The Biomedical & Life Sciences Collection

HSTalks

AGRICULTURAL GENETICS

Understanding and improving plants and animals for food and agriculture



A complete advanced undergraduate/graduate course with:

- 16 online lectures by leading authorities
- Resources for workshops, tutorials, journal clubs, projects and seminars
- Suggested exam questions and model answers
- Multiple choice questions and answers
- Recommended reading: original papers and review articles



View our in-depth HSTalks: hstalks.com/CoursesBrochure

Course module with video lectures, material for tutorials (case studies, projects, workshops and recommended reading), multiple choice questions and suggested exam questions with model answers. A comprehensive course on a subject of major importance.

The material is especially designed to support research and teaching staff when presenting a comprehensive course at graduate or advanced undergraduate level with seminars, journal clubs, laboratory exercises, data workshops, online tests and end of course examinations.

The course is also suitable for continuing professional development/education programmes.

This brochure provides brief details of the complete module, including the lectures, lecturers and additional learning material.

Who is the course for?	The comprehensive material is especially suitable for teachers and researchers who wish to offer courses on specialist subjects to small groups of students (or even a single student) when it is not possible to justify the time and expense of preparing, internally, a course or there is not the range of expertise available locally to do so. All the lecturers are highly regarded experts in their fields and few institutions are likely to have a comprehensive group of faculty members with a similar range of experience and knowledge of the subject matter.
	and staff acting as course directors, tutors and mentors.
	The material is suitable for flipped classroom, blended, team and distance learning courses.
	New courses are time consuming and expensive to create. These modules cut both the cost and the time, enabling a wider range of options to be offered on specialist topics. Graduate students can take the courses, mentored by their supervisors, while pursuing their research.
Ideal for Virtual Learning Environments (VLE)	All course material, including the additional learning material, is arranged in a standard format that allows easy embedding into virtual learning environments such as Moodle, Blackboard or your institute's own system.
Supporting learning and teaching goals	In an age when faculty and staff face ever greater demands on budgets and time, these lectures and additional learning material will be of great help when preparing and delivering graduate and advanced undergraduate courses.



Course Summary

Human population growth is creating an ongoing increase in demand for food and other agricultural products, and sustainable agriculture to satisfy this demand requires large increases in agricultural productivity.

Varieties of plants and animals with potential to deliver the required productivity have been developed by genetic selection and breeding.

This was not necessarily a conscious process in early domestications for agriculture; however, in more recent times this process has become more deliberate, especially as science and technology have provided a growing understanding of agricultural organisms.

Since advances such as whole genome DNA analysis, molecular screening and targeted mutagenesis serve as important tools in the ongoing effort to meet the global challenge of sustainable food supply, the importance of agricultural genetics is appreciated now more than ever before.

This course aims to cover key issues in this compelling and vital field.



Editor: Prof. Robert Henry University of Queensland, Australia

The course module is designed for:

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- Researchers and graduate students in the fields of genetics, plant science, animal science, agricultural science, food science, human nutrition and environmental science
- Advanced undergraduate students, policy makers, and managers in public and private sectors
- Continuing Professional Education/Development
- Teachers and researchers who wish to offer the course to a small group of students
 - Faculty staff acting as course directors, tutors, and mentors

