The Glasgow Naturalist (2024) Volume 28, Supplement, 115-126 https://doi.org/10.37208/tgn28S03

THE FLOURISHING OF GLASGOW ZOOLOGY: 1973-2023

Chairs, buildings, teaching, outreach and social life

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ABSTRACT

This article takes the arrival of John Graham Kerr (JGK) in 1902 as its starting point, but mainly examines developments and activities in the University of Glasgow's Zoology Department and successor structures following the first 50 years (described in the set of articles titled *University of Glasgow Department of Zoology 1923-1973*). The topics here cover 50 years of substantial change in: (a) chairs, headships, re-organisations from department to division to institute to school; (b) the buildings, not only the original Zoology building and the many alterations it has undergone, but additional ones, some short-lived, others long-term; (c) teaching of undergraduates, including the courses delivered, how they have changed and diversified, and student numbers; (d) postgraduate education, both research degrees and taught masters, including numbers; (e) outreach - taking Zoology outwith the University, an activity JGK pioneered; (f) social life: being a member of Glasgow Zoology is not all work! Specific aspects of Glasgow Zoology, especially research themes, are covered in a subsequent set of short articles.

INTRODUCTION

It is perhaps a little cheeky to invoke the city's motto - *Let Glasgow Flourish* - for this section on the history of Glasgow Zoology, but I think that the expansion and development of Zoology at the University of Glasgow over the last 50 years make it appropriate as an image, especially in light of the city's coat of arms with its tree, bird and fish. This first article covers the chairs and departmental re-organisations, the buildings, teaching, both undergraduate and postgraduate, outreach, and finally the lighter aspects of life in Zoology.

CHAIRS AND HEADS OF DEPARTMENT, DIVISION, INSTITUTE AND SCHOOL

Traditionally, Regius Professors were appointed for life, and acted as head of department (Sir D'Arcy Thompson died in post as Regius Professor of Natural History at St. Andrews, aged 88). In the late 1970s, the University of Glasgow allowed the separation of the administrative duties of head of department from the role of appointed professor. In 1979, David Newth demitted office as head of Zoology and became Dean of the Faculty of Science, retiring just two years later to Hell's Glen, Lochgoilhead in Argyll; his health was not good and he died in 1988. Latterly, he made valuable contributions to wildlife conservation as chair of the Nature Conservancy Council's advisory committee on science.

Keith Vickerman was promoted to professor and was appointed head of department to replace Newth in 1979. The University had agreed years earlier to establish a second chair in Zoology, but had not actually filled the post until Vickerman's appointment in 1979. In 1984, Vickerman was appointed to the Regius Chair, and David Crompton moved from Cambridge to take up the second chair which was now named after Graham Kerr. Vickerman remained as Regius Professor until his retirement in 1998. During his tenure, he was elected Fellow of the Royal Society, a rare accolade for a Glasgow scientist at that time.

In 1985, Stephen Phillips became head of department. The job was now a four-year, once-renewable appointment, made by the University but with departmental members consulted on the suitability of candidates, and not necessarily reserved to a person with professorial status. This made the headship a more manageable task. Around this time, the University introduced clear and transparent criteria for promotions at all levels, including to professor, and the proportion of promoted academics began to rise.

After Vickerman's retirement, there was no Regius Professor, until Pat Monaghan was appointed in 2013, a gap of 15 years. She remains in post, but there has been no appointment to the Graham Kerr chair since Crompton's retirement in 2000. After the re-organisations described in the next section, the headship was of a Division or Institute or School, rather than of a department, and the duties altered as certain responsibilities were devolved to a centralised administration.

DEPARTMENTAL RE-ORGANISATIONS

The Faculty of Science at the University of Glasgow arose from the reforms to the four ancient Scottish Universities recommended by the Royal Commission led by Thomas Henry Huxley in 1877, followed by the Universities (Scotland) Act of 1889, and was formalised in 1893. Its centenary was celebrated both by events and publications: Thomson (1993) and Downie & Stewart

(1993). The Department of Zoology was established in 1903, following the separation of geology from the previous single subject of natural history (at Glasgow, botany was never part of natural history as an academic subject, because botany was regarded as an adjunct to medicine).

By the mid-1990s, serious change was in the air. The biological sciences existed as a multitude of smallish departments located either in the Faculty of Science, or Medicine, or both. The fragmented structure was thought to be disadvantageous in the struggle for resources, and in maximising our research potential. There followed a series of convulsive re-organisations affecting administration, teaching and research: this process may not be at an end, even in 2024.

Focusing here on the impacts of these changes on zoologists, the first re-organisation placed most Zoology staff in a new Division of Environmental and Evolutionary Biology (DEEB) along with a small number of plant ecologists; parasitologists were moved to a separate Division of Infection and Immunity, along with immunologists and microbiologists; and comparative physiologists were united with neurobiologists and human physiologists (Neuroscience and Biomedical Systems- NABS). These arrangements broke up many longstanding professional relationships and were deeply upsetting for some. They did not even last long: Keith Vickerman argued that, as Regius Professor of Zoology, his place was in the Zoology building, not elsewhere. The over-arching structure was now the Institute of Biomedical and Life Sciences (IBLS), which soon morphed into the Faculty of Biomedical and Life Sciences, separate from the other sciences. In addition to the subject-specific Divisions, two educational schools were established: the Undergraduate School and the Graduate School. Their role was to establish common patterns of teaching and training across the Institute, and to provide a system for coping with the increasingly important external regulatory procedures affecting higher education, such as the Teaching Quality Assessments (TQA).

This structure lasted for about a decade, and was replaced in 2010 by a root and branch transformation of the University's structure with the replacement of the faculty system by a set of Colleges, each with a director appointed by the University's Principal. Biologists were transferred to a College of Medicine, Veterinary Medicine and Life Sciences (MVLS). An overt aim of this re-organisation was a separation of staff into research institutes where teaching would be a minimal activity, with the remaining staff expected to do little research, but the bulk of the teaching. "Research-active" zoologists were members of the Institute of Biodiversity, Animal Health and Comparative Medicine; those focusing on teaching were assigned administratively to the School of Life Sciences. The tensions created by this arrangement festered for another decade, until a further re-organisation in 2022. Zoologists are now located in a School of Biodiversity, One Health and Veterinary Medicine: although some staff focus more on teaching than on research, this is no longer a rigid arrangement. One positive result of the past re-organisations is the rise in importance of the field of "One Health" bringing together parasitologists and veterinarians with interests in animal and human health interactions.

