



Royal
Botanic Garden
Edinburgh



BIODIVERSITY AND TAXONOMY OF PLANTS

MASTER OF SCIENCE

APPLICANTS HANDBOOK

ACADEMIC YEAR 2019-2020

Thank you for your interest in our Master of Science in the Biodiversity and Taxonomy of Plants. If you love plants this is a programme that will appeal to you. In a world where biodiversity is increasingly threatened and where sustainable development is a priority, there are real opportunities for trained researchers in plant systematics. The task for future botanists is not only to gather, interpret and conserve plant life in our world, but also to educate people. This programme provides you with a balanced approach to practice and theory that is essential to attain these goals, giving you a strong and broad foundation in botanical skills to assist you in making an impact in your future choice of career.

The MSc Programme in Biodiversity and Taxonomy of Plants is a well established course which has just celebrated its twenty-fifth anniversary this year. It results from a unique partnership between the Royal Botanic Garden Edinburgh (RBGE), a leading centre for taxonomic research and plant conservation, and the University of Edinburgh (UoE), one of the world's top universities. The setting of the botanic garden is ideal for the purpose of the programme, in providing extraordinary living and herbarium collections, a comprehensive library, laboratory space, and expertise of a global reach. RBGE has a unique learning environment, with a strong education department linking science with horticulture. Studying biodiversity at the RBGE whilst living in the vibrant city of Edinburgh is an exceptional opportunity for those fascinated by plants.

We hope you will find this handbook useful and that it will answer most of your questions, but if there are any other queries you may have about the programme, please do not hesitate to contact us at the email address below. We look forward to your applications!

PROGRAMME DIRECTORS

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AIMS AND SCOPE

The MSc programme in the Biodiversity and Taxonomy of Plants will equip botanists, taxonomists, conservationists and ecologists alike with a high level of skill and breadth of knowledge in pure and applied plant taxonomy and related fields. We provide a balance of academic rigour and practical experience which benefits from the strong collaboration between two leading institutions: The Royal Botanic Garden Edinburgh and the University of Edinburgh. Four main themes will be covered:

- Description and identification of botanical diversity
- The evolution and biogeography of botanical biodiversity
- Practical applications of biodiversity data in conservation and sustainability
- Scientific research and writing experience

The MSc is a 1-year full-time programme, including two terms of lectures and a research project during the summer. We also offer the flexibility to spread the programme over two years.

Programme Objectives

- To develop student's knowledge of plant structure and taxonomy, and the evolution and distribution of the major groups of plants.
- To train students in techniques of plant collection and plant identification, surveying of vegetation, ecology, and conservation.
- To form responsible researchers with a strong practical and theoretical knowledge of plants and fungi.

Awarding Bodies

The MSc programme is awarded (validated) by the University of Edinburgh. Students are University students, although most of the time will be spent at the Royal Botanic Garden.

Careers and Future

This MSc is an ideal opportunity for those wishing to develop a career in botany, where a deep knowledge of taxonomy and systematics is essential. Increasing awareness of the biodiversity crisis stresses the need for more trained taxonomists. Graduates are employable in a wide range of fields including survey work in threatened ecosystems, assessment of plant resources and genetic diversity, management of taxonomic institutes and curation of taxonomic collections, university and college training, and pure taxonomic research. The programme also functions as a superb stepping-stone for those wishing to start a PhD. Job prospects for students graduating on the course are very good with about 70% progressing in the area of plant science in the first year after finishing the course. More than 250 students have completed the programme since its start in 1992. They are excellent ambassadors for botany and plant conservation in dozens of countries spread over six continents and truly represent the future of botany.

ENTRY REQUIREMENTS

Applicants preferably have a university honours degree with a 2.1 or above, or its equivalent, in a biological, horticultural, or environmental science, but above all a genuine interest in plants. Relevant work experience is desirable but not essential. Evidence of proficiency in English must be provided if this is not an applicant's first language.

For the IELTS test a global mark of 6.5 is needed (with no score lower than 6.0 in each section). For more information see: <https://www.ed.ac.uk/studying/international/english/postgraduate>

Overall we are looking for keen 'plant people' of all ages, who will value the opportunity of studying at RBGE and who will bring their own interests and enthusiasm to the programme.

Below: A triptych of *Amorphophallus titanum* in the foyer of the Balfour Building at the Royal Botanic Garden Edinburgh, representative of the diverse living collections grown in the garden.



APPLICATION PROCEDURE

The course is administered by the School of Biological Sciences, in the College of Science and Engineering at the University of Edinburgh, and you can apply via this page www.ed.ac.uk/pg/1.

Further information about the programme can be obtained from the Programme Directors, and also the Programme Administrator at the University:

Dr. Louis Ronse De Craene, Royal Botanic Garden Edinburgh

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Prof. Andrew Hudson, The University of Edinburgh

