Transnational Learning

Transnational Learning creates powerful educational digtal resources and experiences for its global partners.

Cornell University
College of Agriculture and Life Sciences

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Cornell University
College of Agriculture and Life Sciences

Transnational Learning

Connecting Classrooms Around the Globe

Started in 2003 and supported by International Programs of CALS, the Department of Plant Breeding and Genetics, and grants from the Rockefeller Foundation, and the Bill and Melina Gates Foundation, Cornell staff has videotaped nearly 1,000 hours of lectures and seminars enhanced with synchronized PowerPoint presentations. Graduate-level students and faculty members in less-developed nations access the lectures and later participate in real-time videoconference discussions with Cornell faculty for face-to-face interactions. This opportunity creates an engaging, powerful educational resource and experience for students in the partner institutions as well as contributing to the internationalization of Cornell students and faculty.

Lecture Resources

Using digital Internet technology, Cornell's Transnational Learning initiative videotapes class lectures and combines the video with slides and supplemental materials to create unique learning presentations. Partner institutions in South Africa, Ghana, Thailand, India, the Philippines, and elsewhere have these digital lecture modules available to them.

The files are distributed using technology appropriate to the infrastructure of the institution: CDs or DVDs, FTP downloads, Web-streams. Currently, Cornell faculty and distinguished visiting scientists have provided over 1000 hours of lectures on topics ranging from advanced plant genetics to applied economics.

Human Resources

In addition to offering classroom content and follow-up discussions, Transnational Learning allows Cornell faculty members to offer professional expertise and consultations to the faculty and students in its partner programs. Students in Africa may choose to discuss their thesis research with a faculty member at Cornell—perhaps an instructor of one of the digital lectures. In consultation with the African student's local advisors, the Cornell professor might call on a panel of informal advisors from Cornell and elsewhere in the U.S. and international community who can help guide the African student on the direction of his or her research. This guidance can be critically important in keeping the research on par with international standards as well as providing a global context to the work. And students may develop increased confidence through this consultation and continue with their fieldwork with more determination and focus.

Library Resources

Cornell University's Mann Library has one of the world's largest holdings of literature in the agricultural sciences. Partners of Transnational Learning may have access to the library's reference assistance and document delivery, TEEAL, and its dissertation library and gray literature repository.

Mann Library's reference service can provide answers to factual inquiries as well as assists users with in-depth research investigations and literature reviews. It provides updates on the latest research via regularly e-mailed database search results. The library also may provide copies of journal articles to students in partner institutions by e-mail, or by postal airmail, whichever is more reliable.

TEEAL (pronounced teal), or The Essential Electronic Agricultural Library, contains the full text to more than 140 international scientific journals and is available eligible developing countries—currently more than 100 countries qualify. The digitized volumes, which are updated annually, indexed, and searchable, are a powerful tool for building capacity in agriculture by helping researchers, faculty, students, and extension workers quickly retrieve relevant and current scientific information. A project of Mann Library and the U.N.'s Food and Agriculture Organization, TEEAL can be made available, where appropriate, to researchers at partner institutions of Transnational Learning.

Exchange Visits

Transnational Learning and the College of Agriculture and Life Sciences encourages and supports Cornell PhD students to travel and visit partner institutions. Likewise, it encourages and supports students and faculty members of partner institutions to visit Cornell. U.S. students who visit partner programs in Africa and Asia gain first-hand knowledge about agricultural systems in those regions. They begin to build an international network of peers working in their field as well as learn about the constraints and opportunities facing researchers there. Students coming to Cornell from African and Asian partner institutions will similarly learn about American agricultural systems and have the opportunity to meet the broad range of international students and scientists studying at Cornell. In addition visiting students are able to observe advanced tools and techniques used in biological science research at Cornell.

For more information about Transnational Learining at Cornell visit

http://transnationallearning.cornell.edu

or call 607.255.6115

Cornell University
College of Agriculture and Life Sciences

Transnational Learning

Index of lecture modules

International Agriculture and Rural Development

Plant Breeding and Genetics

Plant Genome Organization and Function (PLBR 483.3)

Plant Pathology and Plant-Microbe Biology

Seminar Series

Cornell University

The strategic plan for research at Cornell can be summed up simply: Be the best at what we undertake to do. We build on our strengths when creating programs, recruiting faculty, purchasing equipment, and supporting interdisciplinary programs. Cornell research is committed to knowledge transfer and engages in technology transfer and economic development activities that benefit local, regional, national, and international constituents.