I remember years ago seeing a postcard in a colleague's office giving the text of a comment on re-organisations, purportedly written by an ancient Roman soldier Gaius Petronius Arbiter (but actually now attributed to American writer Charles Ogburn in 1957!): "… we tend to meet any situation by re-organising, and a wonderful method it can be for creating the illusion of progress while producing confusion, inefficiency, and demoralisation". I leave others to judge whether or not the biological sciences re-organisations described accord with Ogburn's cynical view.

THE BUILDINGS

Introduction

In 1973, the staff of the Zoology Department were housed in four locations: the Zoology building on the Gilmorehill campus; the Field Station at Rowardennan; the Wellcome Parasitology Laboratory at Garscube estate; and the Developmental Biology Unit at Horselethill. A remarkably detailed article in *Nature* (Anon., 1965) had described the setting up of the Electron Microscope unit and behaviour laboratory in the basement of the Zoology building, the Electrophysiology unit in the yard, the building of the Field Station at Loch Lomond, and the Wellcome Unit for experimental parasitology at Garscube, all over the last few years. The need for some of these additional facilities arose from the rapid rise in staff and student numbers during C.M. Yonge's and D.R. Newth's periods as head of department. As noted by Vickerman (1993), Newth had a policy of maintaining groups of at least three members of academic staff in each subject area (developmental biology, parasitology etc.) and staff numbers rose from 18 to 34 during the 1970s.

The Developmental Biology Unit was relatively short-lived as part of the Zoology Department, opening in 1973 and closing two decades later: it was housed in one of two University-owned buildings at the junction of Dundonald and Horselethill Roads in the Hyndland area, the other building accommodating the Department of Oncology. See my article on Developmental Biology later in this Section. Staff retirements in the early 1990s led to closure of the unit. However, the building was invaluable following the fire in 1988 (see later article by Stephen Phillips) as a refuge for staff and equipment. It later became the Department of General Practice in the Medical School. The Field Station has a complex history (see later article by Colin Adams). The Wellcome Laboratories for Experimental Parasitology are described in the later article by Stephen Phillips.

The Zoology Building itself has been in a state of flux since the 1940s. Yonge (1973) described the changes made during his time. Events since then are now outlined, starting from the basement up.

Basement
In the 1970s, the basement contained the museum store, the departmental stores (equipment, chemicals, stationery), the electron microscope unit, and the photography unit. Since then, the museum collections have moved to new facilities in the Kelvin Hall. The electron microscopes have moved to a College facility in the Joseph Black building (previously called Chemistry); departmental stores have been consolidated into a College facility too, as have photographic and graphics facilities. The space freed up by these moves has been converted gradually to house a set of marine and freshwater aquaria.

Ground floor
The changes to the Museum are described in a later article by Maggie Reilly. In Yonge's time, an annexe was constructed on the west side of the building for the use of the agricultural zoologists. A lack of recruitment and retirements led to the closure of this group by the mid-1990s. The annexe was demolished and replaced by an animal house for the College, with a set of Zoology offices and a seminar room on the upper floors. In the yard, on the south side of the building, a structure was built in Yonge's time to act as an animal house for the parasitologists. Following their move to Garscube, this space was refurbished as an electrophysiology laboratory; then the electrophysiologists moved to a laboratory constructed from one side of the museum, and Vickerman's protozoology group replaced them in the yard. Later still, the building was occupied by Peter Meadows' biosedimentology group. Most recently, it has returned to being an animal house, full of zebra finches, with other buildings filling up the yard to house more finches, and some amphibians and lizards.

Upper level
Early in Newth's time, a "roof laboratory" was constructed above the museum. Much of this new space was devoted to facilities for experimental and comparative physiology, with the rest of the space given to offices. On a Friday night in February 1988, there occurred the most dramatic event in the building's history: a fire broke out in the roof laboratory. The flames could be seen for miles around, and the disaster made the national television news. The water used to extinguish the blaze leaked into the museum below and threatened many of the specimens (recently refurbished). Next morning, stunned staff assembled to hear head of department Stephen Phillips describe how we were going to cope, and that we would teach, as normal, on Monday morning (which we did!). My office had been one of those damaged by the fire: remarkably, documents stored in closed filing cabinets did not burn, presumably owing to the lack of oxygen; they emerged charred but essentially intact. For more on the fire, see later articles by Stephen Phillips, Maggie Reilly and Douglas Neil. A new roof laboratory was then constructed to a much higher standard than the original, and was opened by the Secretary of State for Scotland in June 1991.

In the 1990s, the University decided to name buildings after eminent figures associated with them, rather than by subjects. In Zoology's case, the obvious choice was to name it after Sir John Graham Kerr: this was achieved in a naming ceremony on 24th May 1995, where JGK's son Adam unveiled a commemorative plaque which is now located beneath JGK's portrait in the upper foyer.

TEACHING: UNDERGRADUATES
JGK regarded teaching undergraduates as his primary activity. As the department grew and developed, tensions arose between staff who wished to prioritise research and those who continued to focus mainly on undergraduate teaching. The frustrations felt by some eminent researchers arising from the high teaching loads are well expressed by Vickerman (1993). Here, I describe some of the main developments in teaching over the last five decades.

Medical teaching
Medical teaching was JGK's main focus, since most of his students were first year medical students being taught the fundamentals of biology. From the 1960s to early 1990s, medical teaching remained a major part of the department's responsibilities. S.A. Barnett's textbook (Barnett, 1957; followed by another four editions), based on the course, was a major output of the curriculum taught. Everything changed following the publication of the report *To-morrow's Doctors* (GMC, 1993), which called for major changes in both the curriculum and the general approach to teaching medicine. The University of Glasgow responded by creating a Medical School, for which a new building was constructed, and by totally re-designing the undergraduate curriculum and way of teaching. Formal lectures were largely replaced by the concept of problem-based learning in small groups. This involved the creation of new teaching units and the training of staff to act as facilitators rather than as lecturers. To avoid continual grumbling about what was being lost from the old curriculum, many of the staff brought in to teach in the new way were deliberately chosen for their lack of involvement with the old course! I was one of these staff, and was entrusted with designing the first five-week unit of first year, intended to set the tone and establish the method of teaching and learning: we decided to start with wounds, wound healing and wound treatment. In addition to the main topic blocks, the new curriculum allowed students to take so-called five-week special study modules (SSM) which need not be on core medical topics. Many students chose SSMs in foreign languages and other non-medical subjects. In Zoology, we designed and taught an SSM on *Evolution in health and disease* (Downie, 2004 a,b): the idea for this coincided with the publication of the seminal text by Nesse & Williams (1995).

