National University of Ireland, Galway
Ollscoil na hÉireann, Gaillimh

The Department of Botany

What is Botany?

Botany — the Science of Plants — encompasses aspects of the study of all plants, including algae, mosses, ferns, gymnosperms and flowering plants, which may occur on land, in rivers and lakes and the oceans. It includes aspects of plant distribution patterns, genetic relationships, physiology and biochemistry, and plant interactions with each other, animals and different environments. Plant science has applications in a range of fields, including biotechnology, environmental monitoring and nature conservation, agriculture, and the food and pharmaceutical industries, and is therefore at an interface with many other disciplines in the natural sciences. Plants are an essential component of all ecosystems, and Botany contributes significantly to the basic understanding of essential processes that affect our ecosystems and natural environments. Human activities have placed many ecosystems under pressure, and plants may help maintain, monitor or even improve threatened habitats or ecosystems. Plants are responsible for many essential functions such as producing oxygen that animals (and humans!) depend on, fixing carbon from the atmosphere and counteracting environmental change,

and taking up nutrients from soils and water. They form the base of the food chain that animals and people depend on for food. They are also responsible for creating habitats for animals and improving the environment in which we live. In addition, plants contribute a large proportion of our agricultural products, textiles, medicines and building materials, and new, valuable substances that can be made or extracted from plants are discovered every day.

Over 400,000 plant terrestrial species have been documented, with many thousands more still to be discovered. About a quarter of all known plant species are under threat from extinction largely due to increasing human populations and current industrial and agricultural practices. These

have caused many environmental problems including pollution of soils and water bodies, as well as problems associated with climate change. Botanists can help protect the environment by exploring and monitoring plant diversity, understanding the fundamental processes how plants work and interact within their habitats, finding new ways to restore environments, and developing new techniques to utilise plants in an environmentally friendly and sustainable way.

It is an exciting time to be a Botanist – Botany is an increasingly diverse and dynamic discipline in which the latest technologies are applied to fundamental scientific questions. Botany, or plant science, involves topics such as plant ecology and how plants interact with their environment, and the application of plants in environmental protection and management, improvement in agriculture, health care, medicine and industry. Therefore Botany is an essential component of integrated environmental research and it is vital in the future sustainable development of our natural resources.

Why study Botany at NUI, Galway?

The Botany Department at NUI, Galway has a long history of excellence in research, the study of climate change, including that of past climates and paelaeoecology, plant biodiversity and marine and aquatic plant science. This is reflected in the teaching programme. Specialist courses are taught in these fields which have many practical applications. Instruction is by lectures, practicals and field courses which facilitate an integrated approach to teaching

and learning, combining both theoretical and practical aspects of modern plant science. Galway is ideally situated for the study of marine and terrestrial plants being in close proximity to extensive, diverse rocky shorelines and the unique habitats and plant communities of Connemara and the Burren (one of the most interesting botanical areas in Western Europe). NUI, Galway field research stations are situated within these globally important environments and provide accommodation and facilities for students obtaining practical experience in field techniques and plant identification. The fact that NUI, Galway academic staff are active in research of specialist fields of environmental and marine science, as well as aspects of applied plant science, provides an excellent opportunity for students to gain hands-on experience in modern techniques in plant research. The collaborative and interdisciplinary nature of the diverse research activities

of Botany staff gives students an insight into the many applications of plants. The Department is student-focused and committed to research-led teaching and the training of students in subject-specific, but also in transferable, skills. This allows our Botany graduates to compete successfully for employment or postgraduate research positions.

How to become a Botanist

Entry into an undergraduate degree course in Botany is through the normal CAO route. Students who wish to pursue Botany to General (3-year) or Honours (4-year) BSc degree level should select the BSc Undenominated Science degree course and select courses in Botany throughout their course of study. First year students should choose Biology (BO101) as one of four first year subjects. While no prior knowledge of biology is necessary, foundation studies (e.g. Biology to Leaving Certificate Honours or Pass standard) are desirable. Specialist Botany courses at second, third and fourth year are taught through a combination of lectures, laboratory practicals and field exercises which are described below. These courses are also open to students of

the denominated degree programmes in Environmental Science, Earth and Ocean Science and Marine Science. In the course of their fourth year, Botany students carry out an independent research project in a specialist area of Botany chosen in consultation with one or more members of staff of the Department.