College of Agriculture and Life Sciences

Cornell University's College of Agriculture and Life Sciences (CALS) has a long tradition of discovery and scholarship from the social sciences to the environmental sciences to life sciences. Its researchers are among the best in the world, with world-class facilities at their disposal. The College engages in cutting-edge research and technology transfer with the goal of improving the lives of people in the state, nation, and throughout the world.

Cornell stands as one of the great universities in American and world history, and the College of Agriculture and Life Sciences has been a major contributor to that reputation. One of its strengths has been its ability to evolve to satisfy the changing needs of the industries and societies that it serves.

International Programs

CALS was a pioneer in international agricultural development beginning with activities in China in the early part of the 1900s. Today, International Programs of CALS contributes to maintaining Cornell's prominence among U.S. universities for international work by strengthening support for CALS faculty, students, and staff engaged in international initiatives. IP/CALS initiatives cover a wide range of efforts including scientific exchanges, overseas research, undergraduate and graduate education, professional development, technical assistance, advising, publications and other outreach. Strategic thrusts are linked to university and college priorities, including: biotechnology and genomics; environment and natural resources; globalization initiatives; watershed management, and internationalizing undergraduate curriculum.

For more information about Cornell University, its professors or academic and research programs, visit http://cornell.edu

Ruminant Nutrition: Microbial Ecology and Forage Chemistry

Professor Alice Pell
INSTRUCTOR

Alice Pell is vice provost for international relations for Cornell University. She is a professor in the Department of Animal Science and the director of the Cornell International Institute for Food, Agriculture and Development. Most of Dr. Pell's research focuses on tropical farming systems, with an emphasis on Africa. She also is involved in the West Africa Water Initiative (Mali, Niger and Ghana) that includes an interdisciplinary approach to improving water quality and the efficiency with which water is used. Dr. Pell's recent work is in Afghanistan involving applied research development, education capacity building, and agroforestry initiatives.

Ruminant Nutrition: Microbial Ecology and Forage Chemistry provides an overview of ruminant nutrition with an emphasis on microbial ecology, forage chemistry, and rumen function. The first section focuses on evolution, feeding strategies and plant-animal interactions. The second section concentrates on forage chemistry, and the third section focuses on rumen function and microbiology.

Lecture Titles

- Introduction
- Comparative Nutrition
- Classification of Herbivores
- Diversity of Ruminants
- Opisthocomus Hoazin
- Unselective Feeding of Animals Less Than 40 kg
- Plant, Animal and Environment Van Soest
- Three Phases of Summer
- Mesophyll and Warburg Effect
- Forage Evaluation Plants and Animals
- Markers
- Digestibility Calculations and Fiber Chemistry
- Acid Detergent Fiber System
- Sequential Analysis and NIRS
- Carbohydrates
- Animal Degradation
- Starch Treatment
- Starch Digestion
- Cellulosomes
- Mallard (Browning) Reaction
- Types of Lignin
- Tannins and Other Secondary Compounds
- Ruminal Detoxification
- Alkaiods
- Rumen Conditions and Anaerobicity
- Saliva Composition
- Other Cellulolytics
- Lactate Production and Utilization
- Amino Acid Profile and Bacteria and Fungi
- Retention and Doubling Time
- Mathematical Modeling - Development of Agricultural Models
- Objectives in Modeling
- Mathematical Modeling - Evaluation of Agricultural Models
- Anaerobic Fermentation
- CH4 Production
- Protein Metabolism
- Petide Metabolism
- N and CHO Metabolism
- Ideal Rumen Fermentation, Monensin, and Protien

Course No. ANSC 606
40 lectures • aprox. 50 minutes/lecture

Contemporary Controversies in the Global Economy

Professor Christopher Barrett

INSTRUCTOR

CONTEMPORARY CONTROVERSIES IN THE GLOBAL ECONOMY aims to stimulate critical thinking and cogent writing and speaking about contemporary controversies that attract regular attention in the international press and among key private and public sector decision-makers. Discussions focus on competing arguments about current issues such as patenting and pricing of pharmaceuticals worldwide, controls on commercial and humanitarian distribution of genetically modified foods, and immigration restrictions.

CHRIS BARRETT is an international professor in Cornell's Department of Applied Economics and Management. There are three basic, interrelated thrusts to Professor Barrett's research program. The first concerns poverty, hunger, food security, economic policy, and the structural transformation of low-income societies. The second considers issues of individual and market behavior under risk and uncertainty. The third revolves around the interrelationship between poverty, food security, and environmental stress in developing areas. Professor Barrett's teaching experience includes graduate and undergraduate courses on the microeconomics of international development, rural livelihoods and biological resources, econometrics and contemporary controversies in the global economy.