First year biology
Until the late 1960s first year science students at Glasgow University could choose to take ordinary courses in Zoology and/or Botany. However, at school level, biology had become an integrated subject, and David Newth argued for such a unified course at university too. Biology-1, taught by staff from the

departments of Zoology, Botany, Cell Biology and Genetics, began in 1969 under the leadership of parasitologist Adrian Hopkins, a teacher of considerable charisma. In 1970, the locus of the course moved to the newly-constructed Boyd Orr Building, designed for first year science teaching, with a set of modern teaching laboratories (John Boyd Orr, Nobel laureate for his work in the United Nations Food and Agricultural Organisation, had been taught biology by JGK before the First World War). This move freed up space in the Zoology building, and allowed for a huge expansion in first year biology student numbers, soon rising above 600, and now 800.

As Newth (1973) mentions, the Nuffield Foundation Inter-University Biology teaching project funded a collaboration between Zoology and the Department of Education. The result of this project was the creation of a set of self-instructional biology tape/slide programmes, based on the principles of programmed learning set out by William Dunn of the University's Department of Education, plus the establishment of a self-instructional biology laboratory on the top floor of the Boyd Orr Building, directed initially by Gaye Manwaring, who moved to the University of Dundee when the Nuffield funding ran out. The concept behind this set-up was the provision of a wide range of resources aimed at meeting the different learning styles of students. A set of the self-instructional programmes was published by Longmans. The self-instructional biology unit also permitted some original thinking on ways to improve teaching in biology (Downie & Maden, 1981).

Other first year courses

David Newth regarded biology as having a generally civilising influence, and felt all students should have the opportunity to study it. He stimulated the development of a Human Biology course for arts and social science students, taught from the mid-1970s, and this was well-regarded by students who appreciated the discussion-based format of many of the laboratory sessions. A later development was a response to growing concerns over the environment: Environmental Science-1 brought together staff from Zoology, Chemistry and Geology. Later re-organisations reduced this to Environmental Biology-1, still delivered.

Second year (level 2)

Until the changes of the mid 1990s, zoologists were involved in the delivery of three level-2 courses: Zoology-2 acted as the main qualifying course for Honours in Zoology, and provided a survey of the animal kingdom, accompanied by a showcase of the special topics offered at higher levels such as animal behaviour, parasitology etc. Applied Biology-2 was the main qualifying course for the Honours course in Agricultural Zoology, but also provided coverage of applications such as animal welfare and conservation science. Marine Science-2 was created for the large numbers of students interested in the marine environment, and was taught by zoologists, botanists and marine engineers, a truly inter-disciplinary course.

The creation of IBLS stimulated a re-think of level-2 teaching. Under the direction of biochemist Ailsa Campbell, the concept was that the core areas of each biological discipline should be presented, but also that cross-disciplinary topics should be available, with staff encouraged to be innovative. Each course was worth 10 credits in a 120-credit year, so students generally studied 12 courses, with a small number acting as prescribed qualifying course for each Honours course. The core courses for zoology Honours were Animal Diversity and Conservation Biology. Zoology staff also contributed to Neuroscience and Behaviour, Reproduction and Development, Evolutionary Biology, and Extreme Biology.

Not everyone on the staff liked this system: it encouraged cross-disciplinary thinking, but some complained that this was at the expense of students learning the fundamentals of their eventual discipline. A later re-organisation created a larger component of core for each main area, reducing student choice.

Honours courses

When JGK arrived in Glasgow, the Honours BSc degree required the study of seven subjects, three of them to a higher level. Under "new" regulations from 1921, the BSc degree was offered in two options, Ordinary and Honours. The Ordinary degree extended over at least three sessions and included five subjects, two of which were studied for at least for two sessions (later named Ordinary and Higher Ordinary levels, then simply levels 1 and 2). The Honours degree required the study of four subjects, one of which would be studied for three, or more usually four sessions. So the Honours degree involved less breadth but more depth than the Ordinary (Thomson, 1993). Students who had performed well in qualifying courses during the first two sessions could then be accepted into the Honours course. The two sessions of the Honours curriculum were examined in the Finals examinations, a daunting set of papers which could ask questions on topics covered throughout the four years. Students could be assessed during the Honours years, but these interim assessments did not "count" towards the final degree classification. Traditionally, the two Honours years of the Zoology degree involved advanced coverage of the animal kingdom, invertebrates one year, vertebrates the other, with successive cohorts of students covering them in alternate orders over the two years. In the 1970s, this system was altered to include a qualifying examination at the end of third year which allowed students to graduate with what was called an Advanced Ordinary degree. In addition, the coverage of the animal kingdom was concentrated into level 3, and final year altered to allow focus on a special subject (such as freshwater ecology, or animal behaviour) plus a research project. The research project allowed students to tackle a piece of genuine research, unlike projects at school level, where tried and tested projects are recycled year after year. This meant that on some occasions, the results led to a publication. When projects were first brought in, there was some discussion over their assessment: some staff argued that the closeness of the interaction between

supervisor and student made assessment problematic. However, for most staff, and students, the time investment in the project argued strongly for the gaining of some credit towards the degree classification, and this argument prevailed. The assessment included an element based on the supervisor's judgment of the student's performance on the practical work of the project, and a larger element based on two independent assessments of the project report.

For the Department of Zoology, the core course was Honours in Zoology, and this remains the course studied by the majority of our undergraduates. However, after the Second World War, a new Honours course in Agricultural Zoology was introduced, with the first graduates in 1949. Numbers choosing this course were never large (2.2 per year over the years 1949-1973, and similar thereafter until the course closed: Table 1), but students were generally of high quality and career focused, especially on the agrichemicals industry. One of our graduates rose to be CEO of the multinational company Monsanto. Unfortunately, staff retirements, with no replacement, linked to the low student numbers, led to the closure of the course in the late 1980s.