First year: Botany is studied as part of an integrated biology course (to which the departments of Biochemistry, Microbiology and Zoology also contribute). First year Biology/Botany provides students with a general background in the basics of Botany, preparing students for further study in later years. The Botany module focuses on plant form and function, plant-environment interactions, plant diversity, algal biology, native plant communities and habitats, and conservation.

Second year: Botany courses are designed to provide comprehensive coverage of selected topics in modern plant science. Lectures are accompanied by complementary laboratory investigations which facilitate practical training and allow students to gain first-hand experience of a wide range of scientific laboratory techniques. Field trips enable students to gain valuable experience in plant diversity and identification and practical techniques in field ecology.

Third year: This course provides an introduction to

terrestrial plant ecology, methods of vegetation sampling and mapping, an introductory survey of the principal Irish plant communities and ecosystems (e.g., woodlands, grasslands and peatlands). Other topics include plant-soil relationships and (physical and chemical) soil properties and their measurement, and how plants adapt to different environments. The main techniques used in the reconstruction of past environments are also introduced along with consideration of the possible climate-forcing mechanisms involved and evidence for major (global-scale) climate oscillation during the Ice Ages. Other topics are related to applied and environmental aspects of aquatic plant science, with particular emphasis on marine plants (seaweeds) and applications of plant function; how plants respond to their living and non-living environment by producing special defences, toxins against animal grazers, and the use of modern plant techniques in plant breeding and biotechnology. As in second year, field trips are organised to locations of special botanical interest.

Fourth year: Courses are given in a variety of specialist areas in Botany, deepening the understanding of essential plant processes, and the knowledge of practical skills in applications of plants in conservation and management, the study of (past) climate change and environmental monitoring, including, for example, the use of plants (or algae) as bioindicators for pollution.

Students undertake an independent research project in a specialist area of Botany. Research results are compiled in a short thesis which forms part of the final degree examination. Active research groups within the department facilitate up-to-date teaching and the integration of undergraduate students into current research programmes. There is also close collaboration with staff members in the departments of Archaeology, Biochemistry, Earth and Ocean Sciences and Experimental Physics.

Opportunities for further study

Many graduates with a first degree in Botany choose to undertake further studies at postgraduate level. Research in a specialised field of plant science at Masters or PhD level can be conducted at NUI, Galway, other Irish universities or abroad. Some graduates register for taught Masters degrees in subjects such as ecosystem conservation and

management, applied ecology, plant biotechnology etc. Higher Diplomas (e.g. in Education) are also available to Botany graduates. The Botany Department at NUI, Galway offers both Masters and Doctoral degrees by research, supervised by academic members of staff. Current research opportunities exist in the fields of marine and aquatic plant science (aquatic plant-environment interactions and their applications in monitoring and plant utilization), ecosystem conservation and management, the study of past climates (and how this relates to current changes in the climate) and the study of plant function and its applications in biotechnology and plant evolution.

Career opportunities for Botanists

Botany is a broad and multidisciplinary field and this is reflected by the many career opportunities available. Qualified Botanists find employment in a range of positions, from field ecologists and conservationists advising how to preserve environments, to laboratory-based scientists developing modern techniques or discovering new plant-derived chemicals used in industry and medicine. A degree in Botany provides training in the skills and techniques specific to plant science but also many highly sought-after transferable skills, such as good communication and social skills, the ability to handle data and solve problems. In addition to providing a record of academic success, the skills and techniques acquired during a Botany degree course can be used in many other scientific and non-scientific areas so that a BSc in Botany qualifies graduates for a wide range of science and non-science based careers.

Examples of careers open to Botany graduates are resource managers, agricultural scientists and advisors, conservation biologists, food, agricultural, horticultural or forensic scientists, marine biologists, science technicians in industry, park rangers, science teachers, environmental managers and consultants, science writers, government advisors ….

If you would like further information:

Go to our webpages: **www.nuigalway.ie/botany/**
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