name of the St Andrews Fishery Laboratory. It didn't satisfy McIntosh who soon (May 21 1884) made representations to the University of St Andrews that to the United College Hall, already extended as a Museum, should be added a Marine biological laboratory on basement and ground floors. Sea water was to be piped from the public baths at the base of the cliffs and the manager was agreeable. This scheme came to nothing.

## Chapter 9

1884 was also an important year for McIntosh in a different way. It was also a significant year for the University of St Andrews and later for it's Marine Laboratory.

D'Arcy Wentworth Thompson was one of the, if not the, greatest British Biologists of the late 19th and early 20th centuries. His influence in a number of ways still endures especially through his magnum opus 'On Growth and Form' which applied philosophy, mathematics and engineering to the study of Biology, and effectively created the new field of Biomechanics and couched withal in language befitting a superb classical scholar.

D'Arcy arrived in McIntosh's ambit in 1884. St Andrews University at that time consisted of campuses in two places. In St Andrews itself, of course, since 1413 and from 1881 in Dundee where University College under its own Principal was founded, opening it's doors to students in 1883. The two establishments, while part of the same University, duplicated much of the activities of the ancient seat in St Andrews, and at the time added newer possibilities in a larger city. A Chair of Biology was founded and in 1884 D'Arcy Thompson became the first Professor. He was 24 and was to continue as a Professor in the University of St Andrews until his death in 1948 at the age of 88.

Any reading of the works, letters, notes, comments and observations of these two men leads one to the conclusions that they were the opposite sides of the same coin. The coin was Biology, and the sides were those of the cloistered, rather blinkered, austere, tee-total, woman-shunning, pedantic scholar that was McIntosh with the obverse being the larger-than-life, big, outgoing, bluff, genial, genius that was D'Arcy Thompson. Both had much to offer, both worked hard through long (very long) lives, both were influential in their fields and in their own ways but how different in temperament. It was perhaps inevitable that there would be clashes. They started early.

In a small institution (total student numbers in 1885-6 were 203 in St Andrews, and 10 matriculated from Dundee) both sides of the Tay were bound to have differing views on many basic matters concerning their subject. Very quickly it became apparent that a breach would occur. The

state of Medicine in the University was such that as in McIntosh's own case students still went to Edinburgh to complete their studies. The proposal to continue in the University of St Andrews led to the foundation of the Bute Medical Building in 1901, but before then there was blood on the floor of the Senate. Initially McIntosh and D'Arcy worked together, but McIntosh's rather authoritarian views, and his unwillingness to be adaptable, led to difficulties. McIntosh had accepted the Chair under two conditions (Chapter 5) of which one was the question of teaching in Dundee. This he refused to do. Principal Petersen in Dundee was incensed and he proposed to change D'Arcy's Chair into one of Natural History, and to acquire all of medicine for Dundee. An article in the 'Scotsman' suggested Dundee was a better proposition for science and for research (arguments which have been heard since in different context) and this upset McIntosh who called on D'Arcy Thompson to refute the article at least for Zoology. Thompson didn't. McIntosh had upset D'Arcy Thompson and for many years the two sides remained distinctly cool towards one another with McIntosh referring to D'Arcy Thompson as his 'junior colleague across the Tay' and ensuring that he controlled everything in Zoology from student affairs to examinations (all held in St Andrews). In 1890 Professors from Dundee entered the St Andrews Senate, in 1894 they gained a majority; shortly afterward the convenership of the Science Committee changed hands with McIntosh (having held the position since 1884) being voted off and Professor Purdie (Chemistry) replacing him.

Both McIntosh and D'Arcy Thompson became significant figures in fisheries and in marine studies though in very different ways. The marine laboratory in St Andrews enters the story in quite different ways as shall be seen.

McIntosh was a well known person on the Zoological scene and as such was a member of a number of professional societies including the Linnean Society specialising in taxonomic studies, the Ray Society also involved in systematics, the Zoological Society concerned with general Zoology and the Geological Society; these and the British Museum of Natural History of which his friend Lankester became Director in 1899, were all based in London and claimed several visits a year. During one of these McIntosh became acquainted with another Fellow of these learned bodies, Charles Henry Gatty, who lived at Felbridge Place, East Grinstead. Gatty was a country gentleman with the interests of such a person, serving on the bench as a magistrate, and as a local Councillor; he was patron of the local church and maintained the schools of Felbridge. Like many others with

time on their hands in the 19th century he was also interested in Natural History, and was active particularly in the Ray Society. His interest in Natural History seems to have been reflected in other parts of his family. The wife of his cousin Alfred Gatty, a clergyman in Ecclesfield, Yorkshire, was well-known for writing children's stories under the title 'Parables of Nature'. She was sent in 1848 to the seaside in Hastings, Sussex to recuperate after illness following the birth of her seventh child and became enthusiastic over the sea and its contents, especially sea weeds. Mrs Gatty produced an illustrated guide to British Seaweeds published in 1872 and based on drawings by Professor Harvey in his book 'Phycologia Britannica'. Her attitude redolent of Victorian morals, rectitude, religious fundamentalism and feminine righteousness is displayed in an introduction full of interesting comments on the life of women at the time. The following passages indicate her views on collecting the works of the Maker mixed with sound practical advice on how to go about it. These sentiments were common amongst naturalists of the time such as the Gosse's and Charles Kingsley; Darwinism had yet to undermine their faith in God the Creator.

"About this shore-hunting, however, as regards to my own sex (so many of whom, I know, are interested in the pursuit) many difficulties are apt to arise; among the foremost of which must be mentioned the risk of cold and destruction of clothes. The best pair of single soled kid Balmoral boots that ever were made will not stand salt water many days - and the sea-weed collector who has to pick her way to save her boots will never be a loving disciple as long as she lives. Any one, therefore, really intending to work in the matter, must lay aside for a time all thought of conventional appearances, and be content to support the weight of a pair of boy's shooting boots, which, furthermore, should be rendered as far water-proof as possible by receiving a thin coat of neat's-foot oil, such as is used by fishermen - a process well understood in most lodging houses." After more words of advice she closes this passage with "This advice cannot be enforced too strongly. It is both wasteful, uncomfortable and dangerous to attempt seaweed hunting in delicate boots. Wasteful, because a guinea (!) pair will scarcely last a week. Uncomfortable, because to walk on some rocks in thin soles (the slate edges of those in Douglas Bay, for instance) is so painful, that it very soon becomes impossible. Dangerous, because you must be wetted through by the first bit of moist sand you come to, and it is not everyone who would be justified in running the risk involved in this fact."

Mrs Gatty then becomes prophetic; "next to boots comes the question of petticoats; and if anything could excuse a woman for imitating the costume of a man, it would be what she suffers as a seaweed collector from the necessary draperies! But to make the best of a bad matter, let woollen be in the ascendant as much as possible; and let the petticoats never come below the ankle. A ladies' yachting costume has come into fashion of late, which is, perhaps, as near perfection for shore - work as anything that could be devised. It is a suit consisting of a full short skirt of blue flannel or serge (like very fine bathing-gown material) with waistcoat and jacket to match. ....All millinery work - silks, satins, laces, bracelets and other jewellery etc must, and will, be laid aside by every rational being who attempts to shore-hunt."

Many worthwhile tips are offered to the fair sex on how to go about their work. ".. and you can see your pretty prey floating, displayed to the best advantage, and dip in a bare arm to catch it at comfortable leisure. And here men have certainly an advantage over women, for they can wade with impunity : but never mind : plenty can be done without it, if the loving disciple will have patience with the waves, use her stick cleverly to assist the nearing of the plants ...."

"A stick was alluded to before, and is a very desirable appendage, both as a balance in rock clambering and for drawing floating sea weeds from the water. It should have a crook for a handle therefore." She then recommends improvisation and imagination as worthwhile assistants in collecting. " ... and it would be madness to counsel women indiscriminately to be strong-minded about their condition. People can, however, do at one time what they cannot at another : and with a male companion (authors emphasis) to lend a hand and infuse a sense or security, a very eerie (her emphasis) hunting-ground may sometimes be ventured upon; yet even within the splash and uproar of such heavy dark green waves as beat against the north side of Filey Bridge." The presence of male company was stressed several times. "But even in reflecting upon the best and easiest shores, such as the choice one of Douglas Bay, Isle of Man, for instance, it must be owned that a low-water-mark expedition is more comfortably undertaken under the protection of a gentleman. He may fossilize, or sketch, or even (if he will be savage and barbaric) shoot gulls, though one had rather not; but no need, anyhow, to involve him in the messing after what he may consider "rubbish"; unless, happily, he be inclined to assist."

How happy this lady would have been with wellington boots, jeans and a Barbour jacket. And probably in this age of womanly independence quite content to brave the wildest places on her own or at most with feminine company. She would undoubtedly have become a SCUBA diver. It is sad to reflect that such an intelligent, active, enthusiastic person should spend the last ten years of her life suffering from a gradually worsening creeping paralysis and at the end of her life was totally paralysed.

Mrs Gatty collected in various areas of Britain and, although not directly involved in the foundation of the Gatty Marine Laboratory her collection found it's way on her death in 1907 into the herbarium of the laboratory, and is to be found in the University Botanic Garden collection. The Herbarium is large and contains many foreign species with examples from the collection of Professor Harvey (Trinity College Dublin) amongst them.

C.H. Gatty's interests lay mainly in marine studies and he visited St Andrews to see the Fisheries Lab in the Fever Hospital. Being a man of some means (his father having been one of the six clerks of Chancery; immortalised in Gilbert and Sullivan's Iolanthe) he was able to indulge himself in philanthropy and in 1892 he decided to promote Marine Biology in St Andrews by donating £1000 to the University. Following a lunch party for the British Association meeting outing from Edinburgh, Gatty altered his mind after a prompt from McIntosh and doubled his generous gift to £2000. McIntosh was now able to plan to leave the unsatisfactory accommodation of the Fever Hospital. 1894 saw the preparation of the plans and in 1896 the building was ready. It was opened on October 30 1896 in the presence of over 700 guests, by Lord Reay with Gatty present and the building proudly named in his honour. McIntosh prepared a short booklet on the laboratory and it's facilities and compares the Scottish lab with those of other shores as well as listing the papers that had been published during the history of the Fisheries laboratory. His preface was dated September 1st 1896 and the brochure was widely distributed.

## Chapter 10

McIntosh now had his marine laboratory, named for his benefactor Charles Henry Gatty, but it must not be forgotten that he was not a full time research worker, he was a Professor of the University of St Andrews and carried out all the duties expected of such a person.

His teaching duties were performed within the main University quadrangle but changes were afoot in the late 1890's. Building plans were in progress in other parts of the University and in 1899 the Court attempted to move McIntosh's teaching to the Gatty Marine Laboratory. This seems a not unreasonable attempt to rationalise the position of McIntosh who otherwise had to shuttle to and fro between his research and teaching, but McIntosh said no. The conditions of Gatty's bequest were such that teaching was not part of the function of the building.

The College museum which has been mentioned previously was housed in part of the United College building in the quadrangle, and Bell-Pettigrew the Professor of Anatomy wished for it to be moved as an extension was mooted. This extension would have shaded the sun falling upon his house and his wife, a moneyed lady, objected. At this time the Bute Medical Building, supported from funds provided by the Marquess of Bute, was nearly complete and Pettigrew exerted pressure for the movement of Natural History into it, alongside Anatomy. There was no room for the museum which was large and contained specimens from many parts of the world.

The University were anxious for McIntosh to move. Women were first admitted to the University in 1892, and it will be remembered that McIntosh had his contract drawn up in such a way that he controlled entry into his class. Pressure now came to bear on him in an unexpected way. Two young ladies were prompted into asking if they could utilise his practical room for a retiring room. This request was met with a refusal, but McIntosh then made a mistake. He went on holiday! At this juncture the Clerk of Works moved everything out and converted the room for the use of the ladies.

Further alterations occurred; the Bute Medical building was erected, and a private benefaction provided funds for the construction of a new Museum adjoining the Bute. The

collections were to be housed there for all time, and it was later revealed that the money came from Bell-Pettigrew. His wife no longer needed to worry about the shadows on the house. From these various new additions, the Department of Natural History got four rooms but no lecture theatre which was later added as a wooden building outside. It was cold and draughty.

The privations of such accommodation, however, should not have affected the Professor for he continued in his stalwart campaign against strong liquor vowing that 'No man who joined Bonhomie to wine and women could qualify as a true votary of Science' and whose friends made remarks at dinner to him such as 'I wish I could always dine with you for I should get all the wine'.

The Gatty was now in full swing. The deserted Fever Hospital lay derelict on the East Bents, and in 1905 it burned down. There was no apparent reason, but no tears were shed. Rather different, however, was the response to another fire.

This fire was reported in the Scotsman newspaper for June 23 and the St Andrews Citizen for June 26, 1913. At 0200 in the morning of June 23 David Cunningham, fisherman, was at sea and noted smoke and flame from the area of the Gatty, though he thought it could have been something burning near the hospital. He returned to the harbour and roused the coastguard since a thick haar (sea mist) was in and visibility was poor. The coastguard went to the Gatty, discovered there was indeed a fire, and went back to the gas works (about a quarter of a mile) to use the telephone and raise the fire brigade. After 0500 the fire brigade arrived and an hour and a half later the 'steamer' had the fire completely out.

It was later discovered that a window had been broken after covering with soft soap and brown paper (to minimise difficulties for the entrants). About a dozen tins of inflammable liquid and explosive had been placed on the floor and ignited. A further window had been broken to provide a draught but luckily there was little wind and the draught small otherwise the building might have been destroyed. The damage turned out to be much smaller than first feared because by chance the fire had melted some of the seawater pipes and burst a tap so that water poured out and helped to localise the fire. Signs of the fire can still be seen in the roof timbers. Repairs were

estimated at £500. A claim was made on the Royal Insurance Company and the episode led to a revision of Fire Insurance throughout the University.

McIntosh's life's work had been at risk. Fortunately his drawings were not harmed, and Roberta's, hanging in the hall, got a bit smokey but were otherwise unharmed.

The reasons for this apparently deliberate attack are not clear. Two notices were found at the door which read as follows:

'Take heed of the women's rebellion' and

'We need to be goaded, like oxen as we are, into a trot'.

It was assumed that these indicated the perpetrators of the act were women suffragettes, supporters of a movement much in vogue at the time. McIntosh's seeming antagonism, or at best indifference, towards women may have made him a target for abuse. The Women's Suffrage Society denounced all knowledge of the affair in the following terms; "The St Andrews Branch of the National Union of Women Suffrage Societies desire to condemn in the most emphatic manner the damage done to the Gatty Marine Laboratory which is alleged to have been caused by a woman or by women who have adopted militant methods. The National Union to which the St Andrews Society belongs has officially repudiated and condemned all militant action at its annual meetings from 1908 to 1913 and it stands since its foundation over forty years ago, for constitutional action, justifying the extensions of the franchise to women by reason and argument. This Society believes that violent action is derogatory to those who take part in it or countenance it beside being prejudicial to the cause". It does seems to have been a curious way to make a political point. Perhaps a disgruntled student, or someone refused entry to a class was responsible. At this stage it is impossible to tell.

What is possible to detect is the steam generated by many of McIntosh's associates and friends. His collection of letters contains many from people in all walks of life expressing their concern and anger, most of it from men incensed that the women suffragettes should apparently be responsible.

The Court (entry for July 12 1913 IV p 484) rewarded David Cunningham, with a guinea (£1-1-0) for his having given such prompt notice that action could be taken in time. At the time this was a very handsome sum for a fisherman.

Repairs were in fashion at this time for there is a record of money being spent on painting for the lab and in 1914 McIntosh drew attention to the condition of the road leading to the Gatty alongside the Woodburn Steam Laundry (now the University Works Dept). This had been carefully made in 1896 but rendered impassable for cycles, vehicles or foot passengers owing to excavations, heavy cartage through a gateway operated by the Laundry Co and the placing of rough cinders on the road. Repairs were agreed between the parties on the proviso by the Laundry that the Town council also paid some attention to the road on the North side of the works (Woodburn Terrace). The state of this road has occupied the attention of the Directors ever since, though in 1990 it was satisfactorily resurfaced in time for the leavy traffic of the summer months.

## Chapter 11

In 1914 The First Great War broke out, a way of life disappeared, and many young men met their doom. The social pressures on young men to join the army and go to war were intense, and many received white feathers, were pilloried and castigated and generally pushed into going to war. The young men went to the front.

In 1913 McIntosh considered resigning to allow a younger man to take over but the war intervened and he felt compelled to continue to assist the University. He had been appointed in 1882 by the Patron the Marquess of Ailsa under the conditions, normal at the time, of a life time tenure. In 1914 he was already 76. He retained his Chair and continued to write, and in 1916 asked the Court to sanction, and pay for, the printing of a slip bringing the list of Gatty publications up to date. They refused. In an attempt to ensure the place looked respectable he asked to purchase a grass cutter; again he was refused and told he could borrow one as necessary. W.E. Collinge joined McIntosh as assistant and invigilated his examinations, for which McIntosh requested payment. The Court gave Collinge a guinea and admonished McIntosh for taking liberties.

But other forces were now afoot. As the war progressed the personnel in the Gatty diminished, and by 1917 only the Professor and his long serving trusty servant A. Wallace Brown remained. It would be a lot to expect any elderly man to be at the forefront of his subject, and McIntosh was long past what would now be considered a normal retiral age. Voices were raised enquiring how much longer he would go on. He received unsigned letters suggesting he should retire, that there were many things wrong in his Department that needed change and updating, that the equipment was old and worn out and that he should leave the scene to a younger more active person.

For anyone, let alone an elderly man, to receive letters that read 'Your lectures, like your microscopes, are out of date.' 'D'Arcy is looking forward to your post as soon as you resign. Why not appoint a deputy and thwart your would-be detractors. Delays are dangerous.' and

'A Natural History Lecture;

1. A multitude of diagrams

2. Innumerable pots and jars of specimens

3. A long list of names and some ancient classification

4. Some very old microscopes and broken and damaged slides

5. General and very discursive remarks on numbers 1,2,3 and 4

Results Professor pleased and smiling

Students bewildered and disgusted.'

must have been distressing to say the least.