Course Lectures

The importance of genetics in agriculture



> Agricultural genetics for food security

Prof. Robert Henry University of Queensland, Australia



The role of genetics in adaptation of agriculture to climate change

Prof. Roberto Tuberosa University of Bologna, Italy

Social aspects associated with genetic engineering in agriculture

Prof. Ania Wieczorek University of Hawaii, USA



Plant genetics

Plant domestication

Dr. Duncan Vaughan Formally National Institute of Agrobiological Sciences, Japan



Prof. Mark Tester University of Adelaide, Australia



Prof. Robert Park University of Sydney, Australia

One plus one is better than two: Genome doubling in flowering plants

Biotic stress tolerance and resistance

Genetics of abiotic stress tolerance



Prof. Doug Soltis University of Florida, USA



hstalks.com/biosci

by world leading authorities

16 specially recorded, animated lectures

Animal Genetics



Genetics of animal health

Animal behavioural genetics

Heterosis in agriculture

Transgenics in agriculture

Epigenetics in agriculture

Mutation breeding in agriculture

Dr. Carlos A. Driscoll Wildlife Institute of India, India

Dr. Donagh Berry





Prof. Temple Grandin Colorado State University, USA

Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia

Genetics technologies and processes in agriculture

Marker assisted selection in agriculture





Dr. Nathan M. Springer University of Minnesota, USA



Dr. Bradley Till International Atomic Energy Agency (IAEA), Austria

> Dr. Wendy Harwood John Innes Centre, Norwich, UK





The impact of DNA sequencing technology on agriculture



Dr. Stephanie Pearl Prof. Scott Jackson research group University of Georgia, USA





Examples of Course Materials

For each lecture the course offers tutorials, workshops, recommended reading, multiple-choice questions, and suggested exam questions with model answers.



HST Moodle My Courses • Agricultural Genetics

Tutorial: Heterosis in agriculture

Lecturer: Dr. Nathan M. Spring

Heterosis has been harnessed to improve productivity for several agricultural species. The level of heterosis varies quite substantially among species and traits. However, the usage of heterosis can be limited in some species with high levels of heterosis due to the modes of plant reproduction. For each of the following hypothetical plant species below describe a strategy to create heterotic groups and to produce large amounts of hybrid seed. Consider which steps will be most difficult for each species.

- Species 1. A dioecious plant species that has male and female plants (No ability to self-pollinate individuals).
- Species 2. A monoecious plant species that has separate male and female flowers on the same plant (self-compatible)
 Species 3. A plant species with perfect flowers that has a very high rate of self-pollination.
- Species 4. A plant species that is self-incompatible and requires an insect pollinator.

? and Model Answers



Multiple-choice What does better parent heterosis (BPH) measure? Question 4 questions and Not yet Select one: answered answers • a) How much better either parent does in comparison to the hybrid for a given trait Marked out of 1.00 • b) How much better the hybrid being tested does in comparison to other hybrids for all traits ○ c) How much worse both parents do in comparison to the hybrid for a given trait C Edit question \bigcirc d) How much better the hybrid does in comparison to the best parent for a given trait*



Recommended reading supporting each lecture: Original research papers and review articles

Recommended Review Articles

- 1. Birchler JA, Yao H, Chudalayandi S, Vaiman D, Veitia RA. Heterosis. Plant Cell. 2010 Jul;22(7):2105-12.
- 2. Charlesworth D, Willis JH. The genetics of inbreeding depression. Nat Rev Genet. 2009 Nov;10(11):783-96.
- 3. Schnable PS, Springer NM. Progress toward understanding heterosis in crop plants. Annu Rev Plant Biol. 2013;64:71-88

Recommended Research Papers

4. Stupar RM, Gardiner JM, Oldre AG, Haun WJ, Chandler VL, Springer NM. 2008. Gene expression analyses in maize inbreds and hybrids with varying levels of heterosis. BMC Plant Biol 8:33,2229-8-33.

5. Zhou G, Chen Y, Yao W, Zhang C, Xie W, Hua J, Xing Y, Xiao J, Zhang Q. 2012. Genetic composition of yield heterosis in an elite rice hybrid. Proc Natl Acad Sci U S A 109(39):15847-52.



How to access the course

Extracts of lectures can be viewed at hstalks.com/biosci/. The full length lectures can be viewed by all members of universities, colleges and medical schools currently subscribing to The Biomedical & Life Sciences Collection. Institutions that do not subscribe to The Biomedical & Life Sciences Collection may take annual licenses at US \$2,000 covering an unlimited number of students.

Full supporting material: video lectures, material for tutorials (case studies, projects, workshops and recommended reading), multiple choice questions and suggested exam questions with model answers are provided to faculty members of subscribers.

To subscribe, obtain additional information and/or the additional learning material contact Dr. Eyal Kalie at eyalk@hstalks.com.

Upload to your VLE

The complete course (lectures and additional learning material) can be loaded into Moodle, Blackboard and other virtual learning environments.

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HSTalks provides access to world class lectures by leading authorities from around the globe, in one online resource.

Our subscribers include a wide range of universities, medical schools, colleges, hospitals, government agencies and pharmaceutical companies.



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