



Royal  
Botanic Garden  
Edinburgh



# **BIODIVERSITY AND TAXONOMY OF PLANTS**

## **MASTER OF SCIENCE**

**APPLICANTS HANDBOOK**

**ACADEMIC YEAR 2022-2023**

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 been running since 1992. 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.

Because of Covid-19 we continued partial online delivery during the past academic year. For some modules, there will be an element of online delivery during the coming year, but wherever possible, and especially for practical sessions, teaching will be on site at the garden. As uncertainty around international travel continues, for 2022-2023 we are running a plant identification course based in Edinburgh rather than in the tropics, supported by a field course in Benmore on the west coast of Scotland.

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**

**Louis Ronse De Craene MSc DSc**  
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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 taxonomy, plant morphology, and the evolution and distribution of the major groups of plants.
- To form researchers with a strong knowledge of plant diversity and taxonomy in addition to state-of-the-art technical and analytical skills.

## **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 350 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 more information see: <https://www.ed.ac.uk/studying/postgraduate/applying/your-application/entry-requirements/english-requirements>

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](http://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

(l.ronsedecraene@rbge.org.uk; TEL +44 (0)131 248 2804; FAX +44 (0)131 248 2901)

**Prof. Andrew Hudson**, The University of Edinburgh

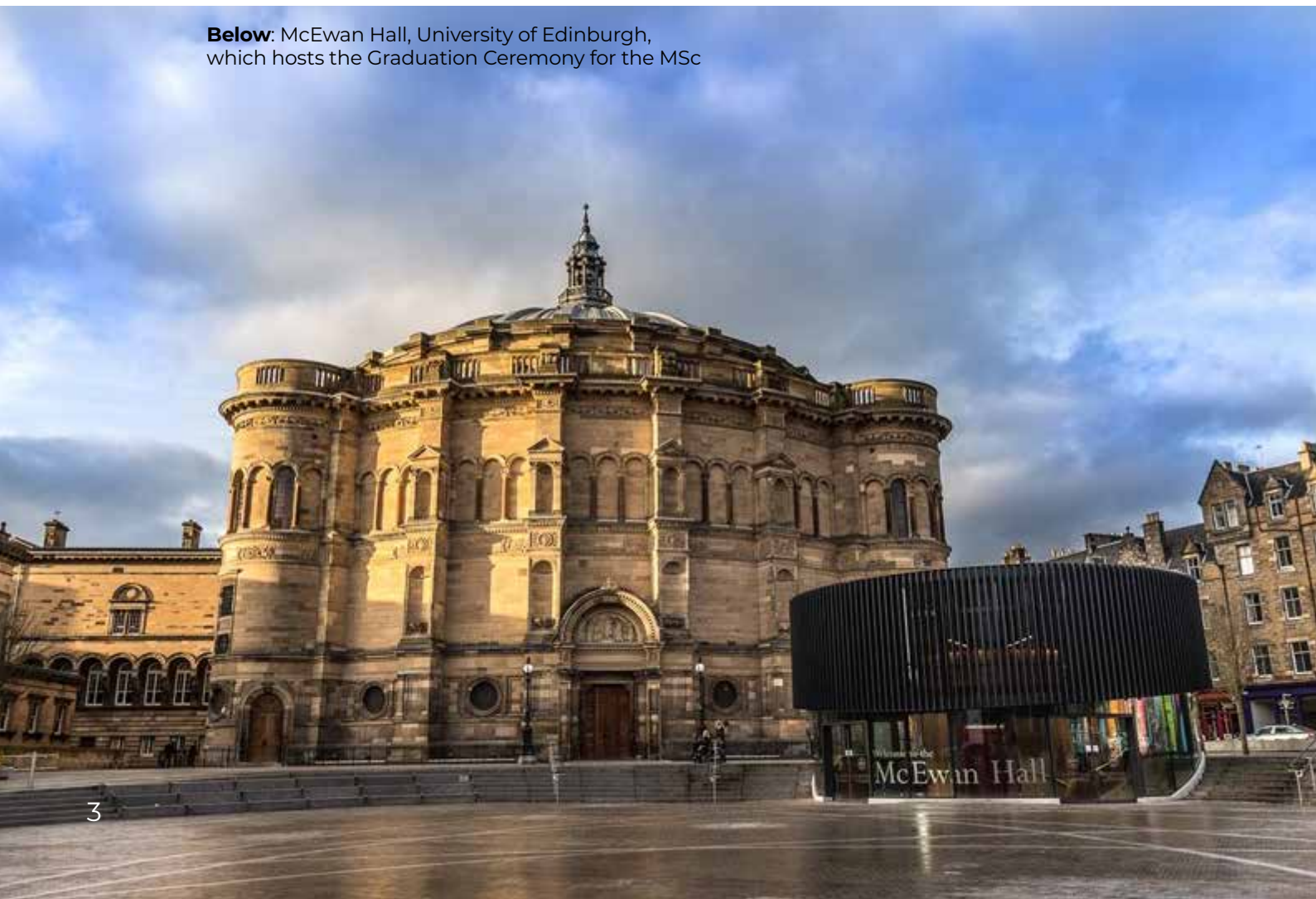
(andrew.hudson.ed.ac.uk; TEL +44 (0)131 651 3383; FAX +44 (0)131 650 5392)