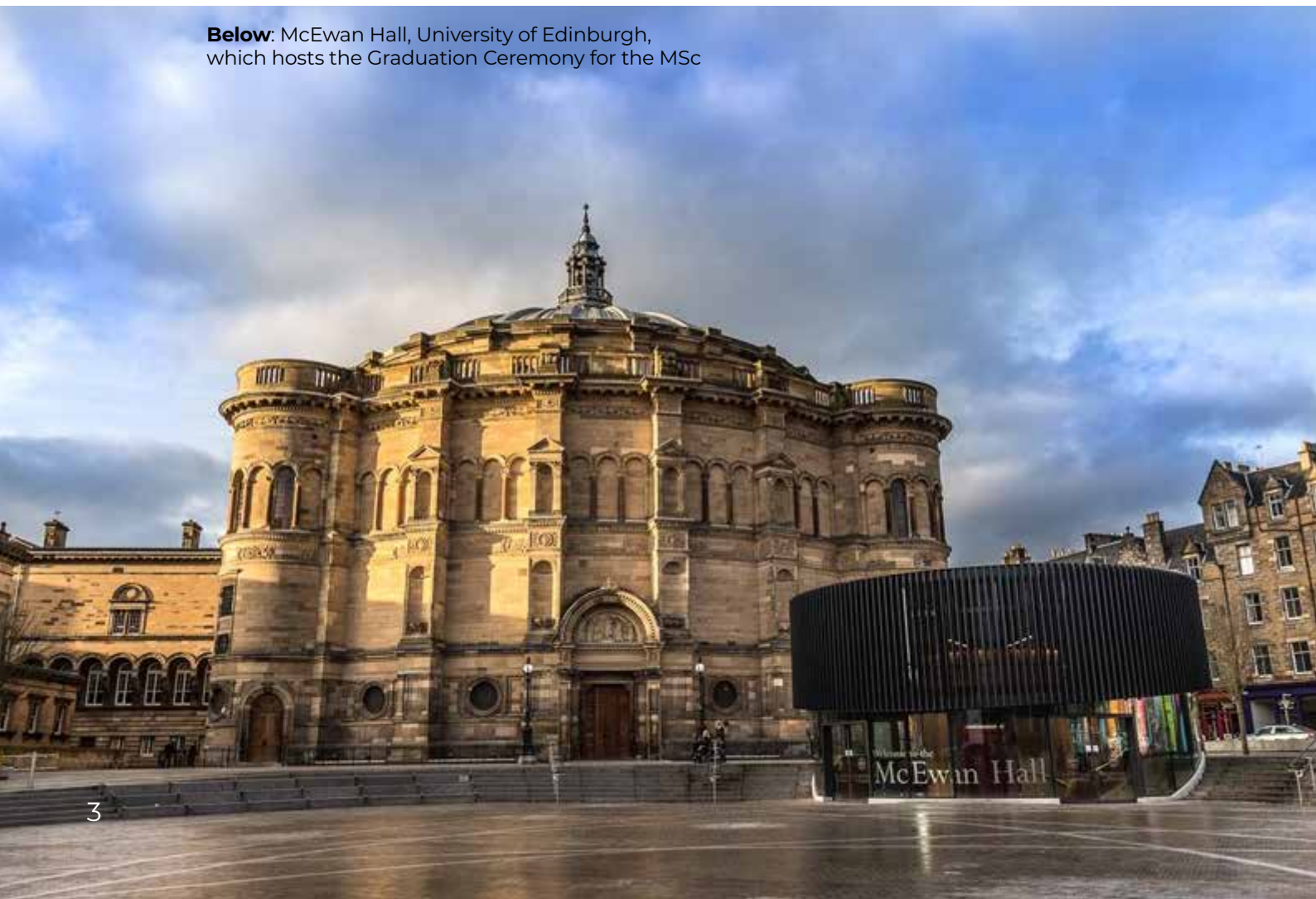
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Programme Administrator, University of Edinburgh

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Applications will be considered during the whole year, but due to the popularity of the programme, places cannot be guaranteed. After consultation and examination of the application by the programme directors, an offer will be made by the College of Science and Engineering on the condition of availability of a place.

Below: McEwan Hall, University of Edinburgh, which hosts the Graduation Ceremony for the MSc





Above: The Main Range and the Temperate and Tropical Palm Houses at the Royal Botanic Garden Edinburgh

COSTS

The tuition fees for the academic year 2019-2020 for UK and EU students are £15,500, which are payable to the University of Edinburgh. Fees for international students (non-EU) are £30,700 per year. Please check <http://www.ed.ac.uk/student-funding/tuition-fees/postgraduate/taught-fees> for confirmation of the latest fees.

These fees include the costs for the tropical fieldtrip, several excursions in Scotland, and costs of the summer research project. You will also receive some RBGE branded clothing, and some course materials such as a plant dissection kit, and a printing allowance.

Although Edinburgh is not the most expensive city in the UK, living costs should not be underestimated. Consider between £9,000-£12,000 a year as a realistic figure. The University has a useful [itemisation of living costs](#) to help you plan your budget.

FINANCIAL SUPPORT

We understand many students looking to embark on the programme will need to raise funding for fees and living costs. A number of potential grants are presented below and further information is available on the course [website](#), but these lists are not exhaustive and we also encourage you to search for other alternatives. There is an option to spread out payment of the fees over the year, or to spread the programme over two years to facilitate payment.

- **British Council:** <http://www.educationuk.org/>
- **University of Edinburgh has a number of useful links**
 - Postgraduate scholarships: for EU, Japan, Thailand, China, and Southern Africa. <http://www.ed.ac.uk/schools-departments/student-funding/search-scholarships>
 - Postgraduate bursaries: <http://www.ed.ac.uk/schools-departments/student-funding/postgraduate/international/science-engineering/biological-bursaries>
 - Funding by region: <http://www.ed.ac.uk/schools-departments/student-funding/postgraduate/international/region>
 - Additional assistance: <http://www.ed.ac.uk/schools-departments/student-funding/financial-support/additional-financial-assistance>
 - Charitable trusts: <http://www.ed.ac.uk/schools-departments/student-funding/financial-support/trusts>
 - International student loans: <http://www.ed.ac.uk/schools-departments/student-funding/financial-support/student-loans>
- **Student Awards Agency Scotland:** <http://www.saas.gov.uk/>
- **Student Loans Company:** www.slc.co.uk

SCHEDULE 2019-2020

You will spend most of your time at the heart of the Royal Botanic Garden, in the teaching rooms, lecture theatre, laboratories, herbarium and library. Some lectures and practicals will be at the University of Edinburgh's King's Buildings Campus on Mayfield Road in the south of the City.

- Induction Week at RBGE and UoE: week commencing Monday 9th September 2019. During the induction week there is a two-day excursion to Benmore Botanic Garden. Tuesday 10th September 2019: Induction day at RBGE.
- Autumn Semester: 17th September 2019 to 6th December 2019.
- Field Trip: 2nd to 4th week of January 2020.
- Spring Semester: 24th January to 10th April 2020.
- Spring Semester exams: third week in April 2020.
- Summer Research Project: 4th May to 20th August 2020.
- Summer Research project seminars: end of August 2020 (TBC).
- RBGE graduation: early September 2020 (TBC).

Below: Benmore House at Benmore Botanic Garden, where you will stay overnight on your first excursion



COURSES

The programme is delivered through a blend of lectures, practicals, workshops and investigations. The class size of up to ca. 20 students makes for easy interaction and discussion with lecturers and demonstrators.

Lectures illustrate a number of themes in the subject, linking with current research at the Garden where relevant, and each will normally last between one hour and maximum two hours (usually in two 50 minute slots).

Practicals are designed to complement your lecture learning, and vary from floral dissections and microscope work to molecular phylogenetic analysis. They usually last between 2 and 3 hours.

Workshops are sessions in which you learn about a technique or a skill in an intensive way, led by a single expert. Workshops may be of one to five days, depending on the topic.

Investigations consist of problems you are given to solve, on your own but with some guidance, usually within a day, - sometimes longer.

