

Bees and Flowering Plants

Lecturers:

Prof. Dr. Marinus J. Sommeijer, Course Leader, Bee Biology; Bumblebees, Stingless Bees

Drs. Luc de Bruijn, Solitary Bees and Flowering Plants

Ing. Mr. Remco Huvermann, Koppert BioSystems, Applied crop pollination, Bumblebees

Dr. Johan Calis and Dr. Ir. Willem-Jan Boot, Inbuzz, bee pollination. Honeybees and Solitary Bees as commercial pollinators

Drs. Jaap Kerkvliet, Pollen analysis for the study of Bee - Plant Relations

Mr. L.J. Nederlof / Mr. Hekke Groenendijk, Live Stingless Bee colonies in "Amazonica" tropical butterfly garden of Blijdorp Zoo, Rotterdam

Sunday 23 July

1200-1800 Key Pick up

Please be aware that registration is required for some of the social and cultural activities offered by the Utrecht Summer School in evenings and weekends during the course period of USS (see the USS website).

This course starts Monday in Room O-307 (3rd floor, East Wing) of Kruyt Building in "De Uithof" (UU SCIENCE PARK), Padualaan 8, 3584 CH Utrecht. Most lectures and practicals will be held in laboratories and rooms of this building.

Monday 24 July

930	Welcome, Introduction	Utrecht Summer School, Department of Biology Utrecht University; Student introduction Course schedule: lectures, practicals, field visits, team study projects, time schedule The diversity of relations between flowering plants and pollinators
	Lecture, video,	
1200-1300	Lunch	
1300	Lecture, video, Lecture Field visit Group discussion	Evolutionary origin of the relation bees - flowering plants The history of the study of the relation of plants and pollinators Visit to solitary bee stand and demonstration hives of honeybees Explanation of Team Study Projects: the importance of bees and their relation to flowers

Tuesday 25 July

930	Lecture and demonstration	The uniqueness of bees Looking at a bee; morphology and physiology
	Lecture and practical	The biodiversity of bees, about 20000 species worldwide The different groups of bees, world-wide distribution
1200-1300	Lunch	
1300	Field visit Practical	UU Botanical Garden, Methods for observation of bee diversity and bee behaviour Classification and taxonomy of the different groups of bees Introduction in simple lab techniques for the study of insect (bee) diversity Solitary bees important for commercial pollination. Management / application Team Study Projects: the importance of bees and their relation to flowers

Wednesday 26 July

930	Lecture and demonstration Field visit	Plant reproduction; Flower biology; Pollination and floral ecology Fields of university campus, Demonstration and collection of plants for study in lab
1200-1300	Lunch	
1300	Lecture and practical	Details of flower morphology related to different pollinators; pollination syndromes Pollination versus fertilization; nectar and pollen production Examples of specific relations (e.g. Orchid and Ficus pollination) Team Study Projects: the importance of bees and their relation to flowers

Thursday 27 July

930 Lectures and video

The general biology of the Honeybee, *Apis mellifera*
Honeybee communication, related to foraging
The evolution of colony living in the bees
Examples of different levels of sociality within the group of the bees

1200-1300 Lunch1300 Demonstration
Practical/Field visit

Bee biology and behaviour applied in the keeping of bees, "apiculture"
Visit to bee stand, demonstration of management of bee colonies
Team Study Projects: the importance of bees and their relation to flowers

Friday 28 July

930 Lecture and demonstration

The biology of Bumblebees
Demonstration of Bumblebee nests
Worldwide distribution of Bumblebees
Other social insects compared to social bees (Ants, Wasps and Termites)

1200-1300 Lunch1300 Lecture and demonstration
Practical/Field visit
Lecture and demonstration
Lab, group discussion

Observing Bumblebee diversity
Bumblebees visiting flowers in the fields of university campus and UU Botanical Garden
Bumblebees for pollination in natural flora and commercial crops
Team Study Projects: the importance of bees and their relation to flowers

Monday 31 July

930 Lecture and demonstration

Bee Products, Pollen, Honey, Wax and Propolis
Present status of bee products, their use, world markets and our own experience

1200-1300 Lunch1300 Lecture and demonstration
Workshop laboratory

Pollen study for the bee plant relation
Pollen analysis for honey research
Pollen morphology and melissopalynology, microscopic analysis of pollen
Team Study Projects: the importance of bees and their relation to flowers

Tuesday 1 August

0800-1800 All day Excursion

Koppert BioSystems, world leader in management of Bumblebee colonies and Biological Control agents. "Bee drivers towards food safety"
Managed pollination by bees: conflict with chemical pest control and need for bio-control organisms
Demonstrations in greenhouses with Bumblebees, Honeybees and Solitary bees
Visit to InBuzz, major pollination beekeeping enterprise in The Netherlands.

Wednesday 2 August

Lecture and video

Stingless bees, the other group of highly social bees
Meliponiculture, the beekeeping with stingless bees. Traditions and modern developments

1200-1300 Lunch

Excursion to Rotterdam Zoo

Amazonica tropical greenhouse; colonies of Stingless bees, tropical butterflies and flowers

Thursday 3 August

930 Lecture and video

Practical beekeeping; History of beekeeping
Worldwide occurrence; Modern technology; Development tool; Recent problems and solutions
Internet, Lab, group discussion
Scientific reading and internet work for team study projects
Team Study Projects: the importance of bees and their relation to flowers

1200-1300 Lunch

1300 Field visit

Excursion to traditional apiary, Skep-hive beekeeping.

Friday 4 August930 Practicals, Literature Study
Scientific reading and writing

Team Study Projects: the importance of bees and their relation to flowers
Students prepare reports for team study projects

1200-1300 Lunch1300 Symposium
1600 Wrap up

Minisymposium: presentations by students, work of team study projects
Certificates and goodbye