**Programme Administrator**, University of Edinburgh

(btpmsc@ed.ac.uk; TEL +44 (0)131 651 7052)

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 2022-2023 for UK students are £18,100, which are payable to the University of Edinburgh. Fees for international students (including EU) are £35,900 per year. Please check [here](#) for confirmation of the latest fees; different fees apply to part-time students.

These fees include several excursions in Scotland, and any consumables or expenses for 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 £10,000-£14,000 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](http://www.slc.co.uk)



# SCHEDULE 2022-2023

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. In the event of restrictions on social interaction being imposed, teaching will move online where necessary.

- Induction week at RBGE and UoE: week commencing Monday 12th September
- Autumn Semester: 19 September - 16 December 2022
- Spring Semester: 9 January - 14 April 2023
- Summer research projects: 15 May - 18 August 2023; seminar day 31 August
- RBGE graduation: early September 2023 (TBC)

**Below:** Benmore House at Benmore Botanic Garden, which you will visit early in Semester 1 for a short field course



# 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:** [PTMSCBITXP1E](#)

**Degree Type:** Postgraduate Taught Masters / Diploma

Semester	Course	EUCLID code	Credits	Level
1	Evolution of Plants	<a href="#">PLSC11002</a>	10	11
1 & 2	Biodiversity of Angiosperms	<a href="#">PGBI11044</a>	20	11
2	Plant Genome Diversity	<a href="#">PLSC1104</a>	10	11
1 & 2	Biodiversity of Cryptogams and Fungi	<a href="#">PLSC1105</a>	20	11
1	Taxonomy and Plant Collections	<a href="#">PLSC1106</a>	10	11
1 & 2	Phylogenetics and Population Genetics	<a href="#">PLSC1103</a>	20	11
2	Plant Geography	<a href="#">PGBI11012</a>	10	11
2	Conservation and Sustainability	<a href="#">PGBI11043</a>	10	11
1 & 2	Tropical Plant Identification Course	<a href="#">PLSC11008</a>	10	11
3	Research Project & Thesis	<a href="#">PGBI11020</a>	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)