Degree Programme Title: The Biodiversity and Taxonomy of Plants (MSc/PgDip)

Programme Code: PTMSCBITXP1F

Degree Type: Postgraduate Taught Masters / Diploma

Semester	Course	EUCLID code	Credits	Level
1	Evolution of Plants	PLSC11002	10	11
1 & 2	Biodiversity of Angiosperms	PGBI11044	20	11
2	Plant Genome Diversity	PLSC1104	10	11
1 & 2	Biodiversity of Cryptogams and Fungi	PLSC1105	20	11
1	Taxonomy and Plant Collections	PLSC1106	10	11
1 & 2	Phylogenetics and Population Genetics	PLSC1103	20	11
2	Plant Geography	PGBI11012	10	11
2	Conservation and Sustainability	PGBI11043	10	11
2	Tropical Field Course	PGBI11046	10	11
3	Research Project & Thesis	PGBI11020	60	11

Note: Part-time study is possible for a non-Tier 4 student over a period of two years, following clarification of the curriculum split over the the two years and arrangements for appropriate supervision.

Evolution of Plants (10 Credits)

Course Organizer: Louis Ronse De Craene

Lecturers: Chris Jeffree (UoE), Jenny Farrar (RBGE), Louis Ronse De Craene (RBGE).

This course examines the origins of terrestrial plants from green algae and follows the timeline of the appearance of their principal innovations, and their evolution from their earliest known attempts to colonize the land in the early Palaeozoic to the present day. The major impacts of plants on the structure, atmosphere and climate of the Earth, and their feedbacks to plant evolution will be discussed in relation to molecular, ultrastructural and morphological data and fossil evidence.

Plants are the primary producers of terrestrial biomes and not only form the visible vegetation cover and define the character of the biomes of our green planet but, over hundreds of millions of years have actually engineered it, modifying the structure of land surfaces and the composition of earth's atmosphere. Today's terrestrial environments are dominated, in terms of biomass, productivity and biodiversity, by flowering plants. This is a relatively recent phenomenon, however, and for much of the time since plants colonized the land, the principal groups of plants on land were spore-producing bryophytes, 'pteridophytes' and various types of early seed plants. The origin, diversity, distribution and special features of the principal plant groups, bryophytes, clubmosses, ferns and their allies, gymnosperms and angiosperms are described. The course ends with an overview of the origins

Below: *Cypripedium* 'Kentucky Pink' in the woodland garden of the RBGE



of the angiosperms and their early evolution. A half day excursion to East and/or West Wemyss (fossil coal deposits) and a half day visit to the National Museum of Scotland are planned. Assessment is by a written assignment during semester 1.

Reading list

- Niklas, K.J. (2016) Plant Evolution, and introduction to the history of life. University of Chicago Press.
- Bell, P.R. and Hemsley, A.R. (2000) Green plants, their origin and diversity. Cambridge University Press.
- Raven, P.H., Evert, R.F. & Eichhorn, S.E. (2012) Biology of Plants 8th Ed. W.H. Freeman.
- W.N. Stewart & Rothwell, G.A.R. (2010) Paleobotany and the Evolution of Plants. 2nd edition. Cambridge University Press.

Biodiversity of Angiosperms (20 Credits)

Course organizer: Louis Ronse De Craene

Lecturers: Jenny Farrar (RBGE), Louis Ronse De Craene (RBGE), Paula Rudall (RBG Kew), Richard Bateman (RBG Kew), Kerry Walter (RBGE), plus further RBGE Science staff.

The purpose of the course is to explain the origin, evolution and special features of the angiosperms to enable you to understand the relationships of major groups



Below: The Lecture Theatre at the Royal Botanic Garden Edinburgh



Above: *Dionysia afghanica* in the alpine collection of the Royal Botanic Garden Edinburgh

of plants. The lectures are provided in the context of the Angiosperm Phylogeny Group (APG IV, Botanical Journal of the Linnean Society 181: 1-20, 2016) and give a broad outline of the major clades and the evolution of key characters. The major lineages of Angiosperms are presented with emphasis on major events of evolution and diversification. Further to this, the evolution of the angiosperms is approached from a floral structural perspective. Morphological characters linked to the flower are analysed and linked with the evolutionary developmental genetics underlying floral development. Other elements affecting floral evolution, such as pollination ecology, are presented. Throughout, full use is made of the excellent collections of living plants at RBGE. Twenty practical sessions spread throughout the year analyse the floral structures of the major orders and families of angiosperms. The practicals give the opportunity to extend on key characters based on further sampling and observation of living floral material grown at RBGE. The best way to become acquainted with the diversity of angiosperm families is through careful observation supported by drawing half-flowers including floral diagrams and floral formulae.

The availability of living study material involves the study of plants as an entity and students are encouraged to observe as many structures as possible during guided walks. After completing this course in combination with the fieldtrip, you should be able to identify major plant groups by sight, mostly to family level.

Assessment is through a specific research project at the end of semester 1 (50%), and a two hour practical examination using live material at the end of semester 2 (50%).



Above: *Usnea cornuta*, part of the globally important cryptogam flora in Scotland which you will explore on several field excursions.

Reading list

- Ronse De Craene, L.P. (2010) Floral diagrams. An aid to understanding flower morphology and evolution. Cambridge University Press.
- Cullen J. (2006) Practical plant identification. Cambridge University Press.
- Beentje H. (2010) The Kew Plant Glossary. Kew, Royal Botanic Gardens.
- Byng, J.W. (2014) The Flowering Plants Handbook. A practical guide to families and genera of the world. Plant Gateway Ltd, Hertford, UK.
- Simpson M.G. (2010) Plant systematics. 2nd Ed. Elsevier.

Plant Genome Diversity (10 Credits)

Course organizer: Catherine Kidner

Lecturers: Catherine Kidner, Mark Hughes, Greg Kenicer, Michael Moeller, Crinan Alexander (all RBGE)

The Plant Genome Diversity course explores the structure and function of plant genomes, the effects of genomic-level change on plant evolution and provides a practical approach to the study of this topic. The structure and arrangement of DNA in plants is described and methods for extraction and purification introduced by Mark Hughes and Greg Kenicer. Lab work in the molecular Biology teaching labs at Kings Buildings provides practical experience in the techniques.

The study of the packaging of plant nuclear DNA into chromosomes is termed cytology. Two lectures from Micheal Moeller and Crinnan Alexander introduce the diversity of plant chromosomes, the methods for their study and their use in taxonomy. These are followed by a week of practical work in the Kings' Buildings Molecular labs producing a cytogenetic study of the genus *Tulbaghia*. New methods of DNA sequencing are revolutionising our study of plant genomics. The fourth week of the course begins with a lecture from Catherine Kidner describing the new sequencing techniques and methods of genome assembly, annotation and analysis. The evolutionary patterns of plant genome dynamics, which have been revealed using these methods are described in a second lecture. The final class is a workshop on preparing a research proposal in this field.