GUEST LECTURERS are George Hay, Thomas Maloney, Vernon Briggs, Steven Kyle, Richard Prybyl, Veronique de Ruggy

Lecture Topics

- Basic Concepts
- Communication
- Obnoxious Markets
- Slavery, A Global Investigation
- IPN
- Immigration Policy
- Soverign Debt
- Film: Debt of Dictators
- Debt Forgiveness in Africa
- International Money Laundering

Course No. AEM 200
23 lectures • aprox. 75 minutes/lecture

System Dynamics Modeling

Professor Charles Nicholson

INSTRUCTOR

Lecture Topics

- Introduction
- Learning in Dynamic Systems
- System Dynamics Defined
- The System Dynamics Modeling Process
- Fundamental Modes of Dynamic Behavior
- Causal Loop Diagrams
- Stocks and Flows
- Dynamics of Stocks and Flows
- Delays
- Exploring Climate Policy Options with Behavorial Dynamic Models
- Aging Chains and Coflows
- Modeling (Human) Decision Making
- Nonlinear Relationships
- Supply Chains and Oscillations
- Expectations Formation
- Numerical Integration
- Model Evaluation

This course introduces the basic concepts important in System Dynamics Modeling, using Vensim® dynamic simulation software, and basic evaluation of dynamic simulation models. "Systems thinking" is a more appropriate way to address social, economic and environmental problems as a real-life problem can be expressed as a feedback model that can help to facilitate understanding of how a problem developed over time, and to suggest lasting solutions to the problem.

Charles Nicholson conducts applied research related to U.S. and international dairy production, markets, and policy. His current areas of research include modeling the impacts of domestic U.S. dairy policy alternatives, dairy trade policy and international trade patterns, applications of system dynamics in agricultural economics research, and the economics of dairy production and marketing systems in developing countries. Dr Nicholson is an associate professor in Cornell's Department of Applied Economics and Management.

Course No. AEM 494
25 lectures • aprox. 50 minutes/lecture

Dynamic Optimization

Professor Jon M. Conrad
INSTRUCTOR

DYNAMIC OPTIMIZATION is concerned with the solution of dynamic allocation problems. Objectives are to pose prototype optimization problems in discrete and continuous time, introduce the common methods for solving prototype problems, present a set of numerical problems, and equip students with basic theory and methods to perform applied research on dynamic allocation problems.

JON M. CONRAD is a professor of resource economics. His research focuses on the application of dynamic optimization to resource management. Recent work has focused on water and marine resources and energy resources.

Lecture Topics

- The Value Function
- Solving the Widget Problem by Calculus of Variations
- The Maximum Principle
- The Phase Plane
- Calculus of Variations and The Maximum Principle and Problem
- Neoclassical Optimal Growth
- Applied Computational Economics and Finance
- Economic Growth and Water Management Questions from Problem Set
- Optimal Stopping Models
- Discrete Time and Stochastic Optimization
- Continuous Time Stochastic Optimization
- "Entry and Exit Decisions Under Uncertainty"

Course No. AEM 713
23 lectures • aprox. 75 minutes/lecture

Resource Economics

Professor Jon M. Conrad
INSTRUCTOR

RESOURCE ECONOMICS uses optimal control and other methods of dynamic optimization to study the allocation and management of natural resources.

Lecture Topics

- Review of Concepts
- Discrete-Time Stochastic Models
- Social Welfare and The Hotelling Rule
- Variations on the Hotelling Rule
- Stochastic Reserves and Exploration
- Entry and Exit
- Start of Bioeconomic Models of Fishing: Models of Growth
- Pure and Regulated Open Access
- Regulated Open Access
- Linear Fishery Model with Stock-Dependent Net Benefits
- Optimal Harvest
- Optimal Harvest Policy
- Stochastic Growth and Measurement Error
- Fishery Management/Forestry
- The Faustmann Model
- Stochastic Forests as a Real Option
- A Real Options Approach to the Valuation of a Forestry Investment by Margaret Insley
- Optimal Management of Groundwater The Alberta Dilemma: Optimal Sharing of a Water Resource by an Agriculture and an Oil Sector - Gaudet, Moreaux, and Withagen
- Diversity Model
- Diversity Theory and Crane Conservation

Course No. AEM 750
23 lectures • aprox. 75 minutes/lecture

Microeconomics of International Development

Professor Christopher Barrett
INSTRUCTOR

MICROECONOMICS OF INTERNATIONAL DEVELOPMENT focuses on the specification and estimation of models of individual, household, firm/farm, and market behavior. It provides an indepth survey of the research frontiers in various key areas of the microeconomics of international development.