In the early 1970s, Newth saw an opportunity to attract medical and veterinary students into our courses, as "intercalated" degrees. This option allowed medical, dental and veterinary students, after successful completion of the first two years of their course, to move into the Faculty of Science and study a relevant course for one or two years, emerging with a degree in the subject chosen before returning to their original course. Newth and colleagues created two new degree programmes: Parasitology and Animal Developmental Biology (see later articles on these subjects). Science Faculty regulations required that these courses should also be available to Science students, and, indeed, the Zoology course also became available as an intercalated degree. Not too surprisingly, over the years, Zoology attracted a few veterinary students interested in "exotic" animals, but no medical students. After *Tomorrow's Doctors* (1993), and the resulting changes to medical teaching, the two-year intercalated degree was withdrawn, and only a single year option was offered.

In the early 1980s, David Crompton encouraged the creation of a new Honours course to take advantage of several strengths: our access to the Clyde marine and estuarine environments including the marine station at Millport; the Rowardennan field station on Loch Lomond, the U.K.'s largest freshwater lake; the presence of several researchers in aquaculture, especially fish welfare aspects. Other universities already taught degrees in marine biology, but Glasgow was unique in uniting all aquatic environments in our Aquatic Bioscience degree (later re-named Marine and Freshwater Biology), taught from 1988. In terms of student numbers, this was a success from the start (Table 1).

The Zoology Honours degree course has been taught since the new regulations began in 1921. Numbers of graduates were initially low (2.0 per year in the 23 years from 1924 to 1946, with no graduates in some years), but increased after the Second World War (4.5 per year in the period 1960-1965) and really took off after the arrival of David Newth (13.3 per year, 1966-1971, later rising to over 50 per year: Table 1). To accommodate the increased numbers and to allow students to specialise according to their interests, the Junior Honours (level-3) year included options at various points, and these were helpful in providing courses for the new degrees, such as Parasitology. Therefore, students on each degree were sometimes taught on their own and sometimes in combined classes with students on one or other of the Zoology-related programmes. Table 2 shows the level 3 course structure for the four programmes as delivered in 1995-1996.

Such diversification clearly required more academic staff. As Vickerman (1993) has described, the academic staff complement in Zoology increased from 18 to 34 in the 1970s. It was rumoured that, at its peak, Glasgow Zoology was the largest such department in Europe. Unfortunately, as student numbers continued to rise, funding did not follow, and the increased student/staff ratios created strains, also described by Vickerman.

Later, after the formation of IBLS, the Undergraduate School attempted to create common patterns of Honours teaching across all bioscience degrees: the structure agreed was that final year should be divided into four five-week optional courses, plus a research project. Table 3 shows the Zoology-related course options available in 1995-1996. More recently, under the College, this has been slightly modified, but the general

	Programme					
Decade	**Zoology**	**AZ**	**MFB**	**DB**	**Parasitology**	**Total**
1970s	25.8	2.8	-	2.0	4.0	34.6
1980s	30.1	3.1	-	2.8	5.0	51.0
1990s	35.8	-	14.4	7.8	18.7	76.7
2000s	47.2	-	12.1	-	10.1	69.4
2010s	55.6	-	19.4	-	9.9	84.9

Table 1. Average annual numbers of Honours graduates in Zoology and related degree programmes by decade. Raw data supplied by Guilhem Vadon and Emily Howie. The final graduates in Agricultural Zoology were in 1989 and in Developmental Biology in 1998; Parasitology ceased to be a separate programme in 2020. Programme name changes: Animal Developmental Biology lost the word "animal" in 1986; Aquatic Bioscience became Marine and Freshwater Biology in 2012. AZ, Agricultural Zoology; MFB, Marine and Freshwater Biology; DB, Developmental Biology.

Zoology
Term 1: Biodiversity, Computing, Microscopy, Freshwater and Terrestrial Ecology Field Course (Rowardennan), Vertebrate Biology OR Biology of Parasites, Biometry.
Term 2: Animal Physiology OR Immunology and Immunoparasitology, Biometry (continued), Reproductive Biology OR Pelagic and Benthic Processes OR Molecular and Biochemical Parasitology with Chemotherapy.
Easter vacation: Marine Biology Field Course (Millport).
Term 3: Arthropods and Vectors.
Aquatic Bioscience
Pre-term 1: Marine Biology Field Course (Millport).
Term 1: Biodiversity and Aquatic Environments, Computing, Vertebrate Biology, Biometry.
Term 2: Animal Physiology, Biometry (continued), Pelagic and Benthic Processes.
Term 3: Water Quality, Freshwater Field Course (Rowardennan).
Developmental Biology
Term 1: Cells and Tissues, Computing, Developmental Processes, Molecular Biology of Development.
Term 2: Vertebrate Organ System Development, Reproductive Biology.
Term 3: Fetal-Maternal Relations, Evolution of Developmental Systems.
Parasitology
Term 1: Biodiversity, Computing, Microscopy, Biology of Parasites, Biometry.
Term 2: Immunology and Immunoparasitology, Biometry (continued), Molecular and Biochemical Parasitology with Chemotherapy.
Term 3: Arthropods and Vectors.

Table 2. Course content of Zoology and related degree programmes at level 3 in 1995-1996. In addition to lectures, practicals and field courses or a discussion weekend, programmes included small group tutorials. In 1995-96, the University teaching year contained two ten-week terms and a five-week third term. A few years later, the University changed to a two-semester teaching year.

Term 1
Weeks 1-5: Marine ecosystems; Biochemical Parasitology; Animal Behaviour.
Weeks 6-10: Cellular Morphogenesis; Physiological ecology; Parasitism and Disease; Behavioural Neurobiology; Insect Anatomy and Systematics.
Term 2
Weeks 1-5: Freshwater Ecology; Immunology of Parasitic Infections; Behavioural Ecology. Weeks 6-10: Fisheries and Aquaculture; Molecular Parasitology; Applications of Ecological Principles.

Table 3. Level 4 optional courses (five weeks each, 30 h contact) offered by Zoology, 1995-1996.

principle has been maintained. For many years, the Zoology Department published an annual *Students' Guide to Honours Courses*, distributed to all staff and students, detailing the timetables for all courses. The *Guides* had attractive covers featuring zoological subjects (Fig. 1).