Assessment is by a Scientific Report for the cytology practical (2000 words, 50%) and a Research Proposal (1,000 words, 50%).

Reading list

- Kersey PJ. (2019) Plant genome sequences: past, present, future. *Curr. Opin. Plant Biol.* 2019 48: 1–8. doi: 10.1016/j.pbi.2018.11.001.
- Wendel, J.F. et al. (2015) Evolution of plant genome architecture. *Genome Biology* 17: 37 doi: 10.1186/s13059-016-0908-1

The Biodiversity of Cryptogams and Fungi (20 Credits)

Course organizer: Rebecca Yahr

Lecturers: Neil Bell (RBGE), Chris Ellis (RBGE), Mary Gibby (RBGE), Katy Hayden (RBGE), David Mann (RBGE), Heather McHaffie (RBGE), Robert Mill (RBGE), Rebecca Yahr (RBGE).

Though sometimes inconspicuous, algae, fungi and non-flowering plants are extremely diverse and play crucial roles in nutrient cycling, as environmental indicators and in the evolution of diversity. Many cryptogams, including bryophytes, fungi, and lichens are important indicator organisms, increasingly used to monitor environmental change and pollution over timescales of years to millions of years. Despite their importance, expertise in identifying cryptogams is nationally and internationally rare. This course is designed to develop skills in interpreting cryptogam diversity in workshop-style sessions including practical, hands-on examination, as a basis for identifying algae, fungi, lichens, bryophytes, ferns and their allies, and conifers. Application of these skills in conservation and monitoring will also be discussed. Within the UK, RBGE is unique in offering training of this kind.

The evolution of the major groups of cryptogams, their ecological significance and conservation are discussed. The course strengthens familiarity with cryptogams through an applied project examining the ecology of cryptogamic epiphytes and

responses to habitat and pollution. Data collected by students in the field, and analyzed under supervision, will be written up as a mini report. This course also comprises a number of excursions in Scotland, including a fungus foray (Dawyck), a lichen excursion in East Lothian, and a bryophyte and fern foray at Rosslyn.

Assessment is by: 1. Your choice of a synthetic essay topic in cryptogams (30%, semester 1); 2. Epiphyte ecology project write-up (20%, semester 1); 3. Exam – a two-hour practical examination using live material (50%, semester 2).

Reading list and ID guides

- Atherton, D.M., Bosanquet, S.D.S. & Llawley, M. (2010) Mosses and Liverworts of Britain and Ireland: A Field Guide. British Bryological Society.
- Graham, L.E., Graham, J.M., & Wilcox, L.W. (2009) Algae. Second edition. Benjamin Cummings, San Francisco.
- Mehlreter, K., Walker, L.R. & Sharpe, J.M. (eds) (2010) Fern Ecology. Cambridge University Press, Cambridge.
- Nash T. (2010) Lichen Biology. Cambridge University Press, 2nd Edn.
- Page, C.N. (1997) 2nd Edn. The Ferns of Britain and Ireland. Cambridge University Press, Cambridge.
- Phillips, R (2006) Mushrooms. Macmillan, London.

Taxonomy and Plant Collections (10 Credits)

Course Organizer: David Harris

Lecturers: Eimear Nic Lughada (RBG Kew), Crinan Alexander (RBGE), Mark Watson (RBGE), Kerry Walter (RBGE), Colin Pendry (RBGE), David Harris (RBGE), Elspeth Haston (RBGE), Axel Poulsen (RBGE) and various members of the herbarium staff.

The aim of the herbarium taxonomy course is to understand its crucial role in plant biology and its power and elegance as a technique to study plant diversity. By the end of the course you will have experience of working in a large international herbarium and the curatorial and taxonomic skills required for a career in curation or research. The course consists of an introduction followed in depth coverage of plant specimens collecting, curation, nomenclature of wild and cultivated plants, taxonomy of cultivars, surveys and monitoring, the production and use of taxonomic tools, monographs, floras, checklists, keys, and data bases. After 8.5 days of preparation in a combination of practicals and lectures the students carry out a piece of original curation and make a short presentation at a seminar. The course culminates in a piece of original taxonomic research called the mini-revision.

Assessment is through a flora writing exercise on a selected genus or group of genera in semester 2.



Above: The Herbarium at the Royal Botanic Garden Edinburgh has over 3 million specimens and is research archive of global importance.

Phylogenetics and Population Genetics (20 Credits)

Phylogenetics Course Organizer: Mark Hughes

Lecturers: Mark Hughes (RBGE), Tiina Sarkinen (RBGE), Peter Moonlight (RBGE), Kyle Dexter (UoE).

Population genetics Course Organizer: Markus Ruhsam.

Lecturers: Markus Ruhsam (RBGE), Aline Finger (RBGE), Mark Hughes (RBGE).

Phylogenetics is a discipline with an ever increasing impact in biology, from taxonomic classifications, biogeography, trait evolution and biome assembly. The Phylogenetics Course leads you to the current state-of-the-art in the field, starting with a historical overview of phylogenetics. By the end of the course you should be adept at taking raw molecular data and generating phylogenies based on parsimony, bayesian and likelihood methods in a range of software packages. Population genetics focuses on examining the amounts and partitioning of genetic variation and establishing the evolutionary processes underlying population differentiation and diversification. This provides insights into how some groups of populations remain on a common evolutionary trajectory and others diversify into different ecotypes or species. Population genetic approaches are also widely used in conservation programmes in which the conservation of genetic biodiversity is an explicit goal. At the interface of population genetics (diversity and differentiation within species) and phylogenetics (relationships and differentiation between species) is the nature of the species themselves. The course ends with a discussion of the definition of plant species, and how the disciplines of population genetics and phylogenetics can contribute towards enhanced understanding of the most appropriate concept(s) of what constitutes a species.

Assessment is through two written assignments, an exercise on population genetics counting for 1/3 of the mark, and a phylogenetics exercise counting for 2/3.

Reading list

- Bromham, L. (2016) An Introduction to Molecular Phylogenetics. Oxford University Press. Sinauer Associates.
- Allendorf F.W., Luikart G. & Aitken, S.N. (2012) Conservation and the Genetics of Populations. Wiley.
- Judd, W.S., et al. (2007) Plant Systematics: a Phylogenetic Approach (4th edition).
- Freeland J.R. (2005). Molecular Ecology.
- Hartl, D.L. and Clarke A.G. (2007) Principles of Population Genetics.