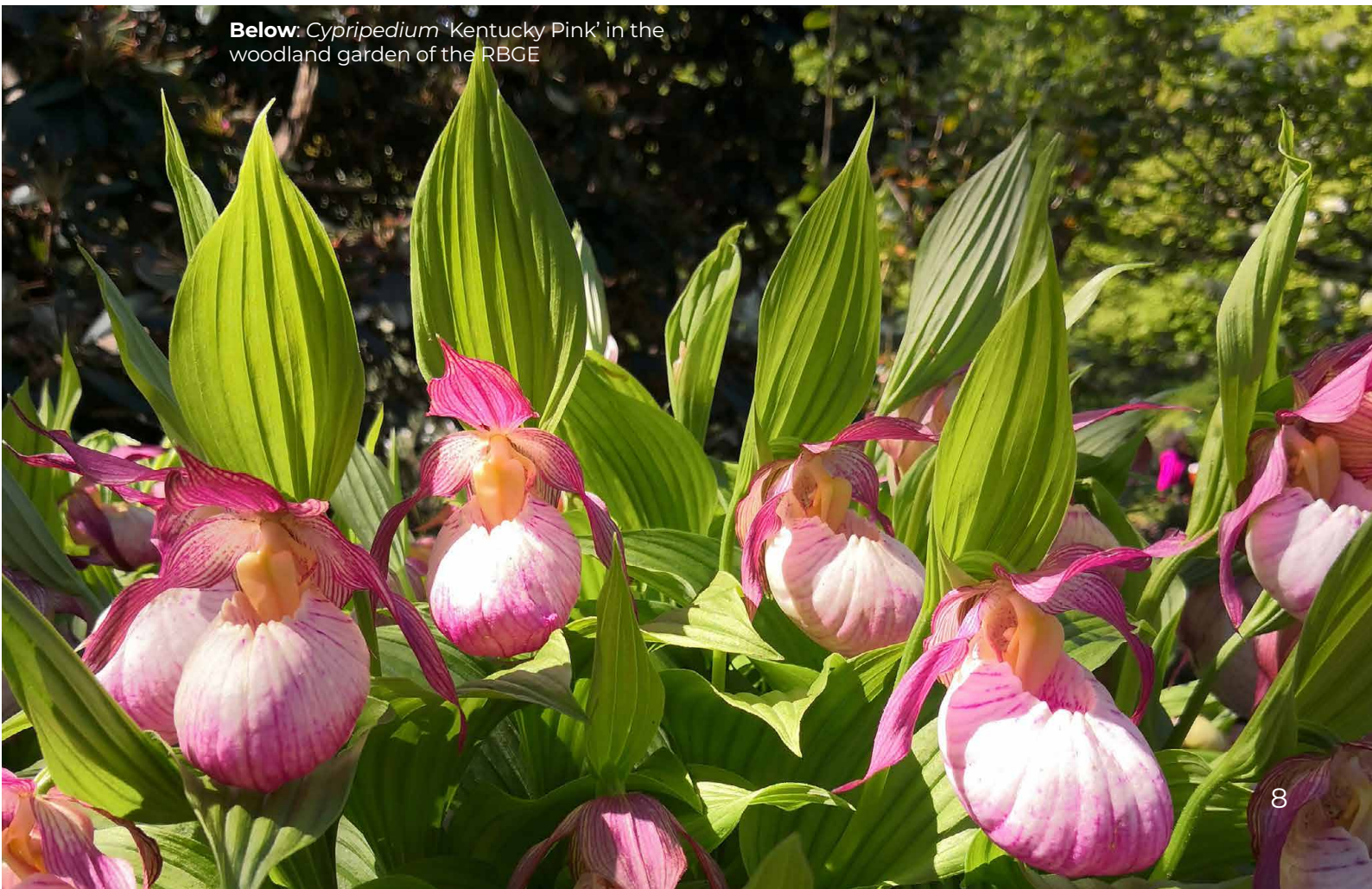
**Course Organiser:** Zoë Goodwin

**Lecturers:** Zoë Goodwin (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.

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





The course ends with an overview of the origins of the angiosperms and their early evolution. A visit to the National Museum of Scotland fossil collections is included in the course.

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 organiser:** Louis Ronse De Craene

**Lecturers:** Louis Ronse De Craene (RBGE), Zoë Goodwin (RBGE).

The Biodiversity of Angiosperms course explores the major features of Angiosperm families to enable the understanding of their phylogenetic relationships



**Below:** The Lecture Theatre at the Royal Botanic Garden Edinburgh



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

and evolution as well as their identification. The course relies heavily on the understanding of floral structures (through floral diagrams and floral formulae) and the identification of plants to family level using key characters. The evolution of angiosperms is reflected in the study of their floral diversity. The study of angiosperm diversity involves the sampling and observation of diverse living floral material grown at RBGE.