Work placement year

Another IBLS innovation, created by David Crompton, was the introduction in 1996-97 of a work placement year. Many universities were dealing with the criticism that degrees were too theoretical and divorced from the world of work by incorporating work placement components of varying sorts. IBLS decided on a full year's placement, taken between the two years of the Honours programme, and that the placement should involve a research project. Because the work-places offering placements would look after the students for a whole year, IBLS decided that only good quality students would be permitted to go on placement. Therefore, students who have good grades after years 1 and 2 are invited to apply for the placement year. They are then selected on the basis of their written application and a rigorous interview. After this, selected students have to organise their placement, with the assistance of staff. For Zoology-related degrees, organisations offering placements include conservation charities, zoos, museums, government agencies, some companies and other University departments. Placements can be at home or abroad. Members of Glasgow's staff act as mentors to each placement student during the year away. The inclusion of this extra assessed year converted the Honours degree into a five-year Master in Science (MSci) qualification, with the placement year assessed on the basis of the student's written report, an oral examination and a review essay. The placement location supervisor sends a report on the student's performance, but this does not contribute to the grade. In the five years 2020-2024, 26 Zoology and ten Marine and Freshwater Biology students have gone on placement, from Iceland to New Zealand and most places between. In session 2023-24, three are in Australia, one at Chester Zoo, one in Hawai'i, one with the RSPB in Edinburgh, and one working on urban biodiversity in Glasgow. The departure of the U.K. from the European Union has made the organisation of placements elsewhere in Europe highly problematic because of the loss of the right to freedom of movement. Funding for the placement year is challenging in Zoology-related organisations which often lack resources. The placement students often earn their keep by working part-time, say in the organisation's shop, while carrying out their

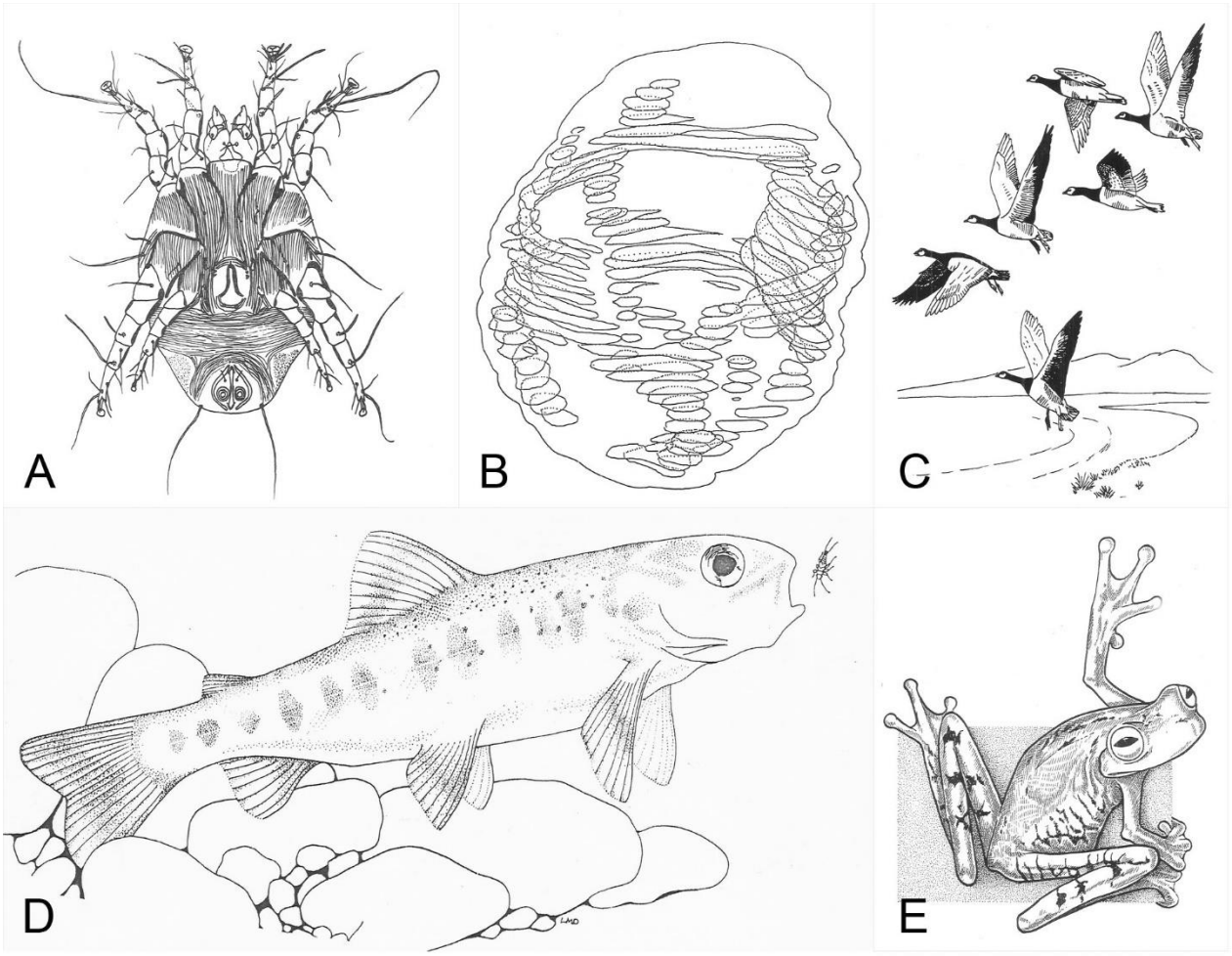

Fig. 1. Cover illustrations from Zoology Students' Guides 1984-87. (A) Ventral view of a male European house dust mite: these mites are responsible for allergic disorders in people, and can also transmit a bacterial disease; departmental researchers developed an assay for monitoring levels of mite allergens in the homes of chronic asthmatics. (B) computer-aided reconstruction of the mitochondrion of a *Leishmania* parasite: this parasite causes skin ulcers in Central American forest workers; Glasgow research worked on how the parasites evade the host immune response. (C) Barnacle geese (*Branta leucopsis*), which breed in the high Arctic and overwinter in Scotland: on Islay, high numbers of the geese result in conflicts with farmers which Departmental researchers found ways to alleviate. (D) A salmon parr feeding on an invertebrate: Departmental research investigated why some parr stop feeding early in life, while others continue for up to four years at this stage before migrating to the sea. (E) A tree frog attached to a vertical surface: when this species was studied in the 1990s, it was named *Hyla crepitans*; after taxonomic revisions, it has become *Boana xerophylla*; work on 12 Trinidad species by Jon Barnes and expedition students showed that frogs stick by means of wet adhesion.

research project the rest of the time. Placement students tend to be highly motivated, and their reports often form the basis of later published papers; a high proportion of placement students progress to PhD programmes.