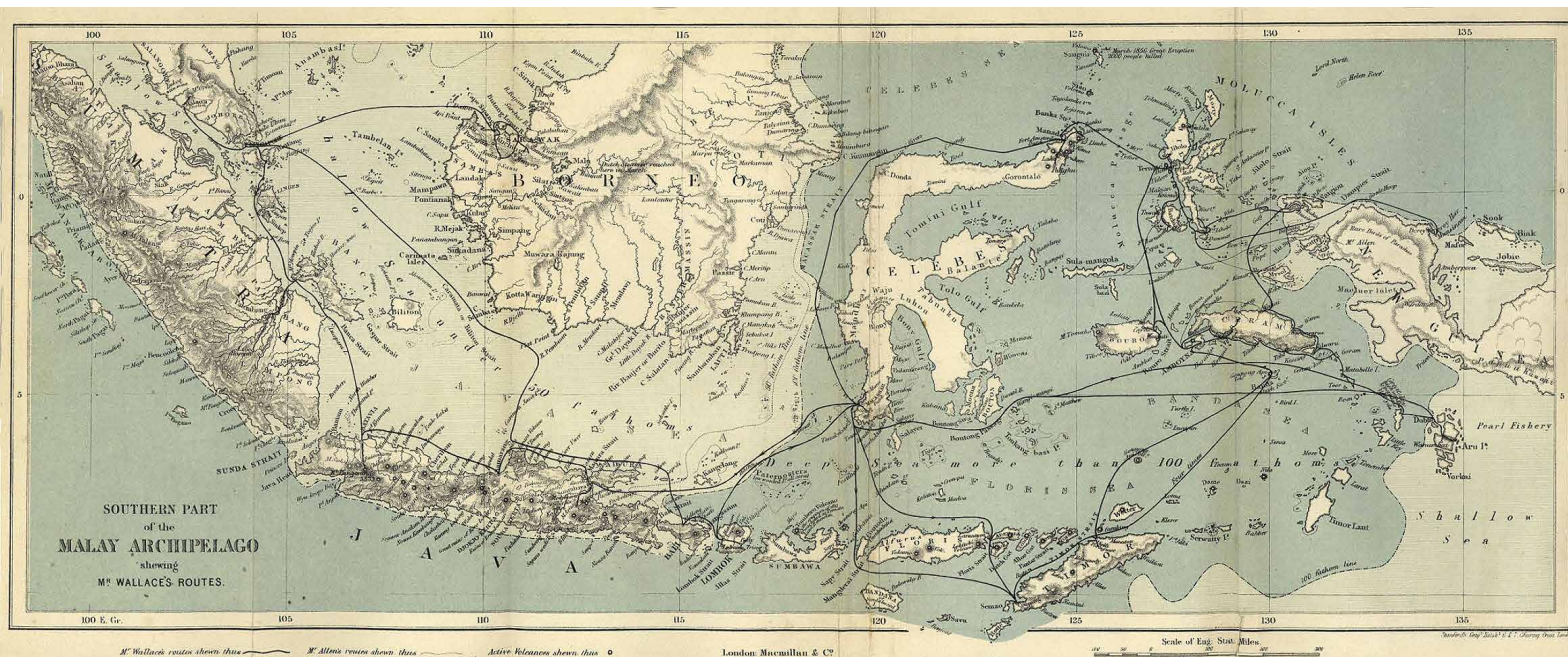
Plant Geography (10 Credits)

Course Organizer: Tiina Sarkinen

Lecturers: Tiina Sarkinen (RBGE), Richard Milne (UoE), Hannah Atkins (RBGE), Mark Hughes (RBGE), Caroline Lehmann (RBGE & UoE).

Biologists have sought to understand patterns of species distribution, richness and endemism across the globe for over two centuries, a field of enquiry called biogeography. This field is vital for planning effective conservation strategies and being able to predict how organisms will react to anthropogenic environmental change. Surprisingly, however, we still lack data to understand plant species diversity across many areas of the world. Models are now being used to predict patterns where data is lacking, but because of the complex interplay of contemporary ecology, earth history, organismal extinction and evolution, universal biogeographic explanations are still elusive. This course provides a background to

Below: Frontispiece map from The Malay Archipelago (Wallace, 1869)



the discipline of plant geography, including an account of its history, overview of basic concepts, as well as explanations of the most modern biogeographic tools used. This theoretical material is interspersed with examples based upon areas that are under active research at the Royal Botanic Garden Edinburgh and University of Edinburgh. Teaching will involve several group discussion tutorials, where students will be encouraged to read, interpret, and criticise recently published research articles in the field.

Assessment is through written course work in the form of a research proposal.

Reading list

- Lomolino et al. (2010) *Biogeography*, 4th Edition. Sinauer.
- Cox et al. (2016) *Biogeography, an ecological and evolutionary approach*, 9th Edition. Wiley Blackwell.
- Ladle & Whittaker (2011) *Conservation Biology*. Wiley Blackwell.

Conservation - Science, Policy and Implementation (10 Credits)

Course organizer: Antje Ahrends

Lecturers: Antje Ahrends (RBGE), Pete Hollingsworth (RBGE), Chris Ellis (RBGE), Aline Finger (RBGE), Katherine Hayden (RBGE), Tiina Sarkinen (RBGE), Tony Miller (RBGE) and team of the Centre for Middle Eastern Plants (CMEP), Phil Thomas (RBGE), Alan Forrest (RBGE), Martin Gardner (RBGE), Colin Pendry (RBGE), Peter Wilkie (RBGE), Phil Franks (IIED).

This course introduces the students to major conservation issues and explores how science can contribute to policy making and conservation implementation. Teaching on this course has a strong applied focus and consists of a mixture of lectures and practicals. The main focus is plant conservation but a lot of the issues and techniques that are covered are transferable to other taxa. You will receive an introduction to current conservation issues and global challenges. This is followed by an overview of the major international and national conservation policies and bodies. The course will then explore how biodiversity scientists can help to address conservation issues and look at ways of implementing conservation, drawing examples from many parts of the world and covering both in- and ex-situ conservation. The course also provides you with skills in several state-of-the-art techniques that are used to prioritize areas and species for conservation. These include some specialist techniques like Red List assessments but also transferrable skills like GIS, Species Distribution Modelling, survey design and statistical analysis. The aim of teaching these wider skills is to increase the participants' employability in conservation and more widely, and to this end the course will also provide some training in CV writing and job interviews.