McIntosh appears to have been aware of who sent them for the back of an envelope bears in his handwriting the message 'apparently the work of a man to whom I has shown persistent kindness and help'. The identity of the writer need not now concern us, but his intentions were clear, and McIntosh may have recognised the essential truth behind the thrusts. In 1917 at the age of 79 he resigned from his post as Professor of Natural History in St Andrews. D'Arcy Thompson, his arch rival, was transferred from Dundee and took the position. There was a small debate over the wisdom of this, since Dr Barrie Dow of the Court, moved that 'The Court do not appoint a Professor to the Chair of Natural History, but appoint a lecturer during the period of the war', but this found no seconder and the amendment fell.

D'Arcy Thompson's conditions of appointment included '1. The Professor will be charged with the general management of the Teaching and Research Department in Natural History in the United College of St Andrews and St Leonard in the University of St Andrews (including the supervision of the Gatty Marine Laboratory) with such assistance as the University Court may provide.' The Court provided on October 1st a Class grant to Natural History of £50.

McIntosh wrote to the Court thanking them for their appreciation and recognition of his services, and for their willingness to make arrangements for his continuing to do scientific work, and also suggesting certain repairs on the room he wanted to continue to use in the Gatty. The court deferred consideration of this until D'Arcy Thompson had thought about it.

McIntosh did not accept he had reached the end of his scientific career. He retained all his contacts, and continued to occupy a room in the Gatty Marine Laboratory. He had no support,

except his own private sources but still continued to write profusely, to hold Open Days and Conversaziones. His sister Agnes still stood alongside him and there are still in existence many cards of invitation to these events with brother and sister as host and hostess. His masterpiece on the British Annelids, started so long ago in 1873 now occupied 7 volumes. The last of these had been delayed for several years for the lithographic illustrations had been made in Germany, and were stored in the workroom until after the war when they could be proofed and coloured (by hand). The last volume appeared in 1923; 50 years from start to finish.

Worse was to come though. On July 6 1918 the University Court minuted that the Gatty was to be closed. Alexander Wallace Brown, McIntosh's Man Friday was to paid off as from July 31st. Collinge was retained on a £50 fee to man the Bell-Pettigrew Museum.

D'Arcy Thompson, though involved in various matters to do with the sea, such as the Behring Sea investigations and the foundation of the International Council for the exploration of the Sea (I.C.E.S.), more or less ignored the marine lab in St Andrews. His relationship with McIntosh was still rather uncertain, sometimes he helped but it was not an easy interaction. He had made no sustained effort to keep the Gatty open and active. An example of the strained relationship between the men is given by the following; The St Andrews University Biological Society began its life in 1923, under the Presidency of David Burt, later to become Professor of Zoology in Ceylon. The inaugural lecture was given by McIntosh on 'The riches of St Andrews Bay' (a topic on which he had written at length in his book The Resource of the Sea'). D'Arcy fell asleep as McIntosh droned on, but in a pause in the harangue, he suddenly awoke, looked at his watch, leapt up promptly closed the meeting, leaving his old predecessor rueing this dreadful behaviour since he had not reached a conclusion. Thompson's disdain for the Gatty disturbed McIntosh, who could not understand this disregard for marine studies 'but I bear him no ill will, no ill will'; it would seem, however, that he did. The activity that went on was McIntosh's own. His collector and assistant Alex Brown was reduced to calling in twice a week to see to the tanks.

McIntosh's occupation of the Gatty went on bereft of facilities, with little heat and assistance. He would work in his 80's in a cold laboratory, with his overcoat on, his feet in a box of straw and mittens on his hands. The laboratory was otherwise unoccupied and visitors were

implored to try and improve matters. The Scottish Fishery Board and St Andrews University Court did nothing. In effect the laboratory was closed as a University Department.

His life long membership and interest in the Officer Training Corps continued and he visited them at summer camp dressed in uniform with sword and feather in his cap, covered in a dark blue cape lined with red silk. At Silloth in 1930 he was asked what he would like for lunch and answered that a little fish and something farinaceous would do nicely. This was interpreted as boiled cod and rice pudding. Still he attended meetings in London, travelling by train. One day he was returning from a Ray Society meeting, and at Edinburgh another passenger entered his carriage. He started to smoke and McIntosh, true to his long held principles against such habits, remonstrated with him. The other man opened a window. McIntosh caught a chill, which worsened to pneumonia and he died on April 1st, 1931 at the age of 93. A lifetime devoted to work, which had seen the publication of over 300 scientific papers, 10 books of various sorts, election to the Royal Societies of Edinburgh and London, the loyalty of his sister Agnes as his staunch companion, a rift in his family which lasted for 30 years following the death of his sister Roberta, difficulties with the fishing fleets, and with his professional colleagues, terminating in poison pen letters leading to his retirement, but which due to his single mindedness he must have found eminently satisfying, was at an end.

When McIntosh died he willed many of his personal effects to the University. He seemed to have had an exaggerated idea of the value of much of his work and his possessions. Whilst the buildings undoubtedly were valuable in their provision of places for students much else has aged and become devalued. He seemed to be of the opinion that his written work and his library would retain their value for ever, but could not forsee the increasing pace of science that has far outstripped their use, though the 'British Annelids' series still has considerable value. Many of his books are retained in the University library but they are not of interest, except perhaps for their antiquarian and historical value. His hope that many would remain within the Gatty lasted until the mid 1960s when space was required for other things.

One entry, however, has specific interest to us today. He directed his trustees to convey and make over to the University Court of the University of St Andrews free legacy or succession duties or other expenses with entry as to the first term of Whitsunday or Martinmas that shall occur six months after my death the heritable subjects Nos 1 and 2 Abbotsford Crescent St Andrews, belonging to me with the pertinents thereof... to be used by said University court as a Residence Hall for men students, said Hall to be known as 'The John and Eliza McIntosh Hall' and said to be cut in raised letter not less than 6" in height in the stone belt running round the property, immediately above the street name plate presently affixed thereto, facing Hope Street or to appear on a large brass plate affixed to said stone belt at the place indicated...He attached some conditions 1) The said University Court shall never sell or alienate the subjects 2) that the subjects shall be used only as Residence Hall for men students, or in the event of their not being required for women students and 3) that said University Court shall keep a separate account in their books for said subjects as appearing in the Valuation Roll, or after debiting all outlay incurred in respect of rates, taxes, feuduty, insurance, repairs, property tax, and factoring or other revenue expenses, carry the balance yearly to credit of another account, the sums at credit of said last mentioned account to be applied for some purpose connected with the upkeep of the Gatty Marine Laboratory, said University Court to have it entirely in their discretion to as to what said purpose shall be and as to how and at what time said monies shall be applied. If the University didn't accept under his terms the house were to go to his nephew Robert William Theodore Gunther (his sister Roberta's son).

McIntosh's father's legacy to St Andrews lay in his buildings; his son donated one, Chattan House, McIntosh Hall, Abbotsford Crescent to the University for a student residence. But his enduring legacy to the town and his University was the Gatty Marine Laboratory. Or was it?

## Chapter 12

When William Carmichael McIntosh demitted office in 1917 because of age and external pressures he left the Chair of Natural History in the most capable hands of D'Arcy Thompson, who had been Professor in Dundee since he was 24 in 1884. Now at 57 he became the senior Zoologist in the University of St Andrews. He was a man of great stature, both physically and mentally, and the scene was set for advances in the science at least equivalent to those made by McIntosh.

With regard to the Gatty Marine Laboratory, however, D'Arcy had problems. First of all Mcintosh sat tight. It was his empire and he intended to use it. Second, and this became acute later, was the lack of funds. Throughout the history of the laboratory money had always been tight. Private benefactions were acceptable but the resulting building cost money to run. In the case of the Gatty part of this trouble had been recognised at the outset. When the building was nearing completion C.H. Gatty had asked McIntosh about the contents, and offered £500 to help to equip it upon opening. Since that time outside donations and help, and McIntosh's own efforts in raising funds, had kept the place afloat. The University were always equivocal in funding the Gatty from it's earliest stages taking the view that it was an externally provided and supported establishment, but nonetheless trying to persuade McIntosh to undertake University business within it.

Now things changed dramatically. There was no possibility of D'Arcy helping what in effect was an independent laboratory, and with his class grant standing at £150 a year to cover everything needed to teach and research no support was available. The University Court minutes record a sad tale of inadequate funding possibly not altogether alleviated by D'Arcy Thompson's apparent disinterest in what happened to the place.

As we have seen in the previous chapter the lab was closed by order of the Court in 1918 but no one could make it go away. It remained a substantial building with grounds around it, and both deserved attention through the succeeding years. Although D'Arcy Thompson was not prepared to push too hard various entries in the University records suggest that from time to time he did attempt to raise interest in the Gatty.

Such steps were insufficient and no one was added to the personnel. D'Arcy Thompson suggested to the Court (February 1924) that if they paid his train fare he could take advantage of a visit to Cambridge to go further and visit Plymouth Marine Biological Laboratory with a view to renovating the equipment of the Gatty. He also reported shortly afterwards that a trip to the Dove Marine station at Cullercoats, Northumberland belonging to the University of Durham, (now Newcastle) had convinced him that it would be very expensive indeed to restore the Gatty.

With the formal closure of the Gatty by the University Court and McIntosh's lonely, but continued, occupation the fortunes of the Gatty Marine Laboratory flowed at a low ebb, and documentary records are sparse. With no University activity going on it is not surprising that the records become few and far between.

Nonetheless throughout the 1920's McIntosh informed the Court that various items were donated. For example in 1919 Dr Dickson of Bath gave a microscope which was to be engraved with his name, together with a collection of diatom slides and in 1920 he gave another microscope equipped with objective hand-picked by Carl Zeiss himself. D'Arcy Thompson was in no position to do much even if had wanted. His Class grant for Natural History remained obstinately at a low level (£80 for 1920-1921) with a little more for equipment (£120 in 1920-1921), but a Gatty Marine Laboratory Committee still remained in existence though there are no records of it's deliberations.

W.E. Collinge continued to agitate over money; he asked to be paid according to local salary scales (October 26 1920), and he was rewarded with a rise to £400 p.a. (December 18 1920), but in 1921 he was still arguing about his remuneration though by now he was Keeper of the York Museum. His problems seem to have carried over to his successor D.R.R. Burt who claimed he had been appointed by D'Arcy Thompson at a salary of £400 p.a. as assistant, but the Court did not agree, awarded him £200 plus and an extra £50 for work in the Bell-Pettigrew Museum (which nearly 50 years later he again revised and reorganised).

Some attempt to improve the fortunes of the Gatty are evident in the mid 1920's. In late 1923 the Court authorised the expenditure of £400 for the reconstruction of fittings at the Laboratory, the proposal being that the experimental tanks be taken away and that smaller tanks

should be installed with an apparatus for pumping and circulation of seawater through the tanks. A further sum of £65 was set aside for repairs to the building, and at about this time the electric light reached the laboratory for the Court (December 7th 1923) noted that more money might be needed for this purpose.

In early 1924 pressure was exerted from outside in a different way. The Chairman of the Advisory Committee, Fishery Research Development Commission, 6a Deans Yard, Westminster drew the attention of the Court to grants made by the Development Commission for the purpose of renovating and developing the Scottish Marine Biological Association lab at Millport as a centre for research into the science of the sea and suggesting that the University Court of St Andrews should make a more substantial contribution to the working expenses at Millport. The Court replied that they were already involved in uprating the Gatty; though as we have seen this is not borne out by the reports of D'Arcy Thompson even though small sums of money had been committed the previous year.

The Gatty Marine Laboratory Committee was charged with reporting further on this matter, and with deciding what to do about the re-equipping of the Gatty. In 1925 they were still conferring and deferring about it, and outside the sea made some decisions necessary for in September 1925 it was reported the wooden barricade erected in 1912 for the protection of the banks (dunes) outside the laboratory were completely done and the sea was eroding the shoreline. A railway sleeper wall was proposed to counteract this problem and a quote was obtained in 1927 that at £1-8-3 per lineal yard a wall from the Gatty along the St Nicholas farm boundary would cost about £270. It was not until 1938 that another report to the University authorities mentioned this again, to indicate that it was not possible because the sleepers would not go down far enough into the sand due to the rocky substrate. At that time a concrete wall was proposed.

Funding continued to be very small; in 1926 it was raised to £175 per year but at the same time the lab fees charged to students declined from 5/- to 2/6 per term. Two years later in 1928 D'Arcy Thompson reported that he had overspent by £25 and would the Court do something about it. The Court agreed to cover the overspending, and added £25 to the next years grant, but it was purely temporary and in 1929 it was down to £175 again. None of this was passed on to the Gatty

In 1930 the General Council, composed of alumni elected to comment on University affairs adopted a resolution viz; That the General Council views with concern the fact that the Gatty Marine Laboratory is no longer in use for research purposes as formerly, and suggest that the University Court now reconsider the question of its re-opening. The Court replied that it had never ceased to keep in view the desirability of it's re-opening, but they did nothing.

In 1931 McIntosh died. In June 1931 one of his ex-students H.C. Williamson D.Sc. from Dundee wrote to the Court suggesting the Gatty be put in order and restored for it's original function as a Marine Biological Station. He thought that it would not require much to do this, merely overhauling the gas engine to lift water and to repair the tank space, but he also suggested that a boat and a fisherman-attendant be hired to look after the specimens. He further offered to assist anyone appointed to carry on research and to work in the lab himself, giving a course in 'Fisheries'. The Court replied that they had made enquiries into the work necessary and 'are of the opinion that a great deal more would be required for that purpose than the repairs he mentioned'. So again nothing was done. Funds at this time were being actively sought by Principal Irvine for the building of St Salvator's Hall and the Gatty was not an important factor for the time being.

Financial difficulties now beset the University and the whole country and the years of the depression affected academic affairs as they did all other aspects of life. It was unlikely that closed laboratories would fare well, and so it proved. Williamson's effort failed, and in 1930, faced with bigger classes than ever D'Arcy Thompson's plea for more support fell on deaf ears; his class grant in October 1931 went down to £150, but he did persuade the University that he should be helped. He was allowed to search for an assistant at a salary of £250 p.a. for a period of three years it being understood that "it shall be a part of the duties of the assistant to carry out some part of his work at the Gatty Marine Laboratory".

The funding available to the Professor of Natural History continued small, but at least there was some and in 1932 there was about £500 for activity in the subject, but nothing to show the Gatty received any and in 1935 the lack of activity in the building led the County assessor to reduce the rateable value from £60 to £40 p.a. Around the Gatty the ground still had some use for in 1933 the St Andrews Unemployed Association were granted permission to operate 4 allotments to the North

East of the laboratory, There are records that indicated this continued until 1942 when the Association was wound up (full employment in war time affairs removing the pool of men seeking such a way of passing the time though the Dig for Victory movement might have assisted in cultivating the area). Subsequently the allotments continued to be used occasionally by private individuals and there was an attempt by one to buy ground (in 1946) but this was not agreed.

## Chapter 13

The Gatty then remained closed throughout the 1930's but the latter part of the decade saw a rather more determined attempt to restore the laboratory to useable conditions. A new name appears on the scene, that of Professor R.J.D. Graham. the Professor of Botany. His efforts were made with more strength and intention and eventually led to success.

Graham first proposed (July 1937) that the Gatty be used as a field station for students in Botany and Zoology. Necessary repairs on the building he thought would cost about £500, and a whole time attendant was necessary together with a grant for recurrent expenses. The University Court expressed general approval but again delayed by asking for details of the alterations proposed together with a definite estimate of costs. Around this time also Bathgate Academy asked whether the Gatty could be used as a camping place for the Senior girls in the last fortnight of July; this was not permitted.

It took until November 1938 before agreement was reached to do something about shoring up the seawall with concrete, thus protecting the laboratory from stormy seas, and also before Graham came up with an estimated expenditure to repair pump, plant, tanks etc of £299-10-0. But even this was wrong because Graham had added figures to the back of his letter which were not seen and these were added to the original figures a month or so later to give a total of £492-0-0. The Court now wanted immediate action.

Early in 1939 Graham suggested the appointment of an attendant to be in operation when the building was ready. Wages were to be 45/- rising to 60/- per week. He asked for the man to be appointed now (February 1939) as there was work to be done; no duties or hours were detailed and Ashby Patrick joined the staff as attendant, starting his work on March 13, 1939 with the Court directing he be employed to the utmost capacity.

Small sums of money came from the general public (e.g. £3-3-0 from Rev. R.D. Mackenzie) and a further scheme of work and equipment from Graham included a boat and trawl amount to £160-19-5 and more for teaching equipment after discussion with D'Arcy Thompson

(£156-8-9). A boat, the yawl 'Aphrodite' was purchased in June 1939. Progress was not fast enough for Graham, for the British Association for the Advancement of Science (BAAS) was due to meet in Dundee in September 1939 and he wanted the Gatty to be ready to host parties of visitors from that meeting. But, of course, he was overtaken by events on the world stage and the meeting was never held in the anticipation of imminent war between Britain and Germany.

Nonetheless the battle had been won; the Gatty received a separate class grant in 1939 for the first time ever, the princely sum of £50 p.a. for 1939 - 40 and the laboratory also made an appearance in the University Calendar for the first time since 1916 -1917 as a 'Centre for workers in Zoology and Marine Biology'. The Gatty was again open, but at a most inauspicious moment in history.

The outbreak of hostilities in 1939 interfered with many plans and ideas. Not least those of the University of St Andrews with regard to it's marine laboratory. D'Arcy Thompson was now trying to add his weight to schemes which included raising funds for a new engine for the boat. Ashby Patrick was fortunate to be graded as essential and allowed to have his National Service deferred. The inlet pipes to the sea water system were the subject of corrosion and the University complained to the Woodburn Laundry company that they were causing the problem; the Company, of course, denied any responsibility.

In 1940, 1941, 1942 some activity continued within the Gatty, since a class grant was awarded of £50 for each year but there is little indication of any output. H.C. Williamson, who tried to get the lab re-opened as long ago as 1931, asked the Court if they would publish 'British Skates and Rays' as a tribute to W.C. McIntosh; the Carnegie Trust had given £38 for illustrations, and he asked for £100 for printing and binding, estimating that 500 copies would cost £200 and 1000 copies £250. The Court deferred decision until Carnegie and the Worshipful Company of Fishmongers had pronounced on other applications.

Ashby Patrick's escape from the Army lasted until 18 April 1944 when he was called up. Another technician, Andrew Patrick, at that time in Botany, became responsible for looking after the pumps and got an extra 10/- a week for it. The boat was taken out of commission and the engine

removed, oiled and greased and stored in the workshop. Mr Chisholm, boathirer, was asked to keep an eye on the shell of the boat in the inner harbour to ensure it didn't sink or fill with rain water. Miss Rankin, D'Arcy Thompson's assistant was in occupation in 1944. Unfortunately for Ashby Patrick the Court paid a war bonus of £1-0-0 per week in late 1944, but not to those on National service.