The purpose of the course is to explain the origin, evolution and special features of the angiosperms to enable the understanding of the relationships of major groups 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. Teaching is lecture based, with emphasis on floral morphology and a general discussion of the angiosperm phylogeny in the first term, while the second term is devoted to the observation and analysis of flowers and their characters during weekly practical sessions including guided walks among the RBGE collections. The practicals give the opportunity to extend on key characters based on further sampling and observation of living floral material grown at RBGE.





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

The availability of living study material involves the study of plants as an entity and students are encouraged to explore these living resource, and record their observations by drawing half-flowers including floral diagrams and floral formulae, as an effective way to become acquainted with the diversity of angiosperm families. 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 essay at the end of semester 1 (50%), and a two hour practical examination using live material at the end of semester 2 (50%).

#### Reading list

- Ronse De Craene, L.P. (2022) Floral diagrams. An aid to understanding flower morphology and evolution 2nd edition. 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.
- Soltis D. et al. (2016) Phylogeny and evolution of the angiosperms. University of Chicago Press, Chicago.



## **Plant Genome Diversity (10 Credits)**

**Course organiser:** Catherine Kidner

**Lecturers:** Catherine Kidner, Mark Hughes, Greg Kenicer, Michael Moeller, Crinan Alexander (all RBGE), Andrew Hudson (UoE).

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, sequencing, assembly and analysis introduced. Lab work in the molecular Biology teaching labs at Kings Buildings provides practical experience in DNA extraction and cytology. Guest lectures provide an overview of how genomic techniques can be used to address questions in plant diversity.

Assessment comprises production of a research proposal using sequencing to study plant diversity and is supported by two planning and writing workshops (100%).

### **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 organiser:** Rebecca Yahr

**Lecturers:** Neil Bell, Katy Hayden, David Mann, Jo Taylor, Rebecca Yahr (all 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 2); 2. A series of practical examinations on Fungi (25%, semester 1), bryophytes and ferns (30%, semester 2), and Algae (15%, 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 Organiser:** David Harris

**Lecturers:** Mark Watson (RBGE), Colin Pendry (RBGE), Jess Rickenback (U of E), David Harris (RBGE), Elspeth Haston (RBGE), Axel Poulsen (RBGE) and various members of the herbarium staff.

The aim of the course is to provide an understanding of the crucial role of herbarium taxonomy in plant biology and its power and elegance as a technique to study plant diversity. By the end of the course, students will have the 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 by a series of topics which are prerequisites for herbarium taxonomy. After preparation in a combination of practicals and lectures, students carry out a piece of original research and write a Flora account of a small genus or family which forms the main part of the in-course assessment. The following subjects are covered: Plant collecting, curation, nomenclature of wild and cultivated plants, the production and uses of taxonomic tools, monographs, floras, checklists, keys, and databases.

### **Reading list**

- Winston, J.E. 1999. Describing Species: Practical Taxonomic Procedure for Biologists. Columbia University Press 512 pp. also available as an ebook.
- Turland, N. 2019. The Code Decoded: A user's guide to the International Code of Nomenclature for algae, fungi, and plants, 2nd Edition, available free



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

online. Pensoft publishers.

- Sosef, M.S.M. Degreef, J., Engledow, H. & Meerts 2020. Botanical classification and nomenclature, an introduction. Meise Botanic Garden, 2020. 72 pp. [available free online](#).

## **Phylogenetics and Population Genetics (20 Credits)**

**Phylogenetics Course Organiser:** Mark Hughes

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

**Population genetics Course Organiser:** 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 has two distinct parts: 1. Phylogenetics, which covers history of the field



and the development of current methods of analysis and considers data types and data acquisition and formatting. It involves a mix of pen-and-paper and computer practicals for analysis of DNA data using parsimony, likelihood and Bayesian methods, trait evolution and ancestral state reconstruction, and molecular dating. It is taught using botanical examples. 2. Population genetics, covers DNA sequencing methods and molecular markers, DNA barcoding, conservation genetics, phylogeography, and the four evolutionary forces (mutation, migration, selection and drift), and HW equilibrium, plus analytical methods in population genetics.