Assessment is through two separate assignments in semester 2 (50% each).



Above: Collecting in the Otún Quimbaya Fauna and Flora Sanctuary, Colombia, in January 2018 as part of the Field Course module. Photo: Tory Stewart.

Reading list

- Lindenmayer, D. & Burgman, M. (2005) Practical Conservation Biology. CSIRO Publishing.
- Primack, R.B. (2012) A primer to Conservation Biology. Fifth edition. Sinauer Associates.
- Primack, R.B. (2014) Essentials of Conservation Biology. 6th Edition. Sinauer Associates.
- Jeffries, M.J. (2005) Biodiversity and Conservation. 2nd Edition. Routledge.

Tropical Biodiversity Field Course (10 Credits)

Course Organizers: Louis Ronse De Craene, Tiina Sarkinen, David Harris (RBGE)

Lecturers: Core staff (TBC each year)

The course is one of the few in the world that teaches students to identify plants based on vegetative characters alone. Most courses and identification books focus on the use of flowers and fruits for identification, which is more relevant to working in herbaria or in temperate regions. Field studies in the tropics require the ability to identify plants based on vegetative characters alone, and this is the skill emphasised by this course.

We will cover the most important tropical plant families and genera, and you will also gain experience in conducting qualitative and quantitative ecological surveys and how to collect five star herbarium specimens. The specific objectives of the course are:

- To learn vegetative characters of some of the important tropical plant families

and genera, and to understand the processes involved in field identification.

- To acquire botanical field experience and skills in plant collecting and specimen processing.
- To practice qualitative and quantitative habitat survey techniques.

The course consists of ~12 days teaching at three different sites in Colombia, South America, in mid-January. Each morning is spent in the field learning practical skills of monitoring and surveying, whilst afternoons are used for working on plant identification, data recording, and analysis. Formal teaching is done in the evenings through lectures and seminars to integrate the skills and experience obtained during the entire day.

A field course information book, detailing the work and the itinerary, will be available before the field course. Students should all have a valid passport and we will advise on any visa requirements depending on your country of origin.

Assessment is through a presentation of two plant families at the start of the course (20%), a field logbook (40%), and a practical examination at the end of the field course (40%). Passing this course entitles students to receive a Certificate in Practical Field Botany delivered by RBGE.

Reading list

- Gentry, A. (1993) A field guide to the families and genera of woody plants of Northwest South America. Conservation International.

Below left: The striking Paramo ecosystem at 4,200 m elevation in Páramo de Letras, Colombia during the Field Course module.

Right: MSc students and lecturers in Colombia at the Parque Natural Chicaque near Bogota in January 2018. Photos: Ozan Senturk.



RESEARCH PROJECT

Organizer: Louis Ronse De Craene

An integral part of the MSc is the summer research project, which is carried out for the final four months of the programme (after completion of the exams and the field trip). This is designed to give you direct experience of carrying out a piece of independent research under the guidance of one or more supervisors. The research project is written up as a Dissertation and counts for 60 credit points. The MSc project allows students to:

- develop understanding and critical thought in a well-defined subject.
- learn experimental techniques and/or other skills.
- gain experience in organising and writing up a discrete piece of work (which should lead to a publishable result).
- plan and deliver a short (15 minute) seminar, summarising your work and results.

There is much flexibility in the choice of research projects. You will be able to choose from a wide selection of projects offered principally by RBGE and UoE staff, linked to ongoing and current research programmes. Occasionally, projects may be available at other institutes, which can give students the opportunity to experience a different work environment, and to make new contacts.

Some students have more focused interests and they can come up with a project of their own, provided that they find a suitable supervisor and develop their ideas before the end of November.

The list of projects offered will be presented to the class during term two and you are encouraged to discuss the various options with the staff who will supervise each project before making your final choice. It should be stressed that it is possible for a student to have input into the formulation of a summer research project.

The dissertation is examined separately from the theoretical part of the programme. To be able to do the summer project the student needs to have attained at least 50% for the theoretical part of the course (at least 80 over the 120 credits need to be passed with a mark of 50 or above, as well as maintaining an overall average of 50 or above). Students who have an overall mark between 60% and 70% for both exams and dissertation will obtain a Merit award; those who have marks close to 70% or above for both exams and dissertation are eligible for a distinction. Students who did not obtain an exam mark close to 70% but who have 70% or more for their dissertation are eligible for an RBGE award.

STUDY TOURS AND VISITS

Studying in the Edinburgh garden gives you access to plants from all over the world. We also take students on a variety of trips and visits to see other plant collections and wild plants *in situ*. This includes:

- A day trip to Dawyck Botanic Garden, including a fungal foray.
- A two-day visit to the Benmore or Logan Botanic Garden as part of the herbarium taxonomy, angiosperm evolution and ex situ conservation modules, as well as some preparation for the tropical field trip.
- The cryptogam course includes a foray along the East Lothian coastline (algae and lichens), and various sites in East Lothian (bryophytes and lichens), a fossil hunt at Oxroad Bay (East Lothian) and a pteridophyte and moss foray in Roslin Glen (Mid-Lothian).
- Further local excursions may be organized to study the native flora around Edinburgh during early summer.

Below: Dawyck Botanic Garden is a superb venue for an autumn fungal foray



TWO REPUTABLE INSTITUTIONS

Royal Botanic Garden Edinburgh

Our mission is to **explore, conserve and explain the world of plants for a better future**. The garden was established in 1670 and with its internationally renowned living collections, herbarium, botanical library and most importantly the wide ranging experience and expertise of its staff, it is a truly excellent environment in which to learn about plant biodiversity and taxonomy.

The RBGE now has about 180 staff, 50 of whom are scientific staff. Initiated as a small physic garden to provide medicinal plants for the Professor of Medicine, it has undergone several changes of site and status to become the multifaceted organisation it is today. James Sutherland, one of the earliest Keepers of the Botanic Garden, was appointed Professor of Botany at Edinburgh University in 1695, thus beginning the long association between the two institutes. Apart from a break early in the 18th century, the posts of Regius Keeper (Director of the RBG) and Professor of Botany remained united until 1956, and the University Botany Department was based at the RBG until 1965, when it moved to King's Buildings.