The Gatty continued to receive £50 per year for expenses, awarded again in October 1945 for 1945 - 1946, but various problems arose as the war in Europe neared it's conclusion. The foreshore, for example was covered with antitank devices, and in April 1945 the Ministry of War Transport wanted to know by what authority the University Court owned the foreshore below high water mark of ordinary spring tides, but the University Solicitor could find no record or title to such claims and the Ministry were asked to identify their source of information. Nothing further came of this, but it may have had to do with claims for restoration of the area since a demand for seawall repairs made against the War Dept was met in full at £393 in July 1945, but in November of that year the Town Council complained about the state of the ground in the East Sands area.

As thoughts of peacetime work again took shape an interesting conflict of views over the Gatty surfaced from an unlikely source, the Scottish Home Dept. The Fisheries division of the Scottish Home Dept, perhaps prompted by D'Arcy Thompson, asked (October 18 1945) that they might use the Gatty for a special investigation into the effect of chemical effluents on the fish life of the Tay estuary. The personnel were to be supplied by the DSIR (Dept of Scientific and Industrial Research) who would also cover the costs; the investigation would last 8 months. The Director (D'Arcy Thompson) and the Court approved. The condition of the Gatty at the end of hostilities in 1945 had been the subject of an independent report (unfortunately unsigned) from the Marine Laboratory, Scottish Home Department, Aberdeen dated September 4th, 1945. Evidently the author had been requested to comment on the buildings and their suitability for refurbishing for future extended activity in marine science. He had been in correspondence with, and given permission from D'Arcy Thompson to visit and examine the laboratory.

The author of that report is very complimentary about the condition of the building. He remarks that it was described in Kofoid's *Biological Stations of Europe* published in 1910, and

expected 35 years later that it would be in poor shape, "one would have expected considerable changes - if not deterioration - but quite frankly I was surprised at the excellent condition of the building, both externally and internally. This state of things can be attributed to the solidity of the material and to the excellence of the workmanship (How that would have gladdened McIntosh's heart). ... which speaks well for the supervision and caretaking during all these fifty years since the building was erected (and in view of the apparent disinterest of the University Court as we have seen)". He comments on local sea conditions and observes that navigation is highly dangerous if not impossible with onshore winds. One large sewage outfall (see earlier) discharges immediately north of the pier while there is another to the northwest. "Pollution, therefore, is a serious question, and without doubt, with the increased outfall in recent years, the marine flora and fauna, as confirmed by Sir D'Arcy Thompson, have been affected adversely (There is no shred of published evidence to support this; author). There are, however, good stretches of rocky patches to the south and north which still provide rich hunting grounds.

The intake pipe is still in existence, and probably still functions, but as the station has been closed down for some time I could not verify the actual condition for the piping, or the purity of the water supply."

He then expresses his opinion as to the future of the station; "I agree, more or less, with Sir D'Arcy Thompson who has written to me as follows "As a research institution on modern lines, I fear it is out of the question". The Chief drawback to the use of the Gatty as an experimental marine station are 1) pollution from large sewage outfalls in the immediate vicinity, 2) lack of reasonable harbour facilities even for a small research vessel and 3) coast erosion necessitating constant expenditure on the maintenance of a protecting wall. The chances of periodic epidemics resulting from sewage bacteria cannot be rule out so long as the sea water is pumped from the bay and thus delicate experiments involving continuous lengthy use of small tanks would seem to be a waste of time, energy and money. .... The station is within ten minutes walk from the Natural History laboratory and the advantages of live material for teaching purposes are obvious. This can be got largely by shore collecting, but dredging etc from a small boat can be managed periodically under favourable conditions. The Departments (Scottish Home Dept that is) Research Vessels 'Explorer' and 'Kathleen' frequently survey St Andrews Bay and occasionally attempts have been made to take

off parties of students, but contact has been established with considerable risk and in one case at least the party was landed at one of the Fifeshire ports within the Forth estuary.

The curious thing about this report is that it was submitted at more or less the same time that the Fisheries Division were trying to hire the place for it's activities. On the one hand therefore a group felt the Gatty was useful, and on the other the reported believed it had little to offer. D'Arcy Thompson supported both parties!

This unsigned report reads strangely to those who have worked in the Gatty since the war. Sewage pollution may indeed have been considerable immediately after the war and as the town grew in size and effluent was discharged untreated yet Dr Dodd established a highly successful endocrinological unit working on fish living within the laboratory tanks. There are no records extant that show problems in keeping animals that is attributable to sewage interference with the water intake. The harbour is indeed small and the entrance narrow but providing one does not expect to operate a high seas boat access is sufficient for day trips in the immediate environment, as the use of the successive laboratory vessels 'Argonaut', 'Ensis', 'Homarus' and 'Orion' show. Lastly, the erosion problem still continues; periodically a storm breaches the wall, and repairs are required, the cliff collapses at the Kinkell Brae and Cathedral Brae and the whole coast suffers from this problem, but the alternative is abandonment, and disappearance of the whole sand dune system on which the Gatty stands. This would be followed by a breach through which water would flood into the St Nicholas fields behind (now occupied by the new Residence Albany Park) and this would affect the whole town in the area including the newly built sewage works (1984) and swimming pool (1988) complex.

The report in fact reads like an attempt to support D'Arcy Thompson's disinterest in promoting the case for the Gatty, possibly in antagonism to Graham's attempts to upgrade it, and also to protect the Scottish Home Department's vested interests in sea work in the area. No one would consider using larger vessels such as the SHD operated at the time, nor expect to load parties of students with any ease from the harbour in St Andrews. Even small boats run risks with a hard bottomed standing, and with small operating drafts, but it has been achieved successfully for 40 years since the end of the war. The report reduced the function of the Gatty to a collecting station

for specimens for teaching. Fortunately this was not taken as the last word, even by D'Arcy Thompson, who seems to have been playing both ends against the middle.

## Chapter 14

At the end of the war the foreshore was in need of attention and efforts were made to restore it; the Gatty stood unused, only occasionally visited by an attendant and a cleaner. The boat and it's engine were laid up; outside authorities were critical of it's promise for the future. D'Arcy Thompson was still equivocal over the value of a marine laboratory at all and it seemed as though little could be accomplished with the funds available.

In January 1946 a storm severely damaged the sea wall without which the sand dune system, and the Gatty with it, is liable to be washed away. This latest onslaught led to the establishment of an emergency committee to consider what steps should be taken to protect the University's investment. Principal Fulton, Dr Lawson and Mr Matheson, General Manager and Chief Engineer of Dundee Harbour Trust were instructed to look into the matter. In February, Mr Matheson produced a report and a plan for reconstructing the embankment; he saw it as an integral scheme with the area to the North of University property depending on the Town Council being involved on the East Bents. If they were willing to co-operate the cost would be about £2000. In April 1946 the Town Council agreed to participate in the scheme with a proportion based on sea frontage, and estimates were obtained (£3500 for Town Council, £3700 for the University) and agreement reached that the work should be put in hand before the succeeding winter. Messrs McKean and Co estimated for £10-15-0 per linear foot (later revised to £11-0-0) to restore 340' of wall with steel pilings driven into the beach and topped with a concrete coping. The work was eventually completed by mid-summer 1947. The total cost was £7562 and much of the credit must go to Mr Matheson. For his part in the work he was formally thanked by the University Court at their meeting of September 23rd 1947 and awarded an honorarium of £20 guineas plus expenses. That the wall still (1996) stands, bears tribute to the strong construction.

Although activity was barely noticeable, the Gatty received a class grant of £50 in 1945 - 1946, but things now began to stir. Dr Calman, an expert on the Crustacea, who had retired as Director of the British Museum of Natural History at the beginning of the war, assisted the teaching efforts both in Dundee and St Andrews. Mr Waterhouse, appointed as zoology lecturer to Dundee before the war, had spent the entire war period on National Service and returned to his academic post on August 1st 1946. Calman's appointment ended but he left his reprint collection behind. On

the technical side Ashby Patrick was reinstated as a general caretaker in October 1946 at £4-10-0 per week. The boat 'Aphrodite' was recommissioned but it shortly became apparent that it was unsatisfactory for the post-war needs. In early 1947 Professor Graham was instructed to advertise it for sale and to seek it's replacement from Admiralty war surplus stocks. The sale raised £150 and for a period there was no boat.

Although thwarted by the war, Professor Graham was as determined as ever to expand the activities of the marine laboratory. He had a new ally in Mr. David Burt, who returned from Colombo, Ceylon, where he had been the Professor of Zoology, to become a member of staff in the Zoology Department. In mid-1947, Graham persuaded the Court that it was 'highly desirable' to extend the "research work" on marine algae being conducted in the laboratory. [Actually, there was nothing going on.] The Principal suggested that the combination of research on marine flora and marine fauna was timely and the opportunity should be taken to appoint Dr Helen Blackler as a lecturer, attached to the laboratory under Graham's supervision. This was agreed. The Gatty Marine Laboratory now had it's first permanent staff appointment and it's first resident since McIntosh's death 16 years before. D'Arcy Thompson, prodded by Mr Burt, matched this effort. After all, he could not let his laboratory go to a single botanical lady. In October 1947 J.M. Dodd BSc Dip Ed also joined the Gatty as a lecturer in charge with instructions to get it going as a viable marine laboratory. Dodd was attached to Zoology, where he had his share of the teaching. From 1947 to 1951 there were only three staff, Burt, Sutherland and Dodd, in Zoology.

Jimmy Dodd had left the Air Transport Command in 1946 and enrolled as a PhD student in the University of Aberdeen, surviving there on an temporary assistantship that was actually vacated by his future wife, Margaret Macaulay, who went to Harvard. Being already 32 years old, Dodd needed employment with prospects of continuation, and he now transferred his studies to St Andrews with David Burt as his nominal supervisor (Senate papers November 7 give D'Arcy Thompson's name). Effectively, the future of Zoology at the Gatty was delegated to Dodd, who proved to be just the man to get the place working again. Dodd was asked several times to become Warden of St. Regulus Hall and finally he took on this job as well. The student population included

a high proportion of returned servicemen. To quote Margaret's words: "Who better to deal with that difficult bunch than another exserviceman?"

The Gatty had been shut to all but the retired McIntosh for 30 years and was empty. The only equipment was a great number of one gallon collecting jars, called breffits, with the baskets to hold pairs of them for shore collecting. In the winter of 47/48 Dodd and his first student, Terry Carr, had to go outside and exercise in order to get warm. Now that the intention to go ahead was firm it might be expected that financial support would be forthcoming, but for 1947 - 1948 the recurrent grant remained obstinately at £50 for the year, though capital funds of £450 were provided. The sea water system needed immediate attention and Rae-Arnot and Co Ltd, of Cupar, specialists in farm water supplies, quoted for a suitable installation at a cost of £137-7-0. This firm continued to look after the pump systems for many years afterwards. Ashby Patrick asked to be classified as a Technician Grade A but this was not agreed, though the Court increased his wages to £4-15-0 (plus 7/6 for unspecified extra duties) from February 2 1948. He continued to press his claim for upgrading, received another pay rise in late 1948, but suffered from a lack of qualifications for promotion to Technician. This disadvantage was removed when he was sent on full pay to a 2-day course in microscopical techniques in Glasgow in September 1949, and in November of that year he was at last accepted as technician Grade B5.

The Court minutes record a gradual increase in expenditure for the Gatty, new pumps, painting work, installation of central heating, enquiries from external users for space, and in November 1948 a complaint about the lack of a telephone. This was not surprising since there is a ten minute walk to the Bute building; one would not expect D'Arcy Thompson now over 80 to walk up and down to ask his junior staff a simple question. A telephone was installed, No.957. The lack of a boat remained a problem since no satisfactory Admiralty surplus vessel could be found. £1000 was set aside for the purchase, and eventually James Miller and Son, St Monance quoted for a general service launch at a cost of £1092-14-0 with delivery within 6-7 months.

From 1947 on, there was an annual Easter course in Marine Biology, which was exyended in 1949 to admit students from other Scottish Universities. The increased student and research activities led in 1948 - 1949 to an increased grant of £125 (still the lowest in the Faculty), and in 1949 - 1950 to a further increase to £230 plus £5 with an ad hoc grant

for an extra £32 because of over spending. The 'Argonaut' entered service in 1949 and for £82-5-0 she was fitted with a winch. The Argonaut was built for collecting plankton and for trawling, with a single cylinder diesel engine that was a devil to start and could not be re-started when hot. There was a tiny deckhouse and seats for 12 students round a central well. She was not a seaworthy boat, being apt to roll and hard to steer because there was no keel. Fortunately, one of the students, Terry Carr was enthusiastic about boats, and kept the Argonaut in good condition. He and Dodd collected class material themselves, used the boat for the Easter Courses in Marine Biology and took students to the Isle of May in the spring to see the birds. Later, when Terry left, a local fisherman Dave Clark, was appointed as the collector and boatman. It was said that Dave, who was the son-in-law of Chisholm the Harbourmaster, was the only suitable candidate for the job because the other fishermen belonged to feuding families who would never allow their rivals to hold a position that allowed them to land undersized lobsters.

During these years enormous efforts were made to install the basic infra-structure, notably the intake for sea water, new pumps, the settling tank and the header tank, the sea-water distribution system, the central heating with circulating hot water, sanitation, new electrical wiring and a switchboard, ready for the scientific developments that were to come. Additional facilities provided included a constant temperature culture room, called the culture house was built within the area of the aquarium. This was to rear the tadpoles for the research of Dodd and his students. It could hardly be called the tadpole room in a Marine Laboratory. These additions coincided with the long-delayed visit of the British Association to Dundee. In 1949 Dodd Went to see Grahame for support for more space for teaching, for staff and for the annual course in Marine Biology, which was very popular; "even a Nissan hut would be better than nothing". Grahame must have pushed behind the scenes, for the University Court quickly approved an extension, with the condition that it must be built of stone to match the original building (at treble the cost). Building had started by the summer of 1950, and finished in August 1951. It was a time of severe financial hardship in Universities but new shoots were sprouting. At that time there was almost no research going on in the University, none at all in Zoology, and no-one for a scientist

to talk to about research. To gain encouragement, Dodd had to go to Aberdeen to see his former supervisor, Landgrebe, and no doubt he had to borrow a lot of research materials just to survive.

**Chapter 15**

On June 21st 1948, Sir D'Arcy Wentworth Thompson died, loaded with Honours, at the end of a long career, mourned not only by biologists, but by scientists, mathematicians, classicists, linguists and many others. His obituary in the Senate minutes ends as follows:"D'Arcy Thompson was at once, scientist, humanist, traveller, orator and teacher. He was an ornament to his generation and to the University he honoured by his long membership. The great oak which dominated the forest has fallen under the blast of Time leaving a gap which cannot be filled." In retrospect, we see this eulogy as a sign of the mental set of the University at that time. After 80 years or so, under McIntosh and then D'Arcy Thompson, the Department of Zoology consisted of little more than the huge Bell Pettigrew museum, with a minimal staff of three catering for teaching of only a small number of students, none of whom now even visited the Gatty for lessons in marine biology as they had in McIntosh's time. There had been virtually no research under D'Arcy Thompson, who spent his class grant on the Museum, especially on wax models of dissections, and dedicated himself to reading over a wide field, and to the Fisheries Committees that later proved so disastrous for British fisheries. Many departments in many British universities were in a similar situation at the time. In the decade after the war there was a lot of sweeping by new brooms.

But the chair had to be filled. With no new plans formulated, the University set about finding a replacement, and their initial attempts were unsuccessful. David Burt, formerly a student and then assistant to D'Arcy Thompson, had returned from his term as Professor of Zoology in Colombo, Ceylon (now Sri Lanka) and was Lecturer in the Dept of Natural History. His experience carried the Department through the aftermath of D'Arcy Thompson's death and he was asked by the Court to continue when they were unable (September 1948) to offer the Chair to any of the first group of applicants. The Chair was re-advertised in 1949, and was vacant for two years. It was said that no suitable applicant came forward on account of the doubly onerous job of modernizing the Department and preparing for an increase in student numbers. There was no anticipation of the changes in pace and topics that were to come, except from one member of the Committee, C.M. Waddington of Edinburgh University. On April 13, 1950 a further group was asked for interview on May 6. Among them

was Mr H.G. Callan who was working in the Institute of Genetics in Edinbugh, when he was surprised at being told by C.M.Waddington to apply for the chair at St Andrews. Not expecting to get the job, he told the interviewing Committee that St Andrews would suit him very well because the Eden estuary was splendid for wild-fowling, abounding with teal, widgeon, mallard and wild geese! Callan was duly offered and accepted the post. His specified duties included the supervision of the Gatty Marine Laboratory, although Professor Graham was careful to stress that his interests at the Gatty were properly understood. Graham had in fact produced another idea as to the use of the area; he proposed a Marine Botanic Garden. This was to be an enclosed garden planted with maritime plants thriving in the supposedly salty atmosphere prevailing around the Gatty, and he produced an estimate of £1519 for it's establishment. Graham died before this scheme took off. Dr (later Professor) J.A. Macdonald, the other Professors of Botany in Scotland and Glasgow, Aberdeen and Edinburgh were consulted as to the sense behind the proposal. Each recommended it be abandoned, and on December 13, 1951 this idea was dropped.

The new Professor recognised the value of the marine laboratory and strongly supported Dodd behind the scenes. Together they generated the first of three forward leaps. Callan had experience of the Stazione Zoologica of Naples, and indeed his wife Amaryllis was the grand-daughter of it's founder Anton Dohrn, and daughter of Reinhard Dohrn who became Director of the Stazione after his father's death, and the sister of Pietro Dohrn who was himself to become Director at Naples after the war. Callan intended to promote the embryology of marine invertebrates and proposed that the clean seawater obtainable from the aquarium was ideal for maintaining his cultures of larvae. Readers will notice the contrast with the pessimism of D'Arcy Thompson on this topic. Funds had already been advanced for provision of a culture room, but it was used for toad tadpoles.

The arrival of Professor Callan in October 1950 was an enormous boost for the development of a modern scientific traditionHe and the dodds were enthusiastic about research and had knowledge of the modern literature, ability to visualize experiments, order the equipment and carry through the work at a high level of critical expertise. Callan was determined to keep up his own line of research on chromosomes, and supported all Dodd's efforts, notably by giving him a free hand,

giving him secretarial assistance and a new assistant lecturer at the Gatty, John Stevens. Callan also learnt that the Nuffield Foundation were supporting new areas of research, and no doubt with the aid of his powerful friends, a generous grant was obtained with the proviso that the University would continue the support (which they did for years. More about that anon).