Guest lecturers are Subal C. Kumbhakar and Marcel Fafchamps.

S. DeGloria

Lecture Topics

- Key Background Ideas and Methods
- Household Models
- Non-Separable Models
- Jacoby's Method
- Household Labor Supply Without Wage
- First Order Conditions Yield
- Non-Cooperative Bargaining Games
- Poverty, Nutrition, Risk, Poverty Traps
- Econometric Issues
- Risk Management, Consumption Smoothing & Poverty Dynamics
- Anticipatory Savings
- Rationing of Credit
- Poverty Traps
- Risk Management
- Markets
- Multiple Market Failures, Risk and Omitted Relevant Variable Bias
- Efficiency Frontier Estimation
- Technology Adoption
- Sharecropping
- Markets and Contracting Problems
- Understanding Markets

Course No. AEM 762
25 lectures • aprox. 75 minutes/lecture

Statistical Methods I

Professor Marty Wells
INSTRUCTOR

Lecture Titles

- Descriptive Statistics
- Escaping Flatland: Investigating Relationships Between Two or More Variables
- Probability
- Sampling Distributions and the Central Limit Theorem
- Sampling Distributions and One-Sample Inference
- Inference About One Population Mean
- Inference About One Population Mean: Hypothesis Testing
- Two-Sample Inference for Location Parameters
- Inference abour Populations Variances
- Inference about More Than Two Location Parameters
- Linear Contrasts and Multiple Comparisons of Means
- Correlation and Regression Basics
- Regression Basics
- Multiple Linear Regression
- Regression Examples
- Categorical Data Analysis
- Logistic Regression
- Generalized Linear Models

Statistical Methods I develops and uses statistical methods to analyze data arising from a wide variety of applications. Topics include descriptive statistics, point and interval estimation, hypothesis testing, inference for a single population, comparisons between two populations, one- and two-way analysis of variance, comparisons among population means, analysis of categorical data, and correlation and regression analysis. It introduces interactive computing through statistical software and emphasizes basic principles and criteria for selection of statistical techniques.

Martin Wells is the Charles A. Alexander Professor of Statistical Sciences at Cornell University. His research centers on applied and theoretical statistics and sometimes crosses the boundary into applied probability. He has worked on inference questions in credit risk, economic damages, epidemiology, finance (physical and risk neutral worlds), graphical models, legal studies, microarrays, proteomics, quantitative trait loci, extremes, data networks and has considered estimation problems for heavy-tailed phenomena. Dr Wells is a professor in the Department of Biological Statistics and Computational Biology, the Department of Social Statistics and he is a professor in the Cornell Weill Medical School and the Cornell Law School.

Course No. BTRY 601
37 lectures • aprox. 50 minutes/lecture

Statistical Methods II

Professor James Booth
INSTRUCTOR

STATISTICAL METHODS II emphasizes the use of multiple regression analysis, analysis of variance, and related techniques to analyze data in a variety of situations. Topics include an introduction to data collection techniques; least squares estimation; multiple regression; model selection techniques; detection of influential points, goodness-of-fit criteria; principles of experimental design; analysis of variance for a number of designs, including multi-way factorial, nested, and split plot designs; comparing two or more regression lines; and analysis of covariance. Emphasizes appropriate design of studies before data collection, and the appropriate application and interpretation of statistical techniques. Practical applications are implemented using a modern, widely available statistical package.

JAMES BOOTH is Professor and Chair in the Department of Biological Statistics and Computational Biology at Cornell University. His research interests involve basic statistical methodology including: the bootstrap and Monte Carlo methods, clustering, exact inference, mixed models, generalized linear models, and applications of the saddlepoint approximation. Sr. Booth also is actively involved in the Cornell Statistical Consulting Unit which provides free advice on statistical issues to faculty and students at Cornell.