Change and innovation in Zoology courses

As described in *Gallery,* JGK was an innovator in his approach to Zoology education: he overturned tradition by starting with Protozoa, especially those of medical importance (as shown in *Dr Flo's Lecture Notes*, this volume), and he was particularly keen on the educational role of a well-organised museum. In the earlier section on First year biology, I described the Nuffield-funded project on self-instructional facilities. Here, I describe some of the other innovations brought into Glasgow Zoology teaching.

Dissection and its alternatives

Comparative anatomy was the core of Zoology in JGK's time. In the 1960s, dissection of fresh or preserved specimens remained a crucial part of the laboratory course at all levels. Walter Edgar remembers being provided with a small crocodile to dissect in final year, along with a hacksaw to cut through the tough skin! In my year, each student was given a tortoise, with instructions to kill and dissect it; most of us released them in our gardens. The practice of providing students with exotic and possibly endangered animals to dissect is now long gone. From 1970, in first year biology, dissection of a laboratory rat, with students working in pairs, was structured as an investigation of mammalian structure and function, including simple experiments on the lungs, stomach and kidneys. However, by the 1980s, significant numbers of students were unhappy over the killing of animals specifically for their education (the dissection of a sheep's heart and lungs did not generate the same anxiety, because it used slaughterhouse material, where the animals had been killed for food).

Our solution was the offer of an opt-out, where students could choose to do the work of the class using a model rat, thereby saving an animal's life. Students made their choice following discussion of the issues with their peers and a class demonstrator, thereby providing an experience of practical ethical decision-making. Over five years, about 10% of students chose to opt-out, though many of them chose also to watch the later stages of the dissection once they had finished working on the model rat (Downie & Meadows, 1995).

Bioethics education

Experience with the dissection opt-out and other issues concerning the uses of animals in education led to a Marie Curie Grant-aided education research project that introduced ethical decision-making into all branches of biological science education at the University of Glasgow (Downie & Clarkeburn, 2005). Each speciality had its own set of issues: wildlife conservation ethics and animal welfare, for example, for zoologists; but there was also a focus on professional ethics, now usually termed "research integrity". The development of our courses in this area coincided with the activities of the Higher Education Academy's biology special subject group on bioethics, and the Quality Assurance Agency's *Benchmark on the Biosciences* (2002; most recent version 2023), which includes strong recommendations on the role of ethics in biosciences higher education.

Discussion-based teaching

Bioethics is largely taught using scenario-based discussions: students in small groups discuss a particular problem, then report back to a plenary, allowing comparison of viewpoints. Zoology at Glasgow was early in its use of discussion-based methods. I recall a frankly terrifying course on concepts in animal behaviour, designed by Tony Barnett, in the second year course I studied in 1964. Each day, we were given a short paper to read and think about: one was on Clever Hans, a horse that was reputed to be able to count; another was on the nature of consciousness, still a notoriously hard problem. We had been used to sitting in rows in the lecture theatre, with the lecturer on a podium at the front. But for the first of these "free group discussions", the chairs were in a circle and when Barnett came in, he sat at a chair, offered us "good morning" but said nothing more, and waited for us to talk. After an hour of excruciating, desultory comments, Barnett handed out the next topic, and left. We got the message: we were seriously expected to be prepared and to discuss the topic, not to rely on the lecturer, and the discussions grew more lively and even coherent. David Newth was also keen on discussion, and introduced a weekend residency during the first term of level 3 at The Burn, a country house in Edzell, Angus. I recall the female students complaining that we should have told them how grand it was, so that they would have known to bring their best clothes! The discussion topics were mostly chosen by staff, but the students were asked to come up with one. Memorably one year, they decided on "What is normality?" and set R.D. Laing's *The Divided Self* as preparatory reading. After the discussion, late on the Saturday night, and somewhat fuelled by drinks from the bar and the country house atmosphere, a group decided to hold a séance: the next morning we found a group of scared, pale students, convinced that the table they had sat round had "moved" and that some of them had seen "something ghostly" move on the lawn outside! As the class sizes increased, the resources and space needed for these weekends became hard to find, and they were regretfully discontinued, except for the Developmental Biology degree which did not offer the class-bonding opportunities provided by a field course.

Field courses and fieldwork methods

Field courses in marine biology (based at Millport) and freshwater/terrestrial ecology (based at Loch Lomond) have long been a component of the undergraduate programmes in Zoology and related degrees. Geoff Moore tells me that the earliest record of a University of Glasgow marine course at Millport, recorded in the SMBA annual reports, dates from Easter 1922, a six-day course run by J.S. Dunkerly. In later years, staff in charge of the Easter course included Margaret Jepps and G.S. Carter. The Loch Lomond course, begun after the Second World War, could accommodate only small numbers in the original field station, but Rowardennan provided comfort and space for substantial residential courses. In more recent years, additional field courses have been provided as options, designed to give experience of biodiversity abroad. These have been located (1) at the Red Sea in Egypt (or for a time in Tobago, West Indies) for coral reef studies: running for over 30 years, this is probably the longest-running such course organised by a U.K. university; (2) in Ecuador for neotropical forests; and (3) most recently in Kenya for tropical terrestrial work. Field courses not only provide direct experience of biodiversity, they also allow the learning of fieldwork methods. Fieldwork does not have to take students far away from the University campus: daytrips to Possil Marsh Nature Reserve and, even closer, to Kelvingrove Park have provided valuable experience. An innovative exercise used for many years with level 2 students was a mark-recapture experiment based on Glasgow taxicabs. The number-plates were the marks, as well as providing age data, and taxi ranks were the sample points. One year, students with their clip-boards were regarded with suspicion by the drivers, who thought they were City Council spies! An issue with fieldwork is that it may be inaccessible to students with mobility problems. In addition, it is difficult for students to catch up with fieldwork if they have missed the actual experience through illness. With funding from the U.K.'s Joint Information Systems Committee (JISC), Ross McLeod created a set of virtual field course experiences that can help with this problem, as well as providing revision opportunities.