In 1763, the garden moved to a 2 hectare site to the west of Leith Walk, which then ran through open country between Edinburgh and Leith. Sixty years later, however, it was beset with problems; glass-houses had become seriously dilapidated and the nursery had been built over due to the expansion of Edinburgh.

Below: The Temperate Palm House of the RBGE.



In 1823, an area of 6 hectares at Inverleith, the nucleus of the present garden, was bought from James Rochied, a local landowner; this was next to land owned by the Royal Caledonian Horticultural Society, with whom the RBG still has strong links. Since that time several other adjoining parcels of land have been acquired, resulting in the present garden of 28 hectares, and a nearby nursery of 4 hectares.

Research at the RBG is based on three major resources: the herbarium, the living collections, and the library.

Herbarium

The [Herbarium](#) sits at the heart of the research programme of the Garden. There are more than 3 million accessions, including dried material and spirit collections as well as items prepared for microscopy and photographic slides. The collections of the Herbarium are especially rich in European, Himalayan, South African, Brazilian and Southeast Asian flowering plants, conifers and cryptogams, including ferns, bryophytes, algae, lichens and fungi. There are ancillary collections of carpological, timber and spirit-preserved material, and also a large photographic slide collection of both wild and cultivated plants. The cryptogamic collection is considerable.

Living Collections

The [Living Collections](#) of about 12,500 species are of international importance and comprise 28 hectares of garden and 4 hectares of nursery at Edinburgh, 44 hectares at Benmore Botanic Garden, Argyll, 25 hectares at Dawyck Botanic Garden, Peebleshire and 11.4 hectares at Logan Botanic Garden, Wigtownshire. At Edinburgh there are 5,170m² of display glasshouse open to the public and 1,947m² of glasshouse area devoted to plants for scientific and horticultural research. The four gardens represent a wide range of soil, aspect and climatic types, allowing an extraordinarily wide range of plants to be grown.

Library

The [Library](#) holds 75,000 books and about 100,000 volumes of journals. It obtains by subscription or exchange nearly 1,600 current journals, making it one of Britain's largest specialist botanical libraries. There is a collection of about 250,000 'cuttings', some of which are original artworks, together with a large number of botanical illustrations. The Historical Archives Collection consists of about 20,000 items of correspondence, diaries and other manuscript material relating to the history of the garden, and to botany and botanists. The Library provides full research library services to RBGE staff. This includes cataloguing to AACR2 standards; analytical indexes for taxonomic, current awareness and enquiry services; literature searching using on-line databases; inter-library loans facilities; and full loan and circulation services. Electronic access to books and journals is also provided to students through the University of Edinburgh.

Staff Expertise

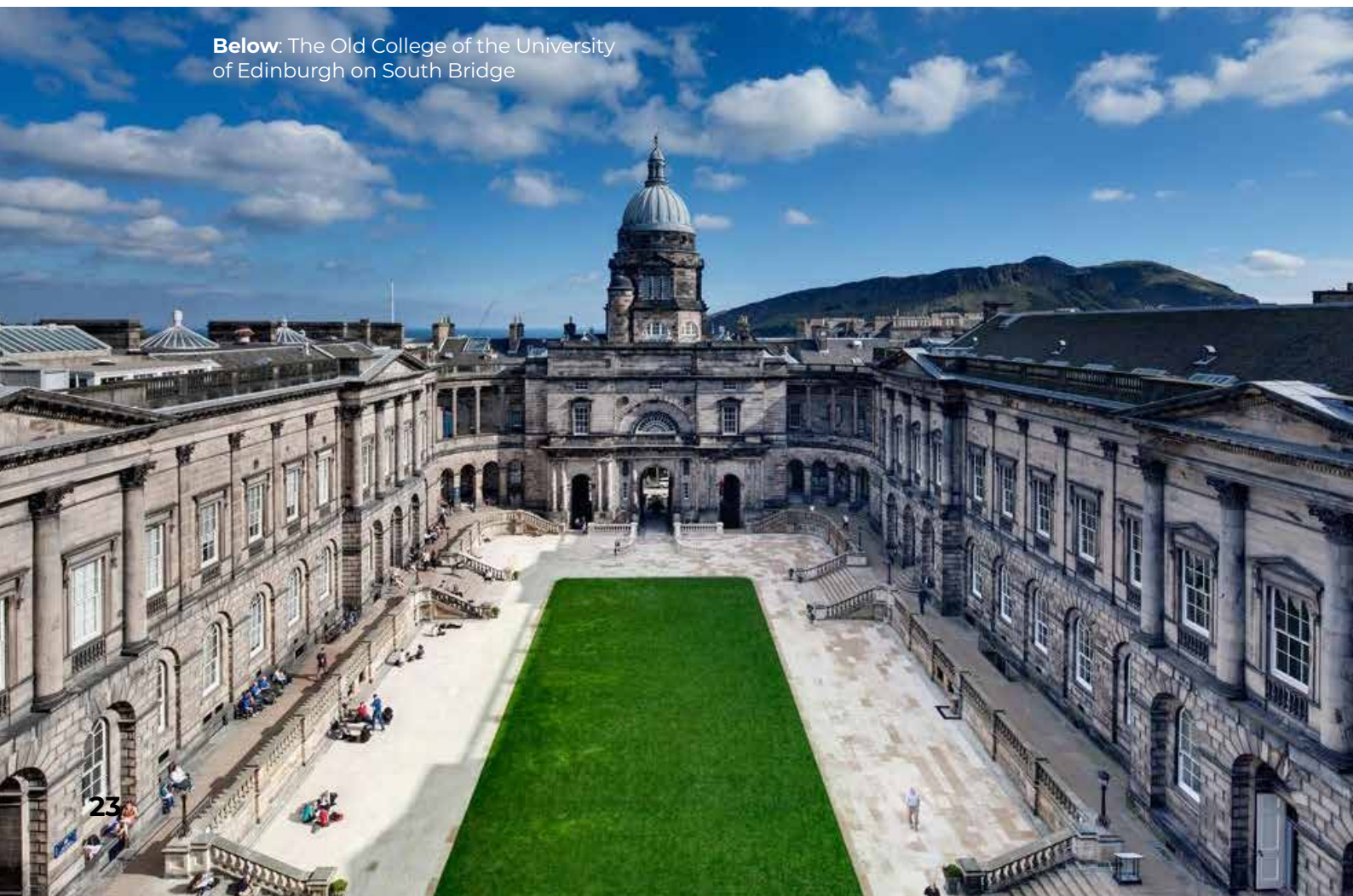
The MSc programme benefits from qualified and experienced members of the botanical staff within RBGE involved with teaching and tutoring on the programme. One of the key features of the course is that many of the staff at RBGE are scientists and horticulturists of international standing. Their expertise and contribution to the programme provides a most valuable opportunity for students to learn at first hand from some of Britain's most respected researchers of particular plant groups. The staff complement is augmented by specialists hired from outwith RBGE. Lecturers participate from the Universities of Edinburgh, St. Andrews, and Aberdeen, as well as other research institutes such as the Royal Botanic Gardens, Kew and the Natural History Museum. This mix of in-house scientists with external researchers provides a varied and highly effective teaching resource.