Assessment is through two written assignments, with population genetics counting for 1/3 of the mark, and phylogenetics counting for 2/3. The population genetics assignment consists of two parts; (i) comparing the genetic diversity between samples collected in the field and samples from a seed bank; (ii) carrying out a STRUCTURE analysis on a real data set with interpretation of the results. The phylogenetics assignment consists of a writing a short scientific paper, based on a DNA data set you will be given to make a phylogeny.

### 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.

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



## **Plant Geography (10 Credits)**

**Course Organiser:** Mark Hughes

**Lecturers:** 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. Biogeography is the study of species distributions in time (past, current and future) and space (from local to global scales). It is a fascinating field tackling some of the most fundamental questions in biology and biodiversity, and is of crucial importance at the intersection of the climate crisis and the biodiversity crisis. Biogeographic research is essential for planning effective conservation strategies and being able to predict how organisms will react to anthropogenic environmental change.

This course provides a background to the discipline of plant geography, including an account of its history, overview of basic concepts, as well as explanations of current analytical biogeographic methods used in the three main fields of biogeography (historic, ecological and conservation). 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 is lecture based (online or in person as conditions dictate), and will involve some 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, and to support you in this there is one session on how to write a research proposal and past examples given.

Assessment is through a research grant proposal based on a project of your choice, using a three year timeframe and a budget of £10,000 (a similar scope to a PhD project proposal).

### **Reading list**

- Cox et al. (2016) Biogeography, an ecological and evolutionary approach, 9th Edition. Wiley Blackwell.
- Karban et al. (2014) How to do Ecology. Princeton.

## **Conservation - Science, Policy and Implementation (10 Credits)**

**Course organiser:** Antje Ahrends

**Lecturers:** Antje Ahrends, Pete Hollingsworth, Chris Ellis, Aline Finger, Tiina Sarkinen, team of the Centre for Middle Eastern Plants (CMEP), Phil Thomas, Peter Wilkie (all RBGE).

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 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 an assignment in semester 2.

### **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 Plant Identification Course (10 Credits)**

**Course Organisers:** Tiina Sarkinen

**Lecturers:** Core staff (TBC each year)

This course teaches both the theory and practice of tropical plant identification and collecting, both core skills for botanists and taxonomists. Although the number of plant species is a bewildering 300,000, there are ways of breaking this diversity down into manageable chunks so you can move forward with the identification process.

The course uses a combination of on-line and in-person learning, supported by material from the diverse living plant collection at Royal Botanic Garden Edinburgh. In addition there will be a residential study visit to the temperate rain forests of western Scotland, based at our Benmore Botanic Garden (depending on any restrictions in place at the time). This course content covers:

- 1 The vegetative characteristics of major tropical plant families.
- 2 Overview of vegetative morphology across tropical plant families.
- 3 How to collect and preserve herbarium-standard specimens.



- 4 The processes involved in plant identification.
- 5 Skills required during plant collecting in different settings.

The course provides the opportunity to develop graduate attributes and skills, including problem solving, decision making, critical analysis. Assessment is through making a learning diary (60%) and a practical plant identification examination (40%). Passing this course entitles students to receive the RBGE Certificate in Practical Field Botany.

### Reading list

- Gentry, A. (1993) A field guide to the families and genera of woody plants of Northwest South America. Conservation International.
- van Balgooy MMJ et al. (2015) Spot-Characters for the Identification of Malaysian Seed Plants. Natural History Publications, Borneo.



The Tropical Palmhouse at RBGE

# RESEARCH PROJECT

**Organiser:** Louis Ronse De Craene and RBGE/UoE science staff

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.

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.