Transferable/graduate skills

When I was a Zoology undergraduate in the mid-1960s, transferable skills were never mentioned, as far as I was aware. We were expected to learn as much as we could about the subject and practice of Zoology, including laboratory and field work and the writing of reports on our findings. Some of this involved learning skills like dissection, some of it small scale investigations. In our

Junior Honours tutorials, which were weekly one-to-one hour-long sessions with a member of staff, researching information and presenting it in essay form were the essential skills learned. The tutorials, as well as the free-group discussions mentioned earlier, were excellent training in thinking clearly about scientific terms and their meaning. Data analysis was very basic: we all took a course in genetics where chi-squared analysis was introduced, and that was about it. There was no course in scientific method, although we did receive a hard lesson on it. As a laboratory test, we were given dead cockroaches which had been fed food containing the indicator dye phenol red (red when neutral/alkaline, yellow/colourless when acid). We had individually to dissect these, examine the intestines, and report on the pH of the contents. Those of us who wrote that we could tell nothing without a control cockroach not fed the dye received full marks: the rest were awarded zero!

More recently, identification of the skills that characterise graduates and make them employable, irrespective of the subjects studied, have become a much bigger and overt part of higher education. These skills are often termed "transferable" because they can be employed in many kinds of occupation, including researching information, presenting it in written and oral forms, data analysis, and organisation and time management. As the inclusion of these skills has become a characteristic of all aspects of higher education, it is not specific to Zoology and will not be further explored here.

TEACHING: POSTGRADUATES

The nature of postgraduate education has evolved considerably over the years. In JGK's time, there was effectively no postgraduate teaching. Graduates who had progressed to scientific careers submitted a body of their published work, usually to the university of their first degree, in order to be considered for the higher degree of Doctor of Science. In a sample of ten Zoology DSc graduates over the period 1961-1973, the period between first degree and doctorate ranged from ten to 34 years.

Later, recent graduates were able to obtain funding to study towards the higher degree of Doctor of Philosophy (PhD), and the number submitting work for a DSc diminished. In Zoology, the work of a PhD student involved carrying out research under a supervisor, and eventually (minimum of three years) submitting the results as a thesis. This would be assessed orally by two examiners, one internal to the University, the other from another institution. The criteria for success in the PhD examination were that the examiners should judge the thesis to contain a substantial body of original research, and that the candidate should be able to defend his/her work successfully during a robust oral examination. Funding for PhD projects came from a variety of sources: mainly from the national Research Councils, but also from a range of charitable trusts and some government agencies. Although original research has remained the prime focus of PhD work, the Research Councils eventually determined that there should be taught components related to the acquisition of generic research skills: data analysis, report writing, research ethics, science communication, and also skills related to the specific research project, such as tropical fieldwork skills. Provision of the generic skills was facilitated in Glasgow by the creation of a Graduate School to administer the affairs of all IBLS postgraduate students. The number of doctoral graduates in Zoology has increased substantially over the decades (Table 4). In the 30 years from 1925-1954, there was a total of only 19 doctoral graduates, whereas in the following ten years there were 45 (predominantly PhDs) and in the next decade 65, 91% PhDs. Most recently, the annual number of PhD graduates averages 20. The recent numbers partly reflect the changed departmental organisation, but also a heavier emphasis on research training. Although academic staff were anxious about any increase in undergraduate numbers, because of the time taken away from research, this was much less of a problem for PhD training, because much of the research done would find its way into publications eventually, usually with the research student as first author and the supervisor last.

Time Period	DSc	PhD	MSc (research)
1925-54	7	12	0
1955-64	8	37	0
1965-74	6	59	13
2013-22	?	195	?

Table 4. Numbers of Higher Degree Graduates in Zoology.

The second general designation for a postgraduate degree is the Masters. It is possible to submit a piece of research as a thesis for Masters by research. This can be for part-time students unable to commit to a PhD, or for students who wish to leave a PhD programme for whatever reason, but to obtain some credit for the work they have done. The number of Masters by research graduates in Zoology has never been large. The other route to a Masters is the taught Masters degree, leading to an MSc (Master of Science) or MRes (Master of Research). Possibly confusingly, the MSc is distinct from the MSci covered earlier, an undergraduate degree including a work placement year. In 2010, the University encouraged the development of taught masters degree programmes, and a number of these are now available in the general field of Zoology (Table 5). These programmes have been successful in attracting students, especially from overseas, and act as a stepping-stone to a PhD programme for some. These taught masters courses all include coverage of research skills and a research project, as well as masters level treatment of subject-related topics. Development and delivery of these courses involved a considerable investment of staff time.

OUTREACH

JGK had considerable interest and involvement in taking Zoology beyond the University, including giving talks on radio, lectures to the Workers Educational Association (despite his conservative politics), and taking a leading role in the Royal Philosophical Society of Glasgow (see *Gallery*).

Animal Welfare Science, Ethics and Law
Applied Conservation Science
Conservation Management and African Ecosystems
Ecology and Environmental Biology
Epidemiology of Infectious Diseases and Antimicrobial Resistance
One Health and Infectious Disease
Quantitative Methods in Biodiversity, Conservation and Epidemiology
Animal Nutrition
Food Security

Table 5. Taught Masters courses available in the School of Biodiversity, 2023-24. All lead to a MSc degree, except Ecology and Environmental Biology, which leads to a Master of Research (MRes). Delivery of these courses often involves expert contributions from outside the School.

Outreach has continued to be important as can be seen from the following examples. For some years, the department offered a popular Christmas lecture to Glasgow schools, somewhat in the style of the Royal Institution Christmas lectures. Jon Barnes and Maggie Reilly put together what was called the Primary Schools Project in the 1970-1980 period: pairs of students visited a particular primary class in a Glasgow school over five or six weeks, bringing interesting specimens for the children to see and discuss. For the project, Maggie assembled a collection of less-valuable museum specimens - skulls, feathers etc. The project was well appreciated by the schools, but also benefitted the students in developing their presentation and time management skills. Members of staff have for long contributed to the courses offered by the Department of Adult and Continuing Education, both for general interest and for credit: examples include courses on animal welfare, the environmental crisis, and a day school on evolution to coincide with Darwin's bicentenary. A recent development, since 2007, is the Glasgow Science Festival, run by Zoology graduate Deborah McNeill as a ten-day event each June: zoologists have contributed interesting and innovative activities and presentations since the festival began.

The Zoology Museum is accessible to the public during weekday opening hours, and Museum staff along with other staff have also curated special events, usually held in the main galleries in the University's Gilbert Scott Building, such as animal architecture and an exhibition on overseas expeditions. Zoologists have also contributed to the Hunterian Museum's popular lunchtime lecture series.