The University of Edinburgh

For the UK, Edinburgh is a big university, with over 30,000 students and about 5,000 staff. It is in a phase of rapid expansion at present, and has a very large income from research grants and contracts, as well as from the Treasury (via the Department of Education and the Scottish Universities Funding Council).

The University of Edinburgh was originally the College of Edinburgh or the Tounis College, founded in 1583 by the Town Council of Edinburgh, under general powers

Below: The Old College of the University of Edinburgh on South Bridge



granted by the Charter of King James VI, dated 14 April 1582. From the first the College possessed the privilege of conferring degrees. This privilege was ratified by the Act of Confirmation, passed in 1621, which secured to the College of James VI as it had come to be called all the rights, immunities and privileges enjoyed by the other Universities of Scotland. This ratification was renewed in the Treaty of Union between England and Scotland, and in the Act of Security. Gradually, in Acts of the General Assembly, of the Town Council, and of Parliament, the College of James VI came to be styled the University of Edinburgh; but it remained under the control and patronage of the Town Council until 1858 when, by the Universities Act, all the Universities of Scotland received new and autonomous constitutions.

Histories of the University have been compiled from time to time. In connection with the 300th anniversary of the foundation of the University, the History of the University of Edinburgh 1883-1993, edited by Local Turner, was published: this volume was in continuation of Grant's Story of the University of Edinburgh during its first three hundred years. The most recent work, however, is Professor Horn's A Short History of the University of Edinburgh 1556-1889. Edinburgh University: an Illustrated Memoir, published on the occasion of the University's Tercentenary, selectively illustrates aspects of Edinburgh's history. Ronald Birse's book, Science at The University of Edinburgh 1583-1993, is an illustrated history which marks the Centenary of the Faculty of Science and Engineering. The University's collection of over 250 portraits is described in The University Portraits (2 vols), with biographies of the sitters. Lists of former holders of chairs and lectureships are given in the 1967-68 and previous editions of the Calendar.

The University Science Campus, at Kings Buildings in the south of the city, houses most of the science departments and institutes of the university. At King's Buildings, the School of Biological Sciences contains six institutes. Two of these, the Institute of Molecular Plant Sciences and the Institute of Evolutionary Biology, are the most relevant to the MSc in Biodiversity and Taxonomy of Plants. Biology at Edinburgh is collectively one of the largest concentrations of national investment and employment in the subject, with a considerable research income and output.

STUDENT SERVICES AND SUPPORT

The Royal Botanic Garden Edinburgh assigns all students on the MSc course a Personal Tutor as a first point of contact to help you settle in to the Garden and life in Edinburgh. In addition, as a student of the University of Edinburgh, there are a wide range of support facilities which are available to you.

The [Student Support](#) pages on the University website give you points of contact for advice on money matters, immigration compliance, counselling, health and wellbeing.

As RBGE is a non-residential centre, a residential doctor is not available at the

Garden. Students should register with the [University Health Service](#), Richard Verney Health Centre, 6 Bristo Square, EH8 9AL. If students live more than a 3 mile radius away from the University Health Centre then they are advised to register with an appropriate Practice close to where they stay for both medical and dental services. Life at RBGE should be stimulating, rewarding, enjoyable and trouble-free. However, there may be a time when students experience emotional, financial or personal stresses, which affect their health or studies. The MSc programme directors are there to offer help and constructive advice in such circumstances. The MSc director acts as the primary contact and will put the student in touch with appropriate specialist counsellors or advisers if requested. The University provides professional help to students at no cost.

ACCOMMODATION AND TRANSPORT

The University of Edinburgh has an [accommodation search service](#) available and can help you find a suitable room. A list of potential accommodation can also be obtained from the education office at RBGE, based on local contacts and rooms available from Researchers at the garden. The City of Edinburgh is very much a 'student friendly environment' and a variety of flats are available to students on an annual basis.

As most of the courses will be organized at RBGE, students are advised to find accommodation within a reasonable distance of the garden. Students preferring the buzz of the city can find accommodation closer to the centre. There is a regular bus service from the city centre, although the main street (Princes Street) is only about 20 mins walk from the garden. Lothian buses 23, 27, and 8 stop at Inverleith Row in front of RBGE main building.

Coming by car is possible but you need to be aware that parking spaces are paying from 8.30 till 5.30 from Monday till Friday and parking attendants are very active. Cycling is a good option as there is a good cycling path network in parts of the city, and there is a cycle park in front of the RBGE Science Buildings.

LEISURE AND RECREATION

Edinburgh is a culturally diverse and vibrant international city, and the Royal Botanic Gardens reflects this. On the social calendar during the first semester is the staff and student pantomime, and after the exam season is over we have our annual round-the-garden race on midsummer night, with barbeque and drinks party. There are numerous arts festivals and events throughout the year in Edinburgh, with the largest being the Edinburgh Festival Fringe with over 3,000 shows and events. For those who like sport, there is a large range of sporting and leisure facilities provided in and around Edinburgh. At registration you will be given the opportunity

to become an Associate Member of the Edinburgh University Sports Union. This membership will allow you to use all Edinburgh University Sports and Leisure facilities. The main facilities are at Pollock Sports Centre, 48 Pleasance, EH18 9TL. The facilities include squash, badminton, circuit-training, weights and judo. Facilities at the Peffermill site include football, rugby, cricket, hockey, lacrosse, shinty pitches and a floodlit synthetic grass pitch for training, 5-a-side, hockey etc. Ski fanatics can use the artificial ski-slope at the Midlothian Snowsports Centre in Hillend all year round. In addition there are over [280 societies at the University](#), from A Capella to Zoology, a great way to expand your interests and meet new people.

FURTHER INFORMATION

The University of Edinburgh [students pages](#) have a wealth of resources for new students, covering academic and city life. You can also check the website of the [RBGE](#) to find out about staff, resources and research.

Below: A view of Edinburgh Old Town from Calton Hill.
[Photo G. Milo](#)