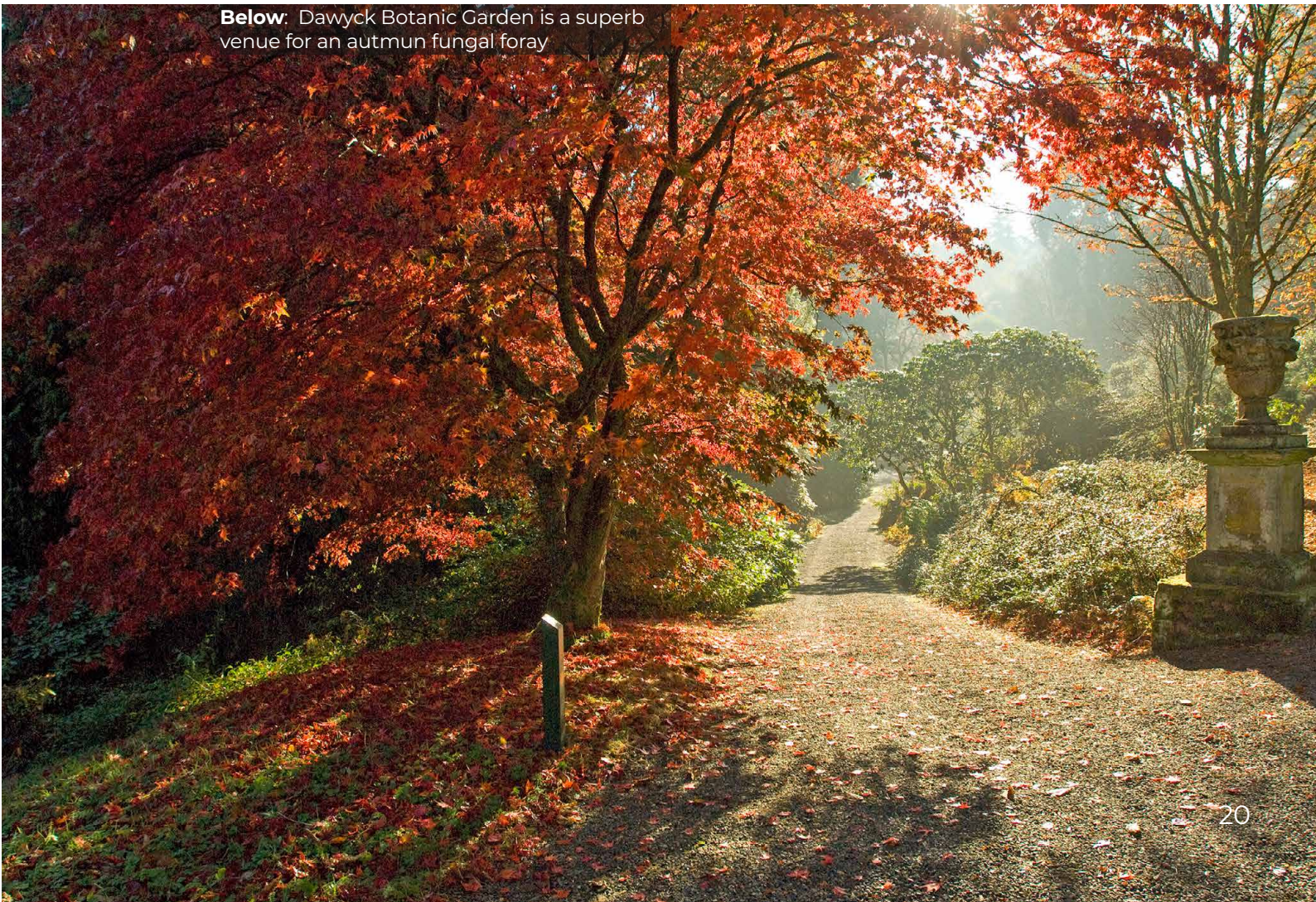


## STUDY TOURS AND VISITS

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*. Covid restrictions permitting, this includes:

- A day trip to Dawyck Botanic Garden, including a fungal foray.
- A four-day residential field course in Benmore Botanic Garden as part of the training for Taxonomy and Collections and Tropical Plant Identification courses.
- 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 5,170m<sup>2</sup> of display glasshouse and 1,947m<sup>2</sup> 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. Our glasshouses are currently undergoing refurbishment and closed to public visitors, but we will give access to material and tours for students wherever possible.