The original Gatty building was very small, with a room with an open fireplace for the resident Zoologist, the technicians room and a library. There was an open area with 6 cubicles for students, one of which was occupied by Helen Blackler for 13 years, because there was nowhere else for her. In fact, Mrs Gatty's seaweed collection was kept at the Bute. There was no space for teaching a class at the Gatty and no space for research associates or the essential equipment that would come. The haybox to warm the feet still stood under the desk in the main room. In early 1948, the UGC asked for an outline of the part to be played by the Gatty among other Marine Stations in the country. In 1948 the University of Wales set up a Marine Laboratory at Bangor, with U.G.C. funds for 4 marine biologists and a Director. Records elsewhere show that the U.G.C. decided to concentrate Marine Biology and Oceanography at Bangor, Liverpool and Southampton Universities. There is no record as to the outcome of the inquiry about the Gatty, which is perhaps just as well because from that time the Gatty developed as a physiological marine station in a way that could never have been anticipated by a committee, and away from studies of fauna and flora. Exciting new ventures depend on the foresight and particularly the follow-through of individuals, not the opinions of distant administrators, who soon find new enthusiasms.

The U.G.C. had funded the 3-room extension on the South side of the old building to the tune of £5000 and other sums were supplied for furnishings and, fortunately, for equipment. This provided a large single laboratory for student use, as well as a histology room, a dark room and a technicians' room with a store below it. That notable indicator of departmental fortunes, the class grant, now showed signs of movement and rose to £400 for 1950 -1951 (Natural History got £600), and other sums became available for research equipment. A course for students attracted 12 from Glasgow and 2 from Aberdeen at £1-1-0 per head (1951). All was set fair for more staff, but then another period of economy set in; the class grant for 1951 - 1952 declined to £400 from £450, and

research equipment funds dropped to £240 from £545. In 1952 - 1953 the recurrent grant declined further to £350. A year later a plea for more money (£100) fell on deaf ears, and Callan was told to exercise strictest economies and stay within the budget. The acting head of Botany, Dr J.A. Macdonald, managed to winkle £10 from the Court for entertainment expenses for the International Seaweed symposium that visited from Edinburgh in 1952, as did Callan in 1953, when the Challenger Society visited.

Meanwhile, the endocrinology group was increasing in numbers and summer student projects were supported at a very nominal level by funds from the University. Students frequently found themselves unable to pay the high charges of summer accommodation in the town, and slept in the attic. This excellent practise (illegal on account of the insurance) continued for many years as a cheap way to live and work on site, and added greatly to the team spirit and the ability to spend long hours on research. Dr Margaret Macaulay (now Mrs Dodd) left the National Institute for Dairying at Reading University and was supported by the Nuffield Foundation and later by the University until 1959.

The increase in size attracted the attention of the Valuation Officer of the local authority and the rates rose from £40 to £108. The 'Argonaut' required repairs and new tackle from time to time, but a curious event nearly removed it from action altogether. On September 29 1953, the Court heard that Mr W. Chisholm, fisherman had discovered the boat adrift near the Kinkell Brae rocks and, with assistance, had succeeded in securing her and returning to harbour. He was rewarded for this action with a letter of thanks and the sum of £20 (£15 of which was paid by the Insurers, the Royal Insurance Co). This represented the second occasion on which the Gatty had cause to thank the local fishermen (the first being the occasion of the fire in 1913). This is a long haul from the days when McIntosh was burnt in effigy by their predecessors.

The question of sewage disposal has been a problem for seaside communities for a long time and St Andrews was no exception. The original method was simply to discharge the effluent untreated to sea and this could cause difficulties when the material was swept back and deposited on shore. In 1945 this had been the basis of the criticism that might have prevented progress at the

Gatty. In 1954 the Town Council faced increasing population and further sewage deposition. The increased activity in the Gatty area led to a plan to supply the lab and St Nicholas Farm with a main sewer at a cost of £1050. The Court were invited to contribute since it would serve only University property for the foreseeable future, but they declined since it believed that it was up to the town to deal with the needs of the inhabitants, and they were faced with the unavoidable cost (£1000) of providing a branch system of sub-sewers within their own property. In the event the Town Council did upgrade the system, and installed a bar-minuter plant near the harbour, which degraded the sewage to fine particles before discharge. This prevented the blockages and minimised the effect of splits in the pipe across the rocks, but still did nothing to decrease the actual discharge. There seems little doubt that much of the problem was cosmetic; the smell and solid deposition being offensive near the castle. There is no evidence that the domestic effluent was a health problem. There was no heavy industry (Guardbridge paper mill being on the Eden estuary) and non-degradable detergents were not in common use. As it turned out, however, for many years there was no need for very clean sea water at the Gatty because the culture of marine animals never started.

Dodd was joined by his wife, Margaret in August 1951, and together they began an extensive research program on the comparative endocrinology of the lower vertebrates, notably on the pituitary system of the dogfish, the tolerance of trout to sea-water, the thyroid gland of fish and amphibians, and the control of neurosecretion by the brain in these animals. Activity in the laboratory now took off rapidly thanks to the groundwork and the new facilities. Like her husband, working with Landgrebe and Waring in Aberdeen, and as a post-doctoral student in Harvard, Margaret Dodd had seen how a research team could be made to work together, and for the first time this now happened in the Gatty. A marine laboratory was an ideal situation for this work, but a great deal of equipment was needed, all of which had to be funded and then cared for. Microscopes and microtomes were purchased for histology, glassware and a set of counting apparatus with flashing decade tubes, for assays of radio-active material. Much of this came from Nuffield Foundation funds. Jimmy Dodd had brought with him from Aberdeen a stock of the South African clawed toad *Xenopus* which was used for pregnancy tests at that time. These were for breeding large numbers of tadpoles for the study of the development of the thyroid and pituitary glands. They were reared in the constant temperature room while the experimental

animals were kept in numerous open jars in a large constant temperature tank in the aquarium.

The research involved measuring the level of the thyroid stimulating hormone in the pituitary gland. For this, great numbers of white mice were required. The mice were injected with a minute amount of radio-iodine and later with the sample of pituitary extract. The mice were killed humanely after the tests, but so many escaped that for years the building was infested with white, and later with piebald mice descended from them. A breeding colony of guinea pigs was kept for the same work. At that time the Scottish Office employed a certain Group Captain Struan-Marshall as Inspector of Experimental Animal Quarters, and he frequently came to St Andrews to visit his daughter, who was reading Medicine. So the Inspector would make surprise visits as often as suited him. The *Xenopus* had to be inspected, although as often as not they would be immersed in a bloody mess of chopped liver. The tadpoles were not classed as animals. The mice and guinea pigs were always hidden out of sight. Dodd, like others after him, always denied that any mammals were kept for more than one day after delivery. They were always bought in, he said, for the experiments. One day, standing in the hall talking to Struan -Marshall, Dodd had just said that he had no breeding stock when the guinea pig colony, which was kept in the attic, started a whistling racket right above them. Both men heard it and realised that the animals were unsuitably housed up there, but neither said a word. Another situation that would not be tolerated today was the method of storing the radio-active iodine in the pump house and of disposing of the residues down the drains along with the sea-water outflow.

There was little in the way of stocks of chemicals, spare parts or servicing of equipment in St Andrews at that time. There were no skilled technical staff to fix apparatus when it broke down. There was also a heavy teaching load--two courses to divide among a staff of about four and a half, and most of the preparation for practical classes to be done. The day could begin with a 9 o'clock lecture, continue with a practical class, followed by research and administration until finally leaving for home about 7 o'clock.

In April 1953, Dodd had parked his car in the Gatty car park all day with his briefcase in it containing the final copy and all the data for his PhD thesis. When he and Margaret arrived home, they discovered that the briefcase had been stolen with all its contents. Imagine the concern. The groceries were never recovered, but the briefcase containing the thesis was found 5 days later under a bush in the Long Walk, so the PhD was saved.

The 1950 extension in stone consisted of a large classroom, a histology laboratory, a darkroom and a technicians room at the south end of the building. Dr Margaret Lang (formerly a doctor from Renfrew) was appointed as Histologist, and PhD students from other universities were given scholarships from the research funds. Some of them in the period 1950-1956, and their eventual destinations, were:- Keith Ferguson from Edinburgh who later went to London as an endocrinologist. Keith Goddard from Edinburgh, who eventually went to Australia. Tony Perks from Cambridge, who went to the U.S.A. Peter Evennett from Liverpool, who moved with Dodd to Leeds and stayed there. Bridget Monkhouse from the Biochemistry Dept. married a St Andrews chemist who joined Bangor University. Mohammed Hyder, who later became Professor of Zoology at Nairobi, Kenya.

The post of secretary was filled by Miss Marjorie Moncrieff, who worked for Prof. Callan in the mornings and at the Gatty in the afternoons. She did not get on with Dr Blackler, whom she would describe as "considerably dilapidated" even in 1950. The students in St. Andrews were turned out of their lodgings from June onwards to make room for summer visitors, who paid a higher rate, but the research students were obliged to stay all summer, when the most research was done. So they were allowed to sleep in the Gatty attic. Being out of the sight and mind of the rest of the University was an advantage in allowing freedom from conventions.
Dodd set the scene for the future in several important ways not common in St Andrews at that time. He and his wife generated an intense interest in research, backed up by Callan, who was single-minded in his own researck on lampbrush chromosomes, and content to delegate. Similar research teams were set up , notably

in Biochemistry under Tristram, in Chemistry under Cadogan, and in Low Temperature Physics under Jack Allen, but most of the Science Faculty did little research and thought it not part of their job. One professor, who went home to tea every day at 3.30 pm, would pronounce that research publications were a cheap form of advertisement! Fundamentally, apart from Callan, there was no interest in the Gatty after Grahame died. Dodd continually applied for funds from outside bodies, mostly for salaries of PhD students, technicians and to support visiting scientists. Appointments supported by outside funds were made directly to the Gatty without University protocol or official control. The University administration was undermanned and could never have a detailed knowledge of the research or how it was managed. At the Gatty there was a free and easy atmosphere with long working hours, including weekends, and deep fellowship in the work situation, with a serious attitude towards the maintenance of the essential equipment on which all relied, rather like a ship's crew at sea. There was also a single research objective and a welcome to anyone who wanted to do research.

In late 1954 there was a proposal that special opportunities existed at the Gatty for specialising in Marine Biology, and the appointment of an additional lecturer with qualifications in the embryology of marine invertebrates was an urgent requirement. This may have been the intention but the next appointment was that of Dr G. Adrian Horridge as Lecturer in Marine Zoology in April 1956. His equipment needs, as a neurobiologist and electrophysiologist, came from a special award from the Walker Trust. Horridge was a broadly trained natural scientist who worked on the nervous systems of anemones, corals, jellyfish, marine worms and crabs using the new-fangled electronic apparatus to record the activity of their nerve cells. He was looking for a job in a marine laboratory. The circumstances were typical of the times. Horridge was busy at the Stazione Zoologica at Naples, Italy, where his former supervisor, the Cambridge professor, Carl Pantin, also occupied a table. Pantin, who knew Callan and his wife well from times at Naples before the war, heard of the vacancy at St Andrews and wrote to Callan, who was looking for an embryologist and had actually thrown Horridge's application in the waste paper basket. The result was that Horridge was appointed, although he too committed a gaff at his interview--he suggested to Principal Knox that land for staff

housing might be found on the 'waste' dunes that could in those days be seen from the train window coming into St Andrews.

A grant from the Walker Trust provided the first oscilloscope, a 2-beam Cossor, and a lot of electrical components. In those days, all electronics was based on valves. Staff and research students built their own amplifiers, stimulators and power packs from loose components. In 1957 a untrained German ex-prisoner of war, Herbert, was appointed and set to work making physiological equipment at the Bute for the use of student classes. People bent their own pieces of metal plate and used their own tools.

In 1957 Horridge was invited by Professor Ted Bullock of the University of California to be the co-author a of a 2-volume treatise on the 'Nervous Systems of the Invertebrates", and he was allowed to take leave in 1958-9 for 15 months, without pay but had to dash back and do some teaching. This huge work, with hundreds of illustrations and 16000 references, was made possible by generous grants from the National Science Foundation and the Center for Advanced Studies in the Behavioral Sciences, Palo Alto, California.

**Chapter 16**

The 1950's established the new direction of the Gatty for nearly 40 years (up to the time of writing). At it's establishment McIntosh had followed the characteristic traditional line of research in systematic and taxonomic studies, naming species and illustrating them. The activities of Dr Dodd turned to analysis and in particular the physiological functions of the thyroid and pituitary glands in lower vertebrates, notably dogfish, trout, toad tadpoles and newts. Horridge continued this experimental approach along his own lines, with upgraded equipment and technical staff to service it.

Faunistic sampling was relegated to providing material for classes. For this, the 'Argonaut', with no toilet, powered by a petrol-paraffin engine started by swinging a handle on the fly wheel, was used. Woe betide the individual who allowed the engine to stop whilst out fishing for it was impossible to restart on petrol while still hot, and swinging a handle in the cramped conditions of the forepeak in oil laden bilge water was not pleasant. On one occasion, a group of students were taken to sea and the engine stopped. Dr Blackler, leading the group became very concerned as the boat drifted with the tide, and asked the boatman (Mr D Clarke) whether some one would notice their plight. Mr Clarke, not given to flights of fancy, replied that it was likely. Dr Blackler then asked if he thought the coastguard would see them and Mr Clarke responded very positively that he was sure the local coastguard knew about it. "How can you be so sure", "Because I am the local coastguard" came the reply.

At this time the Gatty had the only counting equipment in the area for radio-active iodine (purchased on the Nuffield Grant) and regular counts of blood and urine were done for thyroid patients in Dundee Hospital. In 1958, while Horridge was away in America, Dodd was collaborating with people in the Pharmacology Department in Dundee, where Professor Bob Hunter was also interested in promoting research on hormones. Hunter was associated with the Wellcome Foundation and had no difficulty in securing a promise of a large grant for the building of an extension for Comparative Endocrinology. First, Sir Henry Dale O.M., F.R.S., a pharmacologist on the advisory committee of the Wellcome Foundation, was invited to visit the Gatty, and as a direct outcome of the work that he saw there, he supported a new extension. A workshop animal house and equipment rooms were

planned in the basement, and the Botany Department at last planned space of their own on the top floor. At the time it was obvious that the Gatty was a lively place; students did well there because they responded to the enthusiastic atmosphere. Any Professor would want to have an interest in such a promising and diverse research laboratory.

There was, however, a more pecuniary reason. In the 1960's the University Grants Committee gave generous and largely unquestioned grants to provide equipment for new laboratories, and this became an inducement to add extensions wherever the funds for buildings could be found.

A generous grant came from the Wellcome Foundation, together with a sum from the University, for additions to the botanical section, provided a new building for the development of Pharmacology. At this time the University of St Andrews was still linked with the former University College Dundee, now Queens College. The Medical School operated partly in St Andrews and partly in Dundee, and much experimental work was carried out in Dundee. The Pharmacology Dept was in the Clinical School, in Dundee under the direction of Professor R.B. Hunter (later Lord Hunter and Vice Chancellor of the University of Nottingham). His scheme was to have a lecturer working alongside Dr Dodd in the Gatty.

The first estimate (1956) for the planned extension was £12,700, and Wellcome approved this to provide a basement, constant temperature rooms and a ground floor level, but as is the way with such schemes this soon increased. Meanwhile Professor John Burnett (the new Professor of Botany) wanted to increase the "amount" of seaweed work being done and suggested that a further floor be added (at a cost of £5500). His estimates proved to be inadequate and by the end of 1956 the figure was up to £27,500 and the whole building now became more expensive with a total figure of £21,900 eventually being approved. A building time of eighteen months was probable with occupation in 1958, the Court approved of this figure. By January 1957 Wellcome were contributing £15000, and later that year with progress only slowly making headway a Gatty extension committee was established by the Court, consisting of Professors Callan, Burnett, Ritchie and Hunter with Dr Dodd also involved. Estimated costs by June 1958 were £26,630 with part of the outlay now being met by The Carnegie Trust of Scotland. The College Council minutes (June 3

1958 p 114), however, note a cost of £33,020.12.6. These further changes again attracted the attention of the County Valuer who increased the rates of £112 p.a. and shortly afterwards raised them again to £425 (after trying to make it £450)!

This increase in size and scope led the three Professors Callan, Hunter and Burnett to propose various administrative and technical changes to the Court (17 February 1959 XII 3 p 126). They pointed out that

"1. When the new wing was in action it would provide space for workers from three Departments, Botany, Pharmacology and Zoology. In order that the space and general facilities available should be shared between the three departments 'out stations' in an equitable and amicable way, we suggest that the Court should set up a 'Committee of Management' responsible for the Gatty, and that the Professor of Botany, Pharmacology and Zoology, together with the Dean of the Faculty of Science should constitute this Committee. The Chairmanship should rotate between the Professor of the three Departments at some agreed rate, and the 'Director' (see below) of the Gatty should normally be in attendance at Committee meetings.

2. We are firmly of the opinion that one person should have overall charge of the laboratory and we are agreed that this person should be Dr Dodd. We consider that the responsibility of Dr Dodd's position will be such that his status should be clearly defined. He should be Director of the laboratory. Responsibility alone is a sufficient argument for justifying this title, and we do not think that this title should be withheld from Dr Dodd merely on account of lack of precedent for its use within the University. Comparable marine laboratories which are integrated parts of Universities of Durham (Cullercoats), Liverpool (Port Erin) and Bangor each have Directors answerable to 'committees of management' constituted much as I have outlined above.

3. All academic staff working at the Gatty Laboratory should hold their appointments in University Departments. Although we wish to see an integrated development of the laboratory, we are opposed to the view that academic staff appointments be made to the Gatty as such. The present scientific well-being of the Gatty owes much to its intimate connection with the Botany and Zoology depts. There are certain other marine laboratories to which staff have been directly appointed; such laboratories, becoming progressively more and more divorced from student teaching, have tended to stagnate. We wish to promote the Gatty's development as a teaching and research institution fully associated within the Faculty of Science (which of course includes the medical science departments)

and we think that the type of organisation roughly outlined in this letter would ensure it such a future." Signed by H.G. Callan Convener.