Lecture Titles

- Introduction
- Simple Linear Regression
- ANOVA and Multiple Linear Regression
- Inference from MLR
- Inference from MLR *(continued)*
- Comparison of Nested Models, Generalized Linear Models
- Logistic Regression
- Poisson Counts
- Poisson and Binomial Regression
- Variable Selection
- Design Concepts
- Standard Designs
- Review, Solutions to Sample Problems
- Randomized Complete Blocks Design
- Latin Square Designs
- Factorial Experiments
- Factorial Experiments *(continued)*
- Factorial Experiments with More than Two Factors
- Factorial Designs with Blocking
- Unbalanced Data
- Analysis of Covariance
- Linear Models with Random Factors
- Balanced Single Factor Experiment
- Factorial Designs with Random Factors
- Factorial Designs with Random Factors *(continued)*
- Nested Sampling Designs
- Split-Plot Designs
- Repeated Measures Designs
- Repeated Measures Designs *(continued)*
- Cross-over Trials
- Hotelling's One-Sample T2 Test
- Hotelling's Two-Sample T2 Test *(continued)*
- Multivariate ANOVA
- Principal Components Analysis
- Cluster Analysis
- Linear Mixed Effects Modeling in R
- The General Linear Mixed Model Implementation using the MIXED Procedure

Course No. BTRY 602
37 lectures • aprox. 50 minutes/lecture

Nutrient Management and Research in Agro-Ecosystems

Professor Johannes Lehmann

INSTRUCTOR

Johannes Lehmann is an associate professor of soil fertility management and soil biogeochemistry a Cornell. His work includes applied and basic research in Sudan, Togo, Tanzania, Kenya, Malawi, Brazil, Colombia and Ecuador. Dr. Lehmann's publications range from dryland research and nutrient cycling in irrigation systems to the rehabilitation of highly weathered soils in the humid tropics, from research on phosphorus dynamics in heavily manured soils to basic principles of carbon cycling in soils. His research program spans from nutrient and organic matter dynamics in different inorganic and organic pools of soil to nutrient pathways in agroecosystems.

Nutrient Management and Research in Agro-Ecosystems provides the basic concepts of soil fertility and biogeochemistry and how soil and environmental properties affect nutrient availability and cycling. Discussions focus on the way organic farming and soil conservation affect the fate of nutrients in agroecosystems. Emphasis is placed on the way nutrient management can be improved without creating environmental hazards.

Lecture Titles

- Introduction: Why We Should Know About Soil Fertility
- Nutrient Cycles
- Nutrient Transport to Plant
- Processes Controlling Nutrient Availability in Soil
- Mineralization
- Gaseous Losses
- Environmental Factora Affecting Soil Fertility
- Environmental Factors Affecting Soil Fertility *(continued)*
- Bioassey
- Soil Fertility Management
- Fertilization: Inorganic
- Fertilization: Organic
- Fertilization: Losses and Environmental Hazards
- Water Effects on Nutrient Availability
- Mini-Symposium on Laboratory Results A
- Mini-Symposium on Laboratory Results B
- Mini-Symposium on Laboratory Results C

Course No. CSS 472
26 lectures • aprox. 75 minutes/lecture

Physiology of Environmental Stresses

Professor Tim Setter
INSTRUCTOR

Tim Setter is a professor of field crop science in the Department of Crop and Soil Science, with a joint appointment in the Department of Plant Breeding and Genetics. He currently collaborates with researchers at international research centers on studies of drought tolerance of cassava. Dr. Setter's research goals are to further our understanding of plant response to abiotic environmental stresses, to identify potential targets for future crop improvement, and to identify genes responsible for desirable stress tolerance traits.

Physiology of Environmental Stresses examines the responses of plants to environmental stresses, including chilling, drought, freezing, high temperature, salinity, hypoxia, and toxic elements. Emphasizes the physiological and biochemical basis of injury and plant resistance mechanisms at the whole-plant, cellular, and molecular levels.

Lecture Titles

- Introduction
- Drought 1
- Drought 2
- Leaf Growth in Response to Short-term Water Deficit
- Drought: Stomata and Cuticle
- Drought: ABA Synthesis and Stomata Response
- Drought: Injury at Low Water Potentials and its Mitigation
- Tests of the Involvement of LEA Proteins and Other Osmolytes in Drought Tolerance
- Signal Transduction Pathway(s) of Drought Stress
- Regulation of Gene Expression Under Drought Stress
- Roles of LEA Proteins and Compatible Solutes
- Re-filling Embolized Vessels
- Hydraulic Conductance & Stomatal Response
- Heat Stress 1
- Heat Stress 2
- Salt Stress 1
- Salt Stress 2
- Salt Stress 3
- Cellular Mechanisms of Aluminum Toxicity
- Cellular Mechanisms and Genetics of Al Tolerance
- Heavy Metals, Their Toxicity and Uptake
- Mechanisms of