## **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 provided to students through the University of Edinburgh.

## Staff Expertise

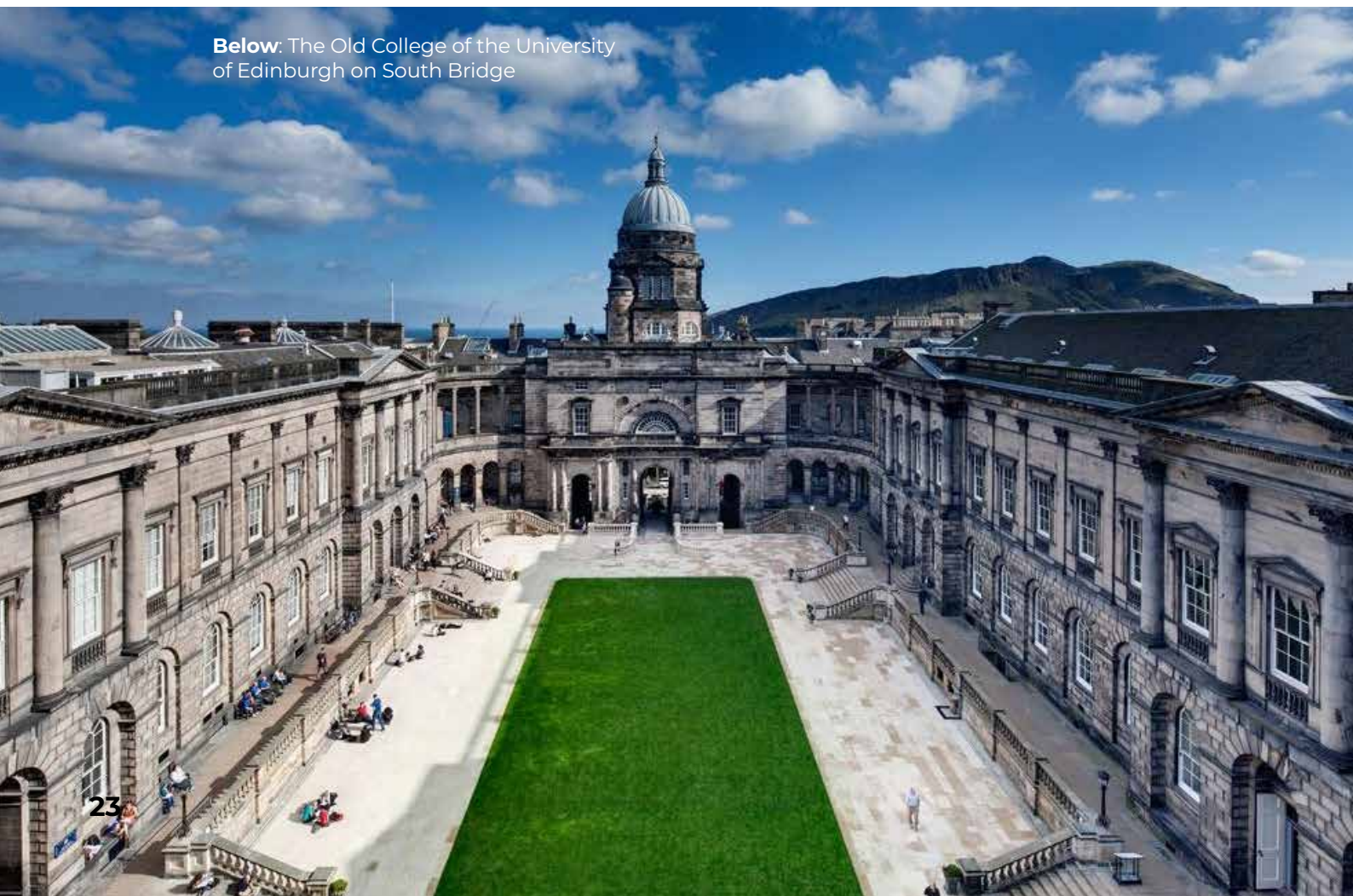
The MSc programme benefits from qualified and experienced members of the botanical staff within RBGE involved with teaching and tutoring on the programme. One of the key features of the course is that many of the staff at RBGE are scientists and horticulturists of international standing. Their expertise 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. 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](#)