The Court agreed with these proposals. The adoption of these suggestions meant that the everyday responsibility for the Gatty and management of funds passed from the Professor of Zoology to the Director (Dr Dodd).

The newly constituted steering committee met for the first time on February 17 1959 and had a number of changes to propose. The first concerned the position of technicians in the laboratory. As I have pointed out previously the technical force was sometimes a lab boy, sometimes a collector, sometimes a helper, but rarely a technician. Ashby Patrick had eventually qualified as a technician, but there were no positions specific to the Gatty. In 1959 the Committee suggested that technicians should be directly appointed to the Gatty, not to the departments and thence seconded. This put the control of such a work force in the hands of the Director. Since the Court had already approved the appointment of a Technician and a junior this was put into effect. They also asked for a workshop technician and that the position of the boatman should be regularised. Mr David Clarke had been hired in the early 50's at £8 per week and was responsible for looking after the boat, and aquarium, as well as making collections. He was not a Technician and not on an incremental scale; the committee asked for this to be changed.

The steering committee also made it clear that provision of space was in the hands of the Director, and that Pharmacology and Botany had first call on the spaces proposed for them and that the financial arrangements should be in the hands of the Gatty as a separate Department. They made plans to extend the laboratory further still by a) moving the constant temperature room from the aquarium, using the space provided for new tanks (this did not happen because at the time rooms were more use than tanks), b) relocating the library in the attic, reached by a new stair (this in fact had to wait almost 20 years until funds were obtained from the Wolfson Foundation), c) converting the then library into a room for the technicians or for Dr Horridge (the old books were removed but the plans changed) and d) installation of a lift in the existing lift well of the new extension (which has still not happened, 1996). For the first time the Gatty had independence in personnel, funds and space. There was, however, no voice on Faculty or elsewhere in University Councils., a detail that in fact led to more independence, not less, because down at the Gatty who cared about the central administration of the University.

The botanists meanwhile had a new Professor John Burnett, another research-minded English missionary to the Scots, and briefly one of the strong group of professors who brought the St Andrews science departments into the modern period. Their additional space on the top floor of the Wellcome wing housed Dr Blackler and briefly the seaweed collection of Mrs Gatty (see Chapter 9). There was also space for another member of staff, and in 1957 Professor Burnett appointed a plant physiologist from Cambridge, Dr D.C. Weeks. Dr Blackler became known nationally for her work on the phases of growth and reproduction of brown algae. The life cycle goes through a haploid phase (with only one set of chromosomes), which was briefly of interest to the Cambridge pioneers of Molecular Biology. A delegation came north to consider the possibility of using an alga for relating gene action to enzyme production. Dr. Blackler retired in 1967; her major work in her years at the Gatty was the study of the algal flora of the region, finally published in 1974 (in collaboration with Professor M.S. Laverack who dealt with the faunal side) in the Fauna and Flora of St Andrews Bay.

Sir Henry Dale opened the extension for Pharmacology on June 1 1960, and a plaque was affixed to the wall to commemorate the occasion. In 1959 Dr Allen Matty (later Professor A J Matty of the University of Aston in Birmingham) was appointed as Lecturer in Comparative Pharmacology to work in the newly provided space. This turned out to be rather ironic since Matty's specialized in the endocrinology of fishes and would have dovetailed with Dr Dodd's own research, but two weeks after the opening ceremony, Dodd resigned and moved as Professor to the University of Leeds in September. There he became instrumental in persuading the Wellcome Foundation to establish a further Marine station at Robin Hoods Bay in Yorkshire, but that laboratory was later closed by the recent government economies.

NEW CHAPTER NEEDED HERE

The physiological trend at the Gatty continued, though in a different direction. Adrian Horridge returned from America in September 1960 to find the old laboratory rapidly emptying and with all the new accommodation filled by botanists and pharmacologists. He was made Director in 1960 and later Reader in Zoology, but he needed space for his own group. Principal Knox was helpful in securing a grant for two research

studentships on the condition that the positions would be continued by the University after the 3 year period of the grant. So, for 9 years, Horridge was able to appoint two extra PhD students each 3 years. Cash was certainly the problem as indicated in a letter of 20th September 1960 from Horridge to the Principal. 'Dear Principal, I would like to put before you the situation with regard to the obligations which the University took over as a continuation of a Nuffield Grant given to Dr, Dodd.'

'Firstly there are two research students, Mr. P.J.Evennett and Miss Honeyman who have been on this continuation support. Both are going to Leeds with Dr. Dodd and the support for them can now lapse. However I myself have two Nuffield scholarships for which I hope the University will begin continuation support in 3 or 4 years time. [Actually the University were already committed] Secondly, continuation support for Mrs Dodd will lapse. Thirdly, Dr. Lang is maintained by the same token. She is in charge of the histological work, microscopes and similar equipment. She is a great help in the teaching of histology to students and contributes to the laboratory in many other ways. I have asked her whether she would like to stay and she is willing to do so. The question will not arise until early 1961 but.....I would like you to bear in mind that at the appropriate time I will be putting in a request for the support for Mrs. Lang to be continued.' Fortunately, Principal Knox was very supportive and met all these requests.

Horridge had worked repeatedly at Plymouth, Millport and Naples marine laboratories, and in 1955 he had spent the summer on the coral reefs of the Red Sea. He had worked for two years as an engineer at the Royal Aircraft Establishment at Farnborough and had spent ten years at Cambridge University, three of them as a Fellow of St Johns College. Between 1957 and 1959 he had written, with Prof. Ted Bullock of the University of California, a treatise on "The Nervous Systems of the Invertebrates" in two volumes with 1716 pages. While on leave without pay in the United States in 1958-9 he gave seminars at many Universities and visited marine laboratories at Woods Hole, Friday Harbor and Port Royal, Jamaica. When he returned, therefore, he was familiar with the cutting edge of research in many parts of

the world and was also able to introduce the new electronics technology that flowed from wartime advances.

Remaining in the old building was Ashby Patrick as technician, David Arnold, an assistant lecturer, who occupied a cubicle, Dr Kahn, from Israel, who worked on camel ticks under Prof. Callan, Dr Lang as histologist, and a part-time secretary. The first move was to apply urgently to the Nuffield Foundation for a grant to cover the salaries of two research students and equipment for them. There was strong support from Professor Callan, who also appointed David Sandeman (from Pietermaritzburg, South Africa) as Assistant to replace David Arnold.

The most important move, however, was to apply to the University for a new extension which would house an electronics workshop, electrophysiology set-ups and an electron microscope. Meanwhile Horridge used his one oscilloscope and the electron microscope in the Zoology Dept and a scanning electron microscope in Edinburgh University. This third extension completed the square around the tea-room on one floor only, but provision for a future basement below it was made by raising the whole structure on brick walls 9 feet high.

This extension brought with it a very large equipment grant including a new electron microscope, but only just in time to cope with the increase in numbers. The first PhD students in 1960-61 were Reg Chapman and John Scholes from Kings College, London, and then David Sandeman. While in the U.S.A. Horridge had attracted the attention of several Americans who now arrived, notably Jim Lawry from San Francisco and Sid Tamm from Chicago, on funds from the U.S.A. A Harvard graduate, Ben Walcott, arrived to study for a PhD, although he had to sell his aeroplane to find the cash. In the early 1960's the D.S.I.R., as it then was, recognized the Gatty as a laboratory entitled to an allocation of research students each year. At first, there was hardly any space. The teaching lab was soon filled up with research, and some of the cubicles held two students. There was John Tunstall from Newcastle, Jonathan Barnes and Pete Shepheard from St Andrews. There were visiting scientists too, who did not have to be paid, notably Prof. Bjorn Afzelius from Sweden and Dr. Ruth Bennett from Boston University, whose husband was researching on the history of Dundee shipping. Joseph Hamori came from Hungary to use the new

electron microscope. The next students to arrive were Richard Hudson on a Fisheries scholarship, Peter Hammond and Malcomb Burrows from Cambridge. Almost all of the academics were from outside St Andrews University.

Financial control became necessary once there were several independent research groups in the same building. Up to 1960, Jimmy Dodd had simply ordered what he needed and kept a running tally of spending in his head because the needs besides his own were small. Anyone could buy what they needed from the shops in town, if available. Having obtained excellent instruction in how to manage a laboratory from Professor Burnett, the new Director copied a document that had been in use in the Physiology Dept. for some years, outlining how and how much money could be spent by individual members of staff, and on what kinds of items. Different members of staff were responsible for different services. Fortunately, large stocks were purchased with the UGC funds for equipping the new building, and it was not difficult to find further funds in those years. Order Books were printed and Invoices were not sent for payment unless a Gatty order number was on them.

Whereas Jimmy Dodd had brought the services of the building back into use, he and his group researched around one theme which needed hormone assay equipment, chemicals and glassware. Horridge set to work to provide the service areas for for a body of scientists using general facilities. He introduced a workshop with heavy equipment, a new radio-active counting room and certified radio-active laboratory, darks rooms and an electronics workshop, more experimental tanks in the aquarium, an electron microscope unit and continued the histology unit, all staffed by technical experts. The increase in technical staff who served several academics was justified by the increase in numbers of researchers and students. Visiting scientists came to work on their own problems, using the rich marine resources of St Andrews Bay and the general facilities of a well-found Institute.

Financial support came from all the sources that could be tapped. In April 1968, for running expenses, there was £1652 left from the Class Grant, £66 from an S.R.C. grant to Dr. Horridge, nothing left on another S.R.C. grant, £150 on an M.R.C. grant (for Armson), £57 on an S.R.C. grant to Dr. Laverack, £101 on a M.R.C. grant to Dr. Cottrell, £367 on a Wellcome Trust grant to Dr. Cottrell, £192

on a Nuffield Foundation grant to Dr. Sandeman and £101 on an A.R.C. grant to Dr. Weeks. In addition there was a total of more than £2500 still not spent for equipment granted by the University Grants Committee, the S.R.C., the M.R.C. and the A.R.C. What a contrast to the old days dominated by a professor who returned some of the £50 unspent class grant.

To fill the vacancy left by Jimmy, now Professor Dodd, Callan appointed Dr Mike Laverack who arrived in November 1960 from the Nature Conservancy Laboratory in Cumberland. Laverack soon began to gather his own students, notably Pete Bailey, Richard Shelton, Jim Cobb and Patricia Holbrook whose husband (now Vice-Chancellor of Wellington University, New Zealand) was an assistant in the Philosophy Dept. in Dundee. Pat used to provide some excitement because she would sleep in the Gatty attic to avoid the long journey home to Dundee. When in her eighth month of pregnancy Pat had to give up research briefly because she could not reach far enough forwards to see into the electron microscope nor could she risk being on the wrong side of the Tay after the last ferry had left at 10 pm.

Several of the PhD students lived in flats outside the town and cooked for themselves. They soon found that they could eat wildfowl shot along the shore, trout from the Kenley Burn, and pigeons from the local woods. The Gatty deep freeze was usually full of game, fish and frozen lobsters, sometimes even a side of venison. Shelton would store his cormorants (to be made into fish patty) in the deep freeze and there was always wild fowl available for poor students. A good many of the ducks from the Lade Braes also disappeared into their pots. Almost all of the new arrivals came from other Universities, a good sprinkling from overseas.

The crowding was accentuated because 1960-61 were vintage years for Honours students who did their project at the Gatty. Notably there was Margaret Rutherford on lobster eyes, Tudor Barnard, who later went to Sweden with Afzelius, and Brian Nelson, who went to Oxford and then to the Galapagos Islands to study the Sulidae (frigate birds and gannets), Bob Bustard, who later turned to farming turtles and crocodiles in Australia, and Sue Bolton who went to Nigeria to run an inter-schools sports union.

All these additional academics meant that a case had to made for increased facilities and especially for ccompetent technicians, who had to be found from among the local population because of the housing shortage and the cost of removal. A full time secretary, Miss Veronique Taylor, appointed in 1960, turned out to be a determined lady who kept the world at bay and allowed the scientists to get on with their research in peace. Since there was little local industry, there was no competition in employing technically minded staff, but few available. Mr. Robert Burns was appointed as workshop technician, and being able, he was soon made technician in charge. An assistant to him was also appointed, Mr. Roland Jack, who in 1996 is now Head Technician. Roland was recommended to the Director by the headmaster of the Borough School as the most suitable boy in the school. It was a problem to find an electronics technician in St Andrews. The post was advertised three times, and finally Charlie Roemmele applied because he wanted to live in The Old Town. He had retired from the Navy, where he had been trained in electronics, radar and communications, so was well able to cope with the design and circuitry of the electrophysiological equipment. Charlie stayed for many years at the Gatty, finally becoming a kind of technical manager until he retired to Pitlochry. Another new technician with a appropriate skills had to found when the electron microscope arrived in 1966. Here was a £100,000 piece of equipment in a town where the industry was making golf clubs, but a Mr Ray Elrick responded to a second advertisement. Ray was already famous because he ran a local dance band (still going strong in 1996) and made a living by mending watches, so he knew one end of a pair of tweezers from the other. Ray was sent on a course at the General Electric Co. in London to bring the operating know-how to the Gatty. He also learned how to use the new ultrasonic cleaner for the parts of the electron microscope, and many a local citizen's watch went into it.

The appointment of Dr Horridge coincided with a great upsurge in interest and support for the sciences in the whole country from the University Grants Committee and the Research Councils. Funds became easier to acquire for additions to equipment and space. Every possible means of growth was explored. Plans were soon in hand for a further extension (the fourth) in the prepared basement area, for facilities for electrophysiology (at an estimated cost of £9000), for support for

Research Assistants, visiting scientists, and the increased value of the property now warranted a visit from the night-watchman each night. The electron microscope arrived in 1966. It was placed on a concrete plinth sunk into the sandy dune on which the laboratory rested as there was no other sound stable floor to carry it. In a gale force wind blowing from the East the weight of the waves crashing on the beach was enough to cause the electron beam to tremble. The building was not designed for delicate electronic equipment. The open sea-water circulation put salt into the air in the lab, and in bad storms with an East wind, rain water would pour down the inside of the walls on the East side.

The security of the Gatty became more vital at this time and a new fence was erected around the area. The Woodburn Laundry to the North (now the Works Dept.) was offered to the University for £9500. The entry for this deal in the Court Minutes is couched in rather coy terms; 'Certain premises near the Gatty Marine Laboratory have been offered to the University'. Everyone was aware that one of the owners was a Professor on the University Court.

The Wellcome Trust again showed their confidence in the Gatty by providing the £10000 needed to provide electrophysiological space (1962). A new assistant for Dr Horridge, Steve Shaw, also arrived in 1962. The appointments of Sandeman and Shaw were later taken over by the Court from the initial research grant support and led to an interesting debate a few years later. The extra space in 1962 was built in such a way that there were substantial foundations 9 ft high, enough to house more rooms below, in a fourth extension in 1966, when more outside funds were obtained after a guarantee by the University that Minor Works would in any case cover the costs.

Not all was plain sailing, however, for occasional difficulties arose which were unsuspected and unwelcome. In 1961, Dr Matty's research in endocrinology required the provision of a range of experimental animals from fish to mammals (mice, rats, etc). As Dodd knew very well, the premises in which such animals are kept are subject to strict regulation by the Home Office and must be licensed for the purpose. Dr. Matty used a basement space under the tea room that incurred the displeasure of the Inspector (still Group Capt. Cellars) who threatened the Gatty with closure and withdrawal of the operating licence. Of course, it was a put-up job to solve a real problem. Immediate steps were necessary to cope with this sudden threat, and emergency plans were drawn

up. A University Committee was established in 1962 to consider the implications, and by extension to determine policy for the provision of experimental animals throughout the University. The Committee eventually advised that rapid steps must be taken, at a cost of about £3000 at the Gatty. In the end this proved unnecessary for Dr Matty accepted the Chair of Biology at the University of Aston and resigned as from December 31, 1964. This effectively removed the problem, and indeed, quite rightly, the basement area was never again used for mammal rearing.

During the 1960's the Gatty was governed by a Committee consisting of the professors of Botany, Zoology, the Dean of Science, Professor Ritchie with Professor Hunter after the Wellcome Laboratory was built, and with the Director as the Convenor, with an understanding to meet at least once a year. This system had its problems, partly because these Professors were all difficult and ideosyncratic men of strong will, definite ideas, considerable territorial jealousies and no "hands-on" interest in the Gatty or the work done there. One Saturday night Professor Callan was even caught stealing experimental lobsters from the tanks in the aquarium. At the first Committee meeting there was so much irrelevance (and irreverence) said that the Director thereafter convened only one meeting a year and produced hardly any business. The way to get things done was to approach each Professor for their aid where they could be of assistance. Collectively they could cause trouble, individually the Director had them over a barrel. The Director, not being a Professor, and having no power in the University, went direct to the Principal when he needed authority to act in exceptional cases. For example, the following extracts of a letter (Horridge to Principal Knox, Dec 12, 1961) explains what happened to the original library left by McIntosh.

'Dear Principal,

I hope you will advise me how to act in a matter where I feel that authority from you is essential. About this time last year the Gatty Marine Laboratory Committee.....gave me leave to clear out from the library at the Gatty a number of volumes, to send them to the main library, and to allow the librarian to dispose of any duplicates that may result. In fact, we sent to the University Library about two tons of old fisheries journals, volumes of "Nature" and reports of the nineteenth century

expedition of H.M.S. Challenger. None of these books had been consulted since 1948.

For Professor McIntosh's set of the "Challenger Reports", of which we have two other sets in St Andrews, (belonging to the University library and formerly to Professor Sir D'Arcy Thompson), we were surprised to be offered £750, and after some hesitation, having sought advice from Professor Callan, the Librarian let the volumes go for this sum. Eventually a cheque for this amount has come to me, and I am concerned about the best way of dealing with the matter.'

An extract from the Principal's reply, 16-12-1961.

'It is certainly only right that the money should be used to make purchases for the library in the Gatty, but the cash ought to have been sent to the Quaestor and Factor in accordance with our financial rules. I would be much obliged if you would kindly let him have the money; he will establish a credit in favour of your library' etc.

Horridge's time as Director, from 1960-69, was a period of rapid growth, abundant funds for research and especially for equipment, and a sharp increase in the level of technology. Several technicians were employed designing and building stimulators and amplifiers, in radiaoactive counting, chemical analysis, and electron microscopy. There were new microscopes and a new pumping system for the aquarium. In the workshop new instruments were designed and made. Visitors from overseas were attracted by the availability of animals, equipment for their experiments, by expert colleagues, and to learn electrophysiology, all of which put the Gatty "on the map" as a research centre.