University zoologists have long had involvement with the city's natural historian community, serving on the Council of Glasgow Natural History Society and for some decades providing space for the Society's library. A highlight of the year is the annual Blodwen Lloyd Binns lecture which brings together the University's staff and students and the Society's members to hear from one of the country's leading natural historians. In addition, the Zoology building has provided space and a venue for several of the local conservation organisations, such as Froglife, the Scottish Ornithological Club, and the Clyde River Foundation.

SOCIAL LIFE

The Zoology Department appears to have been a sociable place since earliest times, with the staff and small numbers of students taking tea together in JGK's rooms. In the Zoology Building, a room on the ground floor has long been designated the Social Room. For a time, this was specifically for the technical staff, with academics and research students having programmed breaks in the library on the upper floor, but this segregation was eventually abandoned, with all staff and postgraduates using the Social Room. In the 1970s and 1980s, the Room was staffed by a team of laboratory assistants, notably Nessie and Chrissie, and managed so successfully by a committee of senior technicians that the profits generated funded the sumptuous technicians' Christmas party, held in the decorated ground floor teaching laboratory, to which all staff and postgraduate students were invited. Sadly, retirements and cutbacks resulted in the Social Room becoming self-service only, and a long tradition of having filter coffee from the venerable Glasgow Thomson's Coffee House died out. Another tradition has been the Christmas breakfast on the last working day before the Christmas break; this could be seen as a training event for your family Christmas dinner – a huge fry-up of bacon, eggs, sausages, mushrooms, and tomatoes with morning rolls, available to all at work on that last morning. Sadly, the pandemic put an end to this tradition.

To organise other social activities, some form of "amenities" committee has long operated. Events have included Burns suppers, Hallowe'en parties (Fig. 2), ceilidhs, summer barbecues (at the Garscube campus, including races and other activities), pub-style quizzes, and sporting events: these have generally been mixed, including hockey, squash, and five-a-side football. I recall that by far the most skillful player in the final of our tournament at the Kelvin Hall one year was one of the female students. For some years, a large group of us braved the old, unimproved A9 in February for a long weekend winter sports break in caravans at Aviemore (sadly, the University abolished the mid-term holiday and made this break impracticable).

A tradition for many years now is that successful PhD vivas are celebrated by means of a specially-created cake (in the image of the student's animal: frog, bird, fish etc.) and other refreshments, with speeches in the museum. Another well-established tradition is the Christmas ornithology lecture (by a visiting speaker, often a distinguished graduate or collaborator of the department), followed by drinks, music and a feast in the museum. The musical aspect has grown from modest beginnings, starting with a small band of enthusiasts (cellist, two fiddlers, and whoever else could be dragooned to help), playing Scots traditional tunes, classics and popular songs (Fig. 3). At the Graham Kerr centenary event in November 2023, three different departmental bands performed. One wonders whether, when prospective new staff and postgraduates are

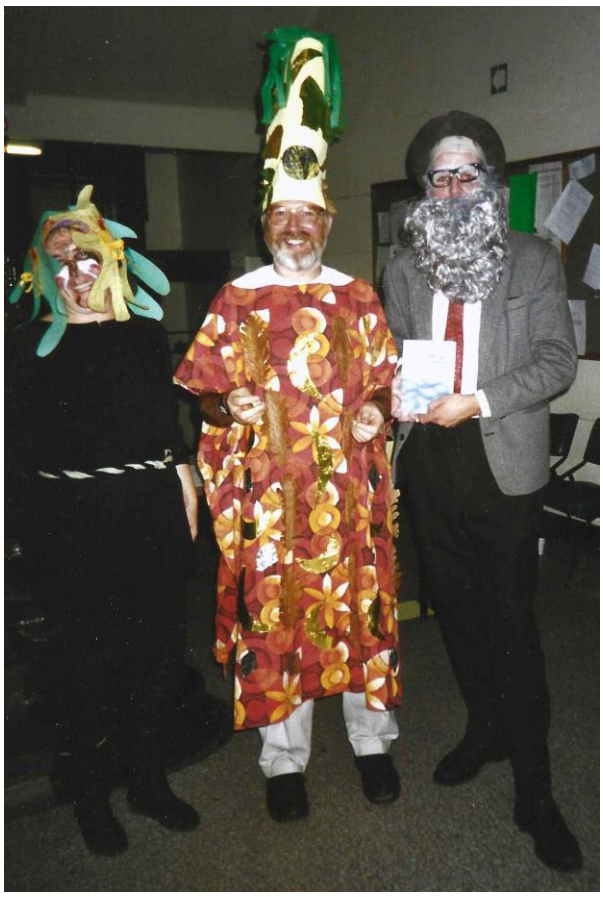

Fig. 2. Naomi Barron and Roger Downie as Trinidadian folklore characters Mama de L'eau (protector of the waters) and Papa Bois (guardian of the forests) at a mid-1990s Hallowe'en party, with Stuart Bearhop as a well-known marine biologist. (Photo: Kate Griffiths)

interviewed, they are asked what instrument they play! Drinks and food often follow talks by visiting speakers, notably after the annual Blodwen Lloyd Binns lecture (jointly organised by the department and Glasgow Natural History Society) and the Darwin lecture. And finally there is the Friday Fox which follows the short talks postgraduates give on their research on a Friday afternoon: when better to have a social in the museum?

Fig. 3. The Black Fox band in the Zoology Museum: from the left - Suzan Trienekens, Luke Powell, Pablo Burraco, Jason Matthiopoulos, Spyros Matthiopoulos and Crinan Jarrett. (Photo: Luca Nelli)

Is this level of social activity unusual in an academic department? Visitors tell us that it is, but not unique: another with a similar atmosphere is the ecology department at the Penryn campus of the University of Exeter, but many of the original staff there are Glasgow graduates! What is sure is that active social interaction of this kind contributes to a positive and happy working environment, and that must be good for productivity.

CONCLUSION

This article has covered organisational, structural and teaching aspects of Glasgow Zoology over the last 50 years, as well as outreach and social life, but has hardly touched on the diversity of research and the people involved. These and other topics are covered in the following articles.

ACKNOWLEDGEMENTS

I thank the following for comments and pieces of information used in this account**:** David Bailey, Lillias Robinson, Guilhem Vadon, Emily Howie, Walter Edgar and Gillian Dyer.

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