Dr Laverack was given leave of absence without pay to spend January-April 1963 as Visiting Professor of Zoology at University of Michigan, Ann Arbor. It is also perhaps interesting to reflect that in 1964 he was reappointed for a five year period as from 1965. At this time it was customary for lecturing staff to receive 5 year contracts; when necessary one year's notice had to be given regarding termination of such contracts and a form of re-appraisal was conducted. Normally this was automatic, but nevertheless had to be carried out. This practice ceased when tenure became automatic after a probationary period, but it compares well with the kind of arrangement the Tory Government of the 1980's proposed for the hire of academic staff. The importance of earning grants, publishing papers and other forms of assessment was not so marked as it later became.

Growth steadily went on. David Sandeman transferred to a lectureship in 1966. Mrs Margaret Lang,who had been Histologist for some years, retired and was replaced by Sandy Edwards in 1965 on a one year appointment, but 30 years later he is still in St Andrews, now helping with the teaching in the Bute. Mrs Lang is remembered, since at her death she left money to the Gatty to allow the establishment of two prizes for the best students in Marine Science.

By 1964 several Research Councils were supporting us. Dr Matty won a grant for research on diabetes when it was discovered that the angler fish, common at St Andrews, has one Islet of Langerhans in its pancreas, and its pituitary gland can be seen through the roof of its mouth, so the whole of the blood sugar regulation can be removed in a simple operation. The Director saw a chance to fund a PhD studentship from the Medical Research Council when a 3rd year Physiology student, John Armson, applied from Cambridge. When John appeared for an interview, it turned out that he had also applied to go to the Community of the Resurrection at Mirfield in Yorkshire as a Novice. With John sitting in the room, the Director telephoned to the Instructor of Novices, who had to be brought off his knees in Chapel. A deal was struck on the spot; John would come to the Gatty for three years and then go to Mirfield. Another one-off was Ayis Ioannides, who could not go home to Cyprus, where there was a war on. Ayis financed himself by playing and teaching music; he taught part-time at New Park School, and for years he ran music groups and a choir, finally, after finishing his PhD in Australia, leaving science to be a full time musician and opera Director.

For a time it was difficult to find a reliable cleaner who would tolerate the smelly messes that discovered themselves as they fermented under the bench. One day, two bulky ladies walked in together to be interviewed. "One at a time, please" said the Director. "But we are one" they said. "One of us will always come, but neither of us wants a full time job". And so it turned out for six months, until one morning after some dreadful fishy mess in a bucket, a notice was written on the blackboard in the classroom "We ain't coming no more" it said, and was signed "cleaners". And they were never seen again. After that John Stevenson's wife was employed and we all lived happily ever after.

Ashby Patrick became Head Technician in due course as the laboratory grew, but he was really an antique exhibit with a training as a plumber. So Mr. Patrick was put in charge of the petty cash, which he managed to the last farthing, but he had other talents. He grew white hair and looked distinguished so the Director would send troublesome visitors to see 'The Professor" and get his permission to have, for example, a child bandaged up, a diving group use our toilets, a delivery of milk, a window cleaning, custody of a baby seal, a dying seagull, a potato chips dispenser or a delivery of coal. Someone had to do these things and the scientists made themselves unavailable.

Dave Clarke, the Collector, also had an interesting job. The needs for the week, for research and for student classes at the Bute, were put on a notice board in the aquarium. Lobsters and shore crabs were always in demand, whatever the weather; there was a large tank for octopus (in fact, *Eledone*). One day Dave would be out in the boat collecting plankton or trawling for plaice (for Hammond), another day he would take his bicycle to the Eden estuary and dig for worms or clams in the mud. He collected withies and made his own lobster pots. He serviced the boat, kept the aquarium clean, dug sand out of the pumping system and smoked his pipe in the coal hole.

Dr Matty left as Professor for Aston in 1964, taking with him Bobby Burns as his chief technician, and was replaced by Dr (now Professor) G.A. Cottrell who returned after a postdoctoral period at Harvard. Cottrell's appointment was officially in the Department of Pharmacology still associated with Dundee. Relations with Dundee were never easy, either in Senate (as we have seen was the case from early on), nor at grass roots level where members of staff were required to lecture in either campus. This was possible, though taxing, when there was a rail link between the two towns, but much more difficult after British Rail closed the station in St Andrews and removed the track from there to Leuchars. In 1967 Dundee went it's own separate way, becoming an autonomous University and relinquishing most of it's collaboration and shared interests with St Andrews. This could have torn the Gatty into pieces.

Two letters, the first to Professor Hunter, show how it was handled.

Dear Bob, (Para 2) You can rest assured that pharmacological work will continue at the Gatty, and I think that the Wellcome Trust should be aware of this. Horridge is giving full support to

Cottrell in all the usual ways, including grant applications, (one of which was sent to the Wellcome Trust). I think Cottrell is happy at the Gatty; you will recall that Horridge met Cottrell at Harvard and brought the appointment at the Gatty to his notice. Cottrell is supervising one Zoology Honours student this year, and he will also do a little Junior Honours teaching in the Zoology Department, as he did last session. Cottrell has offered to do some pharmacological teaching for Tristram and for Ritchie; I don't know the outcome of this offer.

Horridge is decidedly opposed to the notion of an independent unit outside his jurisdiction at the Gatty; I would hold similar views if I were Director there. This naturally has a bearing on possible future arrangements. Yours sincerely H.G. Callan."

A letter of 4 November 1966:- "Dear Mr Mitchell, (University Secretary) Thank you for your letter of 2nd November on the Gatty Marine Laboratory. There is to be an informal meeting of the Gatty Committee on Monday, 12th December, to consider this very question, i.e. the status of the Welcome Laboratories of Pharmacology following upon the separation of Dundee from St Andrews. If as a result of that meeting agreement is reached regarding future policy to be advocated, it will be an easy matter to pass this information on to the Principal. However I have a nasty feeling that agreemnet will not be reached.

If the Principal wishes, I will be very happy to explain to him verbally and beforehand the peculiar status of the Gatty Marine Laboratory in its entirety. The contiguous Wellcome building with its pharmacological staff is merely one side of an inter-relationship triangle. Yours sincerely, H.G. Callan.

Down at the nitty-gritty, Professor Hunter had lost his hook, line and sinker, but careful consideration by the Gatty Committee ensured that the Pharmacology position in the Gatty became permanent, remained assured of financial backing and became allied to the Physiology Department of St Andrews, with the proviso that any alterations were carried out jointly between the Director and the Professor of Physiology in St Andrews, who became a member of the Gatty Committee. The Wellcome Trust were reassured that research would continue along established lines, an arrangement which persisted happily until a new Professor of Physiology (Lamb) moved Cottrell up to the Bute as the numbers of students increased and funds began to dry up.

The 1960's at the Gatty was a period of intense research on the electrophysiological analysis of behaviour, the study of ultrastructure of sense organs, particularly compound eyes of insects and crustaceans, as well as the pharmacology

of the nervous systems of selected invertebrates. There were other lines of research, for example the study of learning of posture in insects, the demonstration that grasshoppers have the hearing mechanism that will separate notes of differing pitch, the demonstration of the origin of ciliary motion by the sliding of the sub-filaments over each other, and the discovery of the rotation of the axis in the beating of cilia, besides the new descriptions of sense organs in jellyfish, ctenophores, crustaceans and annelids. Several of the students were concerned with the mechanisms of vision in crustaceans and insects: there was much travelling to conferences. A list of the students of this period shows how they spread out and how they made their way in the academic world.

Tudor Bardard went to Sweden with Afzelius and settled there. John Scholes went to the USA in 1965 then to the Max Planck Institute in Germany in 1968,finally settling in London. Reg Chapman went as assistant to the Stazione Zoologica in Naples then to work with Katz at University College, London and he is now Professor of Physiology at Bristol University. Peter Hammond went to Kiel University where he later became Professor of Physiology. Jonathan Barnes took a post at Glasgow University, Malcomb Burrows went to work with Hoyle in Oregon, USA, the to Oxford and finally to Cambridge, where he is now a Professor of Zoology and a Fellow of the Royal Society. Richard Shelton went to the Fisheries Laboratory at Lowestoft, then to Aberdeen, and is now the Director of the Brown Trout Research Laboratory at Pitlochry. Richard was always the gentleman game entrepreneur; he was the first to shoot a pheasant from the lab window. Steve Shaw went to Vancouver, then later joined Horridge in Australia before finally settling in Canada at Halifax, Nova Scotia. John Armson went to Mirfield Theological College then to Cambridge as Downing College chaplain, then became Principal of Edinburgh Anglican Theological College. The American visitors, Mike Passano, Jim Lawry, Sid Tamm, and Ruth Bennett, returned home and all eventually became full professors. A number of the later students in the late 1960's went to Australia with Horridge to complete their PhD studies. Agis Ioannides, always a fanatic about music, later won a maestro scholarship to Germany and subsequently directed a succession of opera companies in Europe. Ian Meinertzhagen went to Halifax, Nova Scotia where he

finally became a Professor of Psychology. Ben Walcott worked in Canberra for several years then returned to the USA and is now a Professor at Stoneybrooke , New York. Rick Butler returned to Canada and eventually became Dean of the Medical School at London, Ontario.

Everyone who worked at the Gatty in the 1960's remembers the enormous zest and camaraderie in the place, although freedom generated problems. One of the PhD students, nameless of course, used to arrive about 4 o'clock, rush around to get what he needed before the technicians went home, then he would work through the night, then finally cooking a meal in the little kitchen attached in those days to the tearoom. He would depart about 5 am, leaving his dirty greasy pans, a dirty gas cooker,and cigarette ends on the floor. As a suitable fate for him, it was arranged that he went to a post-doctoral position in Germany, to a lab that was run by a fierce disciplinarian, and within a week he was reformed. Once someone left a saucepan of soup on the high shelf for several weeks, and unfortunately it fell on the cleaner trying to lift it down, putting several people in bad odour. Such were the reasons for getting rid of the gas cooker.

The Academic report of the University for 1966-1967 lists departmental publications as follows, Botany 9, Physiology 3, Zoology 3, Gatty Marine 30. In that Report the Gatty counted 15 PhD students in residence, while the other three Departments had 4 between them. In the two years 1966 and 1967, 8 PhD degrees were awarded to Gatty students.

In Botany Dr blackler retired in 1967 and was replaced by Dr Edward Drew, whose work was on the physiology of algae, particularly the relation between photosynthesis and the quality of the light. This required scuba diving to incubate algae growing in situ at various depths in sea water enriched with radio-active carbon dioxide, and chemical analysis of the products in the plants. The best algal growth occurred on rock faces exposed to strong currents, off the North coast of Scotland and in the Straits of Messina, and Drew was sometimes carried for a mile away from his boat. One of his PhD student worked on Antarctic algae living under pack ice and had to remember his way back to holes cut in the ice sheet. Drew eventually went to the Institute of Marine Sciences, Townsville, Australia, to work in warmer waters. His

replacement was Dr. Robert Read from Dundee, where he soon returned and the post was lost to the Gatty. He and Dr. Weeks, another plant physiologist, worked on the ions and molecules in the cells of inshore algae that are able to withstand large changes in salinity in estuaries and brackish water. In 1984 the botanists were all moved to a new building opened for them in the Botanical Garden on the Dyer's Brae site, which was a major benefaction from Sir Harold Mitchell. When the psychologists also moved in the mid-1980's the Gatty was barely occupied for a while.

The Administration of the University must have been aware of the activity at the marine laboratory, if only because of the grants that were coming from the Wellcome and Nuffield Foundations, the Royal Society, the Research Councils the Carnegie Trust, and later from overseas. A list of available reprints that was sent out in 1966 contains 150 publications in major scientific journals of international importance. In 1968 Horridge was awarded the medal of the Zoological Society and Sc.D of Cambridge University; in 1969 he was elected to the Royal Society. In the summer of 1967 Horridge was working at the Marine Laboratory, Woods Hole, on Cape Cod, on a Lalor Fellowship, with his assistant, Steve Shaw on a Grass Fellowship, when he was unexpectedly invited to go to Australia to look at the prospects for building a new Research Institute of Biological Sciences in the Australian National University. When Callan was told what was afoot he immediately tried to get a new Chair established at the Gatty. Correspondence with the Principal in late 1967 and early 1968 shows that an urgent appeal was made to the Establishments Committee and as a result some thought was given to topping up the Director's readership from an outside source, but nothing came of it. Finally, in 1968 a new Chair of Marine Biology was announced. But the title was inappropriate and it was too late; the challenge of building afresh in Australia, and the attraction of a new fauna and flora for a biologist were too great, besides the difference in climate. But there was another factor of historical importance. The period between 1967 and 1969 saw the appearance of a number of Govt. Reports that foreshadowed the reduction of support for disinterested research in universities in Britain. The Rothschild report recommended more applied contracts and direction from industry; the Dainton

Report spelled out the inability of the State to support an ever-expanding University sector, and it was thought, wrongly as it turned out, that too many PhD's were being produced in the pure sciences. Funds from the USA dried up, and the scientific fraternity noticed the clouds on the horizon. The new Principal could not or would not be as generous as his predecessor had been, as shown by a letter from him dated 31 Jan. 1967. "When you were with me there was one point I did not raise about your £6,000 for the Gatty. We both were talking on the assumption that it could be nothing but good to accept £30,000 from the S. R. C. What will inevitably, and rightly, be asked is how far the £30,000 from the Research Council will commit the University to a take-over operation, and hence mortgage our future funds and pre-judge academic developments. It would help me if you could give me more information about this. Steven Watson.

Only a few years later nobody even raised questions like this because there was no more continuation support, but that was the moment when it became obvious that tough times lay ahead.

In the rest of St Andrews University, no-one seemed to be aware that teams of international significance had grown up in the Gatty Marine Laboratory. The three principal zoologists involved, Callan, Dodd and Horridge became Fellows of the Royal Society on the basis of work that was started or done at St Andrews. Just as Dodd had left for a professorship and his own kingdom in 1960, after 13 years building a research team, Horridge resigned on 5th Feb 1969, also after 13 years, partly because at that time the University was not outward or forward-looking, and did not provide a place on its Faculty of Science for a Research Institute with an international reputation as one of its respected departments. They could not even buy the essential journals for the University Library at that time.

There was little loss of substance because the equipment and facilities continued to be used. It was a small movement in the context of world science, or in the history of St Andrews University, but it is an important object lesson in the way that Science happens. St Andrews University also lost Professors John Burnett from Botany and John Cadogan from Chemistry. The Gatty had seen another burst of

scientific research of first rate calibre, as judged by papers in refereed journals, international invitations, books written and the change in the course of the subject as a result of original discoveries. Research groups succeed because individuals take and use what they need when the time is ripe, and they collapse or go away for reasons hardly influenced by the University administration, and not noticed until they have disappeared.

Over the whole of the period from 1950 to 1970, in the words of one occupant, "one feature of the Gatty was its separateness, isolation, distinctive nature. This bred a notable loyalty in the technical staff--more so than elsewhere in the University. This spirit was strengthened by staff and technicians sharing coffee times and social events; a mutual loyalty conducive to the work of the lab--perhaps worthy of mention".

In 1969 Dr Horridge became a Founder Professor of the Research School of Biological Sciences at the Australian National University in Canberra, taking with him David Sandeman (now Professor of Zoology in the University of New South Wales), and his students, Rick Butler, Peter Shelton, Agis Ioannides, and Ian Meinertzhagen, with Ben Walcott as a post-doctoral fellow, besides others from other British Universities. The numbers that became emigrants tell plainly of the enthusiasm and loyalty of that group. It was to be at least 15 years before another substantial team could be assembled.

**Chapter 17**

Following it's re-opening in 1947 the Gatty had now re-acquired it's world standing as a marine laboratory. It was fortunate in it's staff and it's publication rate and in the fact that more and more students were interested in the natural world. As said, the University had created a Chair of Marine Biology in 1969. Up to that time the Directors, and the major research output, had been in the Zoological area but at the insistence of the Professor of Botany (J.A. MacDonald) the prospect existed of a botanically inclined Professor and the Chair was titled to recognise this. Teaching in the Life Sciences, as well as control of the Gatty was an essential ingredient in the conditions of appointment. Because control now passed to a Professor it was necessary also to consider the consequences on the contracts of other members of staff. Two research posts and two studentships previously supported by research foundations, taken over by the Awards committee. however, were now removed from the Gatty because they had been attached to Dr. Horridge. Dr Mike Laverack was appointed in 1969 as the first Professor. At this time the staff consisted of him and two lecturers (Drs MacFarlane and Cobb) who were Zoologists; two botanists (Drs Weeks and Drew, who had replaced Dr Blackler on her retirement) and a physiologist, Dr Cottrell. The laboratory had the rooms mentioned earlier, was adding to it's stock of equipment, and took delivery in 1969 of a 37' glass fibre reinforced launch, initially known as the 'Leander', but after the Royal Navy had indicated it had lien on such a name it was entitled 'Ensis'.

The new boat was intended to be a great addition to the collecting facilities of the laboratory. St Andrews, in common with many East Neuk harbour dries out on the low tide and the use of a deep draft hull is rather restricted. The planing hull and variable pitch propeller of the Ensis was chosen to overcome such problems by Dr Horridge before he left. It was of shallow draft because of the shape of the hull. The boat was highly manoeuverable and able to work at low speeds as an aid to plankton collection. Unfortunately it was also vulnerable to the kind of environment it was to work in. The boat was delivered at the same time as Dr Horridge left for Australia, its delivery having been delayed by the bankruptcy of it's builders followed by a demand for money owing to the harbour authorities where it was held. It broke down on it's delivery voyage and when it arrived was deposited on the harbour floor by the ebbing tide. Since rocks are present the weight of the boat resting on then was sufficient to bend the skeg bearing the rudder. In order to cure this

minor problem for the moment the skeg was removed. It was not realised that the bolts holding this metal plate actually penetrated the hull, and on the next flood tide the hold filled with water! This caused some consternation as the water level rose towards the batteries.

The design of the boat was ideal for laboratory purposes but the construction and the harbour characteristics defeated it. A marine surveyor pronounced that it needed considerable work to bring it up to specification (cost over £900), and in the meantime the Royal Insurance Co withdrew cover. It's working life was predicted at 2-3 years!. The hardness of the bottom, the inability to find a permanent floating berth and the lack of internal strengthening led to flexing of the hull on each tidal cycle, causing transmission difficulties, and so the vessel was sold. In the hands of shrimpers on the West coast in permanent floating berths it has performed as expected. It was replaced for the Gatty in 1975 by another GRP boat of equal size, the research vessel 'Homarus', moulded by Halmatic in Shetland and fitted out by Cardiff Boat Builders. This proved to be a hard working, powerful, strong machine capable of taking hard ground, but of a deep draft that limited it's periods at sea. On occasion it was berthed at Tayport and Anstruther.

An interesting peripheral event of 1969 was a proposal to build a road along the front of the Gatty but various objections were made to this by the University. Instead an alternative road behind i.e. to the landward side, was mooted with the prospect of a car park being created on uncultivable land belonging to St Nicholas Farm. The Town Clerk asked whether the University had any intentions for this ground, and suggested the Town would find it useful to create football pitches there (or even a swimming pool?). The University had no firm ideas and thought it better to dwell on the proposal. In the outcome the University did develop the field into a new Hall of Residence, Albany Park, now affectionately known to students as the Gatty flats. "I live at Gatty 20 etc" became an address, and mail was frequently delivered to the laboratory instead of the Hall.

The creation of a Chair in Marine Biology led to several proposed developments which were first the concern of the GML committee and then of the Professor. The UGC had enquired yet again in January 1969 about courses for students in Marine Biology, mainly because there were changes afoot or planned for the marine laboratories at Plymouth and at Millport on the Firth of Clyde, where numerous courses were held every year for students..The ecological movement was in

full flow. St Andrews agreed to join the panel of Universities offering courses, for others as well as their own students. Arrangements were made for 40 Oxford students (with 3 members of staff) in October 1970, and it was pointed out that in the early 1960's short courses in comparative physiology had been conducted (for up to 15 students from other Universities) but these had been discontinued because they did not attract research students and the staff had no reward.

The Committee thought it possible to run courses providing the numbers were limited to 20 (lack of physical space at the lab was responsible for this though additional people could be housed in the Zoology Dept 10 minutes walk away). The timing needed to be confined to vacations because living space was at a premium at other times. The problem of staff was also acute; there was no specialist marine ecologist or plankton worker to service a general marine biology course, and either visitors must bring their own staff or the University of St Andrews must appoint a person for the job. This latter course was best, but might require special provisions in the calculation of staff/student ratios and unit costs. There would need to be a charge for any users at a rate of £2-10-0, and publicity could be prepared with a brochure. In fact, there was no survey whether a sufficient number would apply to come. The question of over-collecting due to exposure of the local fauna to many parties was also to be kept in mind. These were the last pronouncements of the steering committee since after one or two other minor decisions they proposed they should abolish themselves and leave the administration to the Professor. Shortly afterwards Faculty pointed out that new courses would require a new staff member with interests in Marine organisms. He didn't arrive for several years.

Since the departure of so many to Australia had left spare capacity in the Gatty, but in 1969 the Professor of Marine Biology was joined by two new Professorial colleagues, those of Psychology and Physiology. Psychology was a new departure, previously being taught as a first year subject by one man. This new appointment brought problems of space for the new Professor. Jeeves had been a fellow student with Horridge at St Johns College after the war, and his move from Adelaide, Australia, was partly influenced by the presence of a strong research group at the Gatty using electrophysiological techniques. His plan was to combine the study of visual perception with analysis of the corresponding neural activity in the brain of the monkey. When interviewed for the chair, he visited the Gatty and was

surprised to find that Horridge would soon depart for Australia, but also learned that he could find space at the Gatty if that proved to be necessary. In the event, when Jeeves arrived, he was offered a room which measured 8' by 10' in the Dept of Arabic with no windows, so having made a polite complaint that it was not what he was used to, he went down to the Gatty again, where Mike Laverack welcomed him. Jeeves immediately moved in and waited for better accommodation for his teaching. A week before the students arrived, when still nothing had happened, Jeeves got in touch with College Gate who, in his own words, "assured him that indeed the Works Dept. had in mind for their programme of work for the coming year the preparation of his office at the Gatty". "I had to point out that once the room had been stripped of benches, shelves and so on, it needed immediate redecoration before it could be used at all. By the middle of the week before the students arrived, I telephoned College Gate and asked them if they would arrange for the ladders and the paint and the brushes to be delivered to the Gatty as I planned to decorate the office myself the coming week-end. This produced great consternation in College Gate and I pointed out that I had just come from Australia, where if you wanted a job done you rolled up your sleeves and got on with it yourself. They immediately said they would look into it again, and within an hour I had a phone call from College Gate to say that a firm of outside contractors would be undertaking the redecoration over the coming week-end. I was able to move in on the Monday just before the students arrived the following day. I later learned there was panic when I declared my intention to get on with it myself because they were very concerned lest it leaked out that a new Professor at St. Andrews had needed to decorate his own office before he could settle in. From then on, I had of course learned something crucial about how to get something done in St Andrews, and it stood me in good stead in the years that followed."

Jeeves was anxious to get on with the work on the brain of cats and rats and he appointed several colleagues to work on brain and behaviour. An operating theatre and experimental laboratories were essential. It was agreed that a new building should be attached to the Gatty,with several rooms for experimental appartus and histology. In one of these rooms, Richard Morris built his first circular swimming

maze for his work on the hippocampus, spatial behaviour and memory in the hippocampus of rats. The Morris Maze is now used world-wide for research in neuropsychology, and Morris himself became the first Professor of Neuroscience at the University of Edinburgh. The small terrapin hut at the Gatty erected by Psychology became their first facility for taking pre-school children in the mornings. The children were studied as part of the course in developmental psychology, so for a time the Gatty car park had ebullient young children mixed with the solemn scientific atmosphere.

Jeeves next persuaded the University to provide the Vic Hallam hut, so named from the contractor who erected it. This arrangement lasted for several years until the re-housing of Psychology in the Carnegie Building, which was vacated by the University Library on it's own rehousing in a custom-built central Library in North Street. The hut was subsequently put to good use for the classes in Marine Biology when Psychology moved up to the Bute Building. Although Jeeves shifted his office up to town in 1972, the teaching and research in Psychology finally moved to their new accommodation in the Bute in the early 1980's. Over the next 20 years, as a result of continual effort by Jeeves, who was able to appoint some outstanding staff, Psychology became the strongest Science Department in the University, and the only one to receive a top rating on three successive occasions. This whole saga of the genesis of modern Psychology at St Andrews, like the rest of the Gatty story, reveals a lot about how a few academics can achieve startling innovations if given the facilities and left to get on with it.

Radioisotope work increased around the University and in 1970 a suggestion was made that a custom-built unit should be erected alongside the Gatty since it would be close to biological personnel and also the incinerator necessary to remove the radioactive waste; this did not come about. Another not very productive scheme at this time was an attempt to stimulate specimen sales from local collections. This was to try and raise some funds to assist in running the boat, but very little came of this. Nonetheless the argument was used to add some aquarium space and a new sea water storage tank to existing facilities at a cost around £10,000. This provided a Home Office approved lab for fish work alongside the storage aquarium.

The arrangements of teaching staff in the Gatty were always a matter for discussion and compromise. Each member of staff, though given research space in the Gatty, was a member of a parent department, either Zoology, Botany, Pharmacology, or Physiology. Changes consequent upon new personnel occurred from time to time. In 1969 Physiology had two lecturers in the Gatty. The new Professor of Physiology, however, expected his staff to be under the same roof as the remainder of his department, so Dr Cottrell and Mr Stanton were both removed to the Bute Building with their postgraduates and postdoctoral fellows. This diminished the laboratory personnel considerably. The Professor of Marine Biology was still nominally a member of the Zoology Department, and did not himself appoint staff to the Gatty.

Other changes that occurred included the loss of a botanical post. Dr E.A. Drew, who had replaced Dr M.H. Blackler on her retirement, took a post at the Australian Institute of Marine Science, and was replaced by Dr. R. Reid. This proved to be temporary condition since a year or so later Dr Reid returned to Dundee from whence he had come. At this stage the post effectively disappeared. A major benefaction came from Sir Harold Mitchell and this was used by the University to create a new Botany building on the Dyers Brae site. This opened in 1984, and Dr Weeks, who had been in the Gatty since 1958, also departed so that all botanists were housed under one roof. This left the whole of a large well-equipped laboratory to a few zoologists and the growing Psychology Department.

The following observations, comments, reminiscences and stories come from a former occupant who was at the Gatty from early 1972-1975. 'The scientific interests of the Gatty in Laveracks period were narrower than those in the Horridge period as most work was on aspects of crustacean neurobiology, particularly sensory biology. Douglas Neil worked on the behaviour of larval *Homarus* and Bill Wales on the effects of different substrates on the biting patterns during feeding; Douglas worked during that time on *Nephrops* statocyst. Malcolm Dando was working on the stomatogastric system; Valerie Pasztor came and worked on the oval organ; and Francois Clarac on chordotonal and other organs. We used to have journal club meetings in the pub just around the corner, although it was not a place generally frequented by Gatty personnel at that time. One day one of the locals came in during one of our sessions and, as there were no other people in the pub at the time, he joined our group. The fellow was slightly drunk when he joined us and became steadily more befuddled as our analysis of the papers progressed. I don't think the poor fellow ever discovered what it was we were talking about but tried to keep his end up by injecting appropriate comments into the stream of discussion. Malcolm Dando's technician (Andrea Sylvester) who had a wicked sense of humour, kept encouraging him and somehow managed to make all his prosaic, everyday statements appropriate to the discussion by giving them other meanings. Edward de Bono would have been proud of us because we managed a few remarkable lateral leaps as a result.

'One of my lasting memories of the Gatty is Jim Cobb "The Good Life" cottage industry. Everybody from that period or later could provide you with many stories of Jim's experiments with

wine, venison, and all manner of game. A meal at Jim's invariably included road kills, game, home grown produce, home made wine and various preserves. He had a network of informers all over the county and most roads were covered by someone's journey to work. It was a common sight to see Jim scrambling out the door to his motor bike shortly after somebody else's arrival to go and collect some carcase for his smoker or for salting or whatever. His lab always had large flasks with wine in various stages of production. If it would ferment, Jim would make wine from it.

The attic was still a home away from home for many students in my time and had its own bed area. It was used by people too tired or inebriated to make the journey home, and on several occasions by students who had run out of money during the writing up stage. Although it must have been completely against University policy, there seemed to be a policy of turning a blind eye as long as the lodgers were discreet enough not to draw attention to their presence. The attic was also a storage place for defunct and old scientific equipment and for the possessions of people who were travelling, had gone on post-docs intending to return or who were merely between houses. There was also the Horridge memorial electrode glass, a legacy I was told was an ordering error in which "bundles" was confused with "boxes"; there must have been enough capillary tube to run an active electrophysiology lab for about a century. I wonder if the attic has been cleaned out yet; the artefacts there might make an interesting record of Gatty History.

Another aspect of the Gatty that always amused me after the tightly controlled workshops in the U.S. A. was the car repair work carried out on the weekend. I was doing an experiment one Saturday and needed a tool from the workshop. Upon opening the door I was confronted with what appeared to be a complete Morris Minor in pieces all over the workshop floor and spilling out of the open external doors on the concrete apron outside. I went down again late on Sunday afternoon to see what had transpired and what sort of mess Roland was likely to be facing on Monday morning, to find that the whole lot had disappeared, presumably reassembled, and the workshop was in apple pie order. Not that this sort of tender loving care could keep those old cars on the road forever. Sandy Edwards had a lovely example of one of those Morris Minor Estate cars which he kept looking absolutely wonderful. I remember the day he came into the lab looking crestfallen because it had been involved in a minor collision at a roundabout and had apparently disappeared in a puff of rust-coloured dust.

The boat was a problem all the time I was there because the standing costs were too high for the funding levels of the projects for which we were using it and Laverack was unable to establish research of a type that would bring in appropriate funds for a boat. At the same time, he remained convinced that the Gatty should have a vessel and that it needed to be of that size. So it pulled funds away from other areas without producing sufficient in its own right. Most of the collecting and teaching work for which we used it could have been done by hiring a boat, or with a much smaller and cheaper vessel.

We had one wonderful incident with the boat. Often when Bill Ireland had some animals for the lab and the tide was not right for landing them at the St. Andrews harbour he would stand off in front of the lab and have his assistant row them in. One of his assistants, whose name I cannot recall, was from Greece or Malta or somewhere else along the Mediterranean, and was very dark

skinned. One day when he arrived on the beach with his trunk full of lobsters he was met by the law. One of the good citizens of St Andrews had answered the call to report the landing of illegal immigrants on the shores of the UK.

The beach in front of the Gatty was the site of another bit of mayhem in which I was involved. Just occasionally after a big storm and while the sea was still high, the wind would swing into the right quarter to create a small but quite steep surf close to shore. I was explaining to someone how it could be surfed if it were not so cold and next thing I knew someone in Ed Drew's group had found a wet suit that fitted me. So there was no going back and I ended up putting on a surfing show with makeshift equipment in an ill-fitting wet suit in front of the Gatty. Word passed around quickly and a crowd from the lab gathered to cheer and laugh to the stupefaction of the bemused citizens. They were told that this sort of deranged behaviour was commonplace in Australia, and no doubt many other stories besides. Mike tried to get a photographer down from the local paper, but the man didn't show up in time; he would have had his work cut out because I did not stay in for very long. I surfed there on one other occasion with cousins of mine from Perth.

I was also ragged unmercifully for wearing long bush socks and shorts in the lab. We were living up on the hill at Stravithie and I awoke on the first day that felt like summer since our arrival. By mid morning I was freezing in my first encounter with the St Andrews haar. I was never tempted to wear shorts again. The ill fitting wet suit that was unearthed for my surfing trial came in handy when Glen Cottrell bought himself an Enterprise and asked me to crew with him in the local competition. We didn't do very well, as I recall. One time we hit the rocks and put a hole in the bottom. We won a couple of races when there was a bit of a sea running and the falling tide moved the finishing line inside the surf zone. Having spent years in the surf when at school and university, I was in my element and we survived where the rest of the fleet was destroyed.

The sage old man of the tea room in my time was David Burt. He always had a word of encouragement for a student and often some advice on histology, illustration and the like. All labs need such people and it was sensible of Mike to make room for him even though we were often seriously overcrowded. When electricity restrictions were imposed during the coal miners' strike, I was doing experiments in Malcolm Burrows' old room in the basement. We were not permitted to turn on our equipment or use heating, and this was mid-winter! It really was cold in the basement rooms and I remember reading and writing while sitting in a down sleeping bag; better than McIntosh's box of straw I'll bet. Mel Robertson was a student of Mike's while I was there. He was pathologically shy and had a difficult stutter. I couldn't believe my eyes at my first Gatty party. With a few drinks and a bit of music he was transformed into the rollicking, exuberant life of the party. I remember Mo Laverack saying to me that she didn't think she could do another dance with him because he was becoming so amorous!!

I was one of the first people to start using the computer regularly in my work at the Gatty. I couldn't believe my good fortune because in the U.S.A. I had been expected to account for every second of central processor time with additional charges for ancillary services, and it wasn't cheap. As a post-doc at St. Andrews I found myself with unlimited computer access, CPU time and everything else! The only disadvantage was that one had to go to the computing centre on the other

side of town as there was no connection to the Gatty. The open access policy had its draw backs. One afternoon when the turn around was particularly slow, the controllers ran a check and found that more than half of the processor time was being used on the lunar lander program, a restricted program for which the passwords had been widely circulated among the computer buffs. I initiated one of Mike's graduate students into the new world of programming. You had to write your own at that time, and Mike told me he subsequently went off biology and became a computer expert, riding the PC wave.

One of the wonderful things that Mike did, and I am not sure that it is widely understood, was that he encouraged non-English crustacean neurobiologists to make contact with the English groups. While some of the Germans were already moving in that direction, there was practically no contact with the French or Italians. Together with Don Maynard, who was a close friend of Mike's, he raised money and entered into collaborations with a host of people. Some of the names I remember are Maurice Moulins, then in Marseille, who subsequently died at Arcachon 12/12/95, such a wonderful contribution to the stomatogastric literature; Francois Clarac (then of Marseille, subsequently of Arcachon and now back at Marseille); Enrico Ferrero from Trieste; Anton Hermann (then from Munich, now at Salzburg); Yolande Barrientos (from Argentina); Bettina Saier (from Freiburg) and a number of others. If they were enthusiastic, Mike would invite them and find some money to help them along. Other people at the Gatty in my time were Mary Crisp, Ian MacFarlane, Ian Lawn, Charles Coleman, and Graeme Shelton (continuing the Shelton tradition). I remember how we all used to be "persuaded" to contribute practicals to the comparative physiology class, a very good class indeed that spawned many excellent honours students.

The various University expansionist policies of the late 1960's - 1970's had led to increases in physical provision and the centralisation of the science Departments which led to a decrease in the number of personnel in the Gatty Marine Laboratory. The only positive step came from the agreement of the Faculty of Science to the creation of a Department of Marine Biology. This took place in October 1979. It was intended to teach an Honours course in the subject using the facilities of the Gatty. One lectureship in Marine Biology was established, and filled by Dr C.D. Todd, in 1979 and the course began in 1980. It was never envisaged that two staff would be sufficient, and in the first place extra-mural lecturers were involved, some, like Dr Weeks, from within other University Departments with expertise in Marine studies but also members of the staff of the Marine Laboratory at Torry, Aberdeen. The Marine Biology Honours course at St Andrews continues to be very popular with students and brings many students into the lab for

their projects in all branches of marine biology including algology, continuing the tradition.

One noticeable change brought about by the growth of personnel, and the establishment of the new course, occurred in the Class Grant. Many years before it had stayed at £50 per year (in the 1940's) and then gradually grew in the post war years. In the 1960's it grew from about £1200 to about £3000 in 1969. Published figures vanish from the University Court records for money was allocated from the Faculty of Science rather than centrally but around about 1979 departmental figures were again recorded and the Gatty received £10320 (including £1000 for the boat costs). It is noteworthy that in the 1940's the figure was published at the beginning of the academic year and everyone knew how much (or little) they had to spend in the year. By the late 1970's, although preliminary awards were made early in the session, final figures were not awarded until March. In 1980-81 the figure was £10630, in 1981-82 £11180 (awarded in April 1982), in 1982-83 £10660 (not agreed until May 1983) and in 1984 £8840 (also May). This is the last separate figure for the Gatty, and by this time various staff movements had led to a drastic alteration in total numbers of personnel. The actual figures decline, and when coupled with the decreasing value of money due to inflation the purchasing power was considerably decreased even over these few years.

The possibility of further appointments was greatly affected by the changing policies of the Government towards Universities. The swingeing financial cuts led to a reappraisal of the future of small Departments. There was none smaller in Science than Marine Biology, and it's members joined (re-joined in the case of Professor Laverack) the Department of Zoology. Changes also occurred in the technical support staff who were also subject to premature retirement schemes and in one year four left, including the skipper (Mr W Ireland) of the "Homarus" and his crewman (Mr W Martin). Subsequently this meant the boat was taken out of service and moored in the inner harbour at St Andrews, but in time it was sailed to St Monans where James Miller's boatyard were hired to keep the batteries up and an eye on it's welfare. Eventually, however, with no crew and no prospect of going to sea and gradually falling into a general appearance of disuse 'Homarus' was sold; for exactly the same sum as was paid for her some years before.

The removal of the Psychology staff to the new department in South Street quadrangle left teaching space, the prefabricated hut erected by the Vic Hallam company, vacant and also the

surgery unit attached to the main building. The hut was modified by the removal of partitions and the installation of sea water into a teaching lab for Marine Biology, and the space altered to accommodate the transmission and scanning electron microscopes and associated equipment. A small terrapin hut at the entrance to the compound was also vacated by Psychology and a plan was mooted to turn this into a small public aquarium (1979), but after a few encouraging noises this also foundered.

In 1982 Professor H.G. Callan resigned his Chair. This coincided with the changing Government attitudes, and the position was not immediately filled as the University worked out it's restructuring plan and estimated the effects of leaving posts vacant. Re-arrangement of departmental government led to a chairman taking control of the Zoology Department; in 1984 Marine Biology and Zoology combined. The Chair of Natural History was advertised and candidates interviewed, but an interesting contrast shows between the openness of the Court in 1948 when a list of interviewed candidates and the Court decision was carefully minuted, together with conditions of appointment, and in 1984 when no names are mentioned although it does say that a candidate was discussing terms and conditions after unanimous election. [ He was Malcomb Burrows, a former PhD student in Horridge's group in the hey-day of the 1960's and now a Cambridge professor and a Fellow of the Royal Society]. His terms and conditions were not, however, met, and he did not come, although later most of his recommendations were put into effect. Later Dr Slater from the University of Sussex was offered and accepted the Chair, and became the Chairman of the combined Department.

The outcome of this was that Professor Slater proposed a combination physically of the entire Zoology Department on the Gatty site. This was costed at about £350,000, with additional costs of removal around £200,000, and the retention of lecture rooms etc in the Bute area. It was agreed that there was no possibility of re-creating the Gatty on a new site. This was an interesting harking back to a much earlier plan (about 1970) to make a new Life Science building on the North Haugh to put all Sciences including the Gatty together following the creation of the new Chemistry, Physics, and Mathematics Institutes. It was pointed out then that a Marine Laboratory on such a site was not practicable with sea water tanks on the roof feeding basement aquaria. Nor did the University believe that a new Life Science laboratory could be made at the Woodburn laundry site

(proposed by MSL). Professor Slater's idea more or less came to the same conclusion, but was not put into practice.

**Final Chapter**

And what of science produced during these various phases of the fortunes of the laboratory? The scientific output of the Gatty Marine laboratory reflects not only the vicissitudes but also the fashions of the various periods through which it has operated.

The mid 1800s saw much activity in the recognition of animal and plant species. The great collectors visited unknown parts of the world and reported on exotic finds. They sent home specimens for inclusion in zoos and botanic gardens, scientist had their 'Box of Curiosities', much being preserved in herbaria and museums and all in need of description. Descriptive biology, however, was also needed in local nature study. Many early posts in Biology were entitled Chairs in Natural History since they included studies in all natural phenomena such as what we now know as Zoology, Botany, Palaeontology, Geology, Geography, Meteorology, Oceanography and Limnology. Before the days of photography, the resaearch works were filled wih beautiful lithograph illustrations of.whole animals and plants.

The growth of knowledge centred on these subjects gradually led to a division of labour and to specialisation. Early courses on rocks eventually split off to become Geology; the study of plants became recognisable as distinct from the study of animals and Botany was established. Such changes were based on the description of more and more material, the realisation that some animals may look like plants (e.g. Bryozoa) even whilst some plants behave like animals (e.g. Venus fly trap, pitcher plants as carnivores) but remain photosynthetic, and the specialisation and speciation of groups. Common species were identified and classified, new habitats explored and their indigenous fauna and flora noted. Books and monographs illustrating the various species increased in detail and coverage. Expeditions such as the deep sea Challenger exploration showed life to exist where previously it was thought barren. These trends are still evident as in the discovery of the 'black smokers' and deep sea vents, and the growing realisation that the Amazonian rain forest contains many more species of insects than are at present described.

Experimental work was, of course, also carried out, much of it concerned with medical studies. Anatomy had become scientific and exact and anatomists became more concerned with fine

structure and disease characteristics than with distribution and position of muscles and bones. The understanding of bodily processes through physiology (and its offshoot Biochemistry) made progress but comparative studies utilising less advanced forms tended to lag behind until it was realised that simpler form also solved problems of life in similar ways to more advanced forms though they may also show specialisations not demonstrated in higher forms.

Not surprisingly, therefore, when McIntosh came to the Chair of Natural History in St Andrews he had been involved for many years in descriptive zoology. Collections made by himself and his relatives from the shores around Fife had sustained his off duty activities whilst he earned his living as a medical man. The period at Murthly had been enriched by his work on annelids (especially polychaetes) and he had become involved in dealing with collections from other more exotic sources through his professional interactions with scientists elsewhere. In 1873 he published the first volume of his massive treatise on British Annelids though this first book dealt with animals, the phylum Nemertea, which are not annelids by definition.

This classificatory and descriptive anatomy type of work was to occupy McIntosh throughout his life and he reached the end of the annelid commitment only in 1923 with the publication of the last volume which had been much delayed by the First Great War. His plates, lithographs etched on stone, and later coloured, were printed in Germany and had lain in the printers store until the end of the conflict. Two volumes were delayed, one scheduled for issue in 1915 and the last for 1920. Instead they appeared in 1922 and 1923. They were published under the aegis of the Ray Society, a group of scientists dedicated to taxonomic and systematic work both in Zoology and Botany and of which McIntosh remained a member until his death.

McIntosh remained a taxonomic zoologist dealing with annelids for over 60 years, but also became involved in other types of work, notably the fisheries around Scotland. When he moved to St Andrews as Professor he obtained support from the Fisheries Research Board of Scotland, and was recruited onto the Trawling Commission to investigate the impact of steam trawling on the fishery yields. There was much passion and dismay about powered boats and the influence on the traditional methods of fishing around the coats. The long liners, sail boats, with their necessity for baited hooks, daily trips from many harbours, the number of boats employed and the people concerned with preparing, repairing, baiting hooks culturing the mussel bait, marketing the catch

and generally concerned with the industry was large, as any photographs taken at the time will confirm. The harbours were forests of masts from side to side and one could walk across the harbour on the decks of boats. Much of their catching interest was in herring.

The fishing fleet, however, at that time was very vulnerable to the weather. Despite the courage of the crews and the sturdiness of the boats the fickleness of the movements and production of the fish, the lack of power available at will and of reliable life saving apparatus, people and organisation, led to considerable loss of life during severe weather. St Andrews and the Fife coast were no exceptions (see Bruce, Reminiscences of St Andrews Bay, Gourlay Fisherfolk) and on occasion the fishing fleet suffered badly. The development of power allowed more directed movement, resistance to driving winds, greater endurance and powered winches and fishing methods. Small wonder that the traditional yawls and other sail boats found their livelihood threatened. The introduction of the steam trawler was thought to influence not only the catch, but also the future catch. Most food fish were believed to lay their eggs on the bottom and hence any 'scraping' of the sea floor would leads to a loss of the future population for fish. In fact Sars in Norway had shown in the mid 1860s that the eggs of such fish as cod, gurnard and haddock all floated and hence the implications for destruction were invalid. Nonetheless herring eggs do stick to the sea bottom and the local concern had some point but it was perhaps ironic that the herring fishery failed anyway for oceanographic reasons.

McIntosh saw the trawling commission and its outcome and influence as an opportunity to assist the fishing industry by determining how fish did develop and by identifying the stages of growth and assessing fish stocks and replacement rates. In 1882 he came to St Andrews and in 1884 he established the St Andrews Fisheries laboratory with grants from the Research Board in the new built and unused fever hospital (see chapter), with its running seawater, tanks and visitors McIntosh was one of the first scientists in the country to attempt a systematic approach to fish culture. In this he competed with Professor Cossar Ewart in Edinburgh and between them the two may be considered to have founded a lively interest in fish farming in Scotland though this was not necessarily their purpose. The land based studies were coupled with the work of the Trawling Commission and trips to sea provided catches which were analysed for numbers and composition. For fifteen years McIntosh published extensively on fishing problems and these were summarised

and reviewed in his books British Marine Food Fishes (published in 1897) and the Resources of the Sea (1899). His overall conclusions and philosophy would not be acceptable and many argued with him then. Basically he believed the sea was inexhaustible and eternally regenerating. Man's activities would not unbalance productivity save temporarily and locally. He did not envisage the days of sonar location of shoals, high speed trawling, and large factory ships and could not have realised the impact of improved (sic ?) fishing methodology and technology. It should also be pointed out that he had a completely different viewpoint to his successor and colleague Sir D'Arcy Thompson whose concern with fisheries lasted just as long, was just as active through ICES (International Council for Exploration of the Seas) but who relied much more on statistical analysis and not practical applications.

The fisheries work at St Andrews was instrumental in focussing attention on this industry in a variety of ways. McIntosh became a founding father of fish farming, of sea resource estimation and of scientific investigation of the sea and it's animal content. He was pilloried in the press, burnt in effigy in front of his own front door, but stuck to his principles. He trained men who later became influential in their own right in fisheries work, notably Edward Prince who founded the Canadian fisheries service, and A.T. Masterman. The success of the operation, and others, led to the decision by the Government to establish a large dedicated laboratory at Aberdeen and McIntosh returned to his academic science. The Department of Agriculture and Fisheries Laboratory at Torry in Aberdeen is the direct lineal descendant of this process and is still involved in assessing fish stocks, and giving advice and research information to the fishing industry in both technical, applied and fundamental technology. In 1895 McIntosh's friendship with C.H. Gatty led to the building of his new workplace.

It must not be forgotten that McIntosh was a University professor and as such he taught courses. He was therefore an educator and part of his time was spent in lecturing and practical classes, as well as research. He also lectured in other places, Universities, Institutes and Clubs and had Open Days (hosted by his sister and himself) in which the general public were exhorted to interest themselves. The Marine Laboratory housed students as well as staff; but as we have seen with McIntosh's death in 1931 the laboratory effectively closed. D'Arcy Thompson saw no need to

use it, and though Professor Graham, Botany, eventually argued for it's reopening this did not happen until the end of the Second Great War. By that time science had changed.

Technology advances by leaps and bounds under the influence of armed conflict. This was especially notable in 1939 - 1945 war when methods for searching for signals for enemy troops, aircraft, ships, submarines and for improving communications took the physics of such methods to levels unknown previously. These techniques came into prominence after the war as science utilised them for its own purposes. The oscilloscope, designed and used in the 1930's became very much more sophisticated; microphones became more sensitive and measuring devices for many chemical and physical processes became more sensitive. The sea became a place of sound instead of silence as the noises made by fish, whales, dolphins, crabs and the like were identified and recorded. The deep scattering layer rose and fell with the passing days and nights and was recognised by echo sounders and other reflected information as emanating from living sources.

Experimental science, in particular experimental biology, is essentially parasitic on physico-chemical advances. As the physical scientists and engineers improve their instruments so biologists utilise these for more and more detailed analysis of living tissues and processes. Gas liquid chromatography, ultracentrifuges, electron microscopes, gel electrophoresis and so on have all revealed more and more and more about biological materials after development by other sciences.

There was a period from 1950 to 1967, approximately, when publications, the PhD degree, technical expertize with newly available equipment suddenly became of importance to scientists in Universities. Large Universities were able to take advantage of a period of rapid growth in staff numbers to build up a solid base in new techniacl subjects for scientific research, with sufficient critical mass, and at the same time they could retain an excellent teaching staff who could provide interesting challenges for Honours students from their own research. By 1968, with the Rothschild and Dainton reports, the writing was already on the wall. The financial pressures arrived, first on resarch, then on the teaching staff and eventually on facilities of all kinds. In the period from 1950 ,for 20 years, anyone could build a

team, but then it became much harder and only the well-equipped strong groups would survive. Unfortunately for the University, the strong group at the Gatty had gone to the Antipodes.

The success of this physiological experimental approach was very much in the fashion of the day as the anatomical and nomenclature bias of earlier times declined. With the rise of interest in this attitude came additional developments. The expansion of education and increasing prominence of science in everyday affairs led to an increase in the size of the laboratory and in staff (e.g. Dr A.J. Matty in 1958, Dr G.A. Horridge in 1957, Dr D.C. Weeks in 1957), Dr Dodd's own success led to his appointment as Professor in the University of Leeds, his election to the Royal Society, and his subsequent establishment of a new marine laboratory at Robin Hoods Bay, Yorks. Dr Matty also left to take up a post as Professor in the newly founded University of Aston in Birmingham where the work of fish endocrinology continued.

The numbers that grew rapidly in the 1950's and 60's had (and still have) a new enthusiasm for pure research as a way of life. The sea offered a huge variety of interesting animals, the new tequniques mde anaysis possible. Training in research, a PhD, publications and invitations to overseas conferences increased the prospects of a job or promotion. All over the developed world there was an upsurge of experimental analysis supported by private foundations and government funds.

Before 1940 frugality was a virtue, after 1950 it was a virtue to ask for funds from a variety of sources simultaneously, and use the employment so created to train more scientists. Before 1940 it was sufficient honour to have a University appointment, especially as a professor, wityhh relatively light duties, after 1950 theree was the administartion of a research group, ones own research, teaching and keeping up with the literature. Hands-on research at the bench remanined a virtue, and a 60 hour working week became common for science lecturers and professors.

At the Gatty the post-war changes mirrored thosein the larger Universities of England na America. There was rapid growth in the number and size of universities, a rapid improvement in the equipment that could be purchased, and a popularization of science in magazines.

At the Gatty Dr Horridge now became Director (1960), and for the next few years another emergent field of biological science became paramount, that of neurobiology, the study of nervous

system using modern methods. An electron microscope made it's appearance, oscilloscopes became commonplace, audio amplifiers and loudspeakers played not the Third programme but action potentials, and electrodes were implants in single nerve cells. The extreme sensitivity of such techniques could be disconcerting; in the quiet of the evening with a lobster nerve hooked over an electrode Radio Moscow or India occasionally came through loud and clear. The nerve acted as an aerial. The invertebrate nervous system ranging from ctenophores like Pleurobrachia through annelids (shades of McIntosh) like Nereis and Harmothoe to molluscs and Crustacea (lobsters and crabs), in fact all marine groups, were enthusiastically and revealingly observed. These endeavours occupied new members of staff Drs M.S. Laverack, G.A. Cottrell, and D.C. Sandeman as well as numerous post-graduate students (including M. Burrows, R. Chapman, S.E. Shaw, and J. Scholes, I, Meinertzhagen). Many Honours undergraduates also spent their final year at the Gatty mostly involved with neurobiology, but some also in algal Botany with Drs Blackler and Weeks.

In hindsight we can now see that the great advantage of the Gatty was its position as **a marine laboratory within a University**. In Britain there is ashortage of places for research students within marine laboratories, and yet the sea is a great source of interesting and important topics in the biological sciences.

Dr Horridge became first professor of Neurobiology at Australian National University in Canberra in 1969, and at the same time University of St Andrews founded the Chair of Marine Biology which was filled by Dr Laverack. This ensured a continuity of activity in the field of neurobiology of marine organisms with appointments such as I.D. McFarlane, J.L.S. Cobb, to strengthen the group, followed by Dr P.A.V. Anderson and W.J. Heitler as replacement in due course. This field has been ploughed deeply and continuously from 1960 till the time of writing (1989) and shows no sign of exhaustion.

During the period of the late 1970s many concerns began to arise about the quality of the environment, numerous scares regarding pollution and overuse, of changing climate, new discoveries in oceanography and deep sea biology as well as the enormous popularity of TV programmes on the sea and its natural history led to recognition of new areas. Undergraduate demands for courses in Marine Biology saw the start of an Honours course in this subject which quickly became popular. New staff (Dr C.D. Todd) introduced the thread of ecology. This new look at the environment, the habitats it provides, the plants and animals it houses and the effects of man

on it required specialist instruction and research and this is now another well defined research field. The energetics of larval settlement and dispersion, reproductive cycles, and the genetic composition of marine invertebrate populations in the wild are all under investigation. The possible influence of new sources of disruption such as the Torness nuclear power station on local animal communities are also sources of research interest and funding.

More can be added to the endless debate about the value of blue-skies research and the chance of an practical application. Some topics, like that of Horridge's PhD thesis, the behaviour of Jellyfish, are not likely to yield a dividend in economic applications, but other topics just as academic are well placed to bear fruit. Most recently the appointment of a new Director, Professor I.A. Johnston, has continued the experimental aspect of Gatty work, through the medium of physiological studies of fish muscle and its actions in swimming in animals taken from such disparate regimes as the North Sea and the Antarctic Ocean. The analysis of structure, function, electrical activity, force generation and temperature effects provides an understanding of the processes of swimming and its energy demands. The public consumption of fish muscle has increased with better methods of freezing and distribution and muscle quality is significant. A better understanding of its basic properties may be valuable in preparing better farmed fish. At the same time, however, there has been rekindled an interest in endocrinology with Dr N. Hazon looking at osmoregulation and the maintenance of water/salt balance in fish, and from Dr Bentley on reproduction control in marine invertebrates, Dr Val Smith - Immunology.

This short review of the type of science conducted within the walls of this marine laboratory reveal that it has altered from time to time, but that since the war functional and physiological studies have dominated, growing ever more detailed as new methodology provides additional opportunities for appraisal of fundamental; processes. There can be no doubt that it will change again in the future as staff and interests vary. One conclusion is obvious, that a great number of reccomendations and reports that originated outside the Gatty have never been put into effect. Instead, the progress and achievements have been made by individual leaders with flair, ploughing and planting their own furrow. Such is the small scale of a microcosm of the world of scientific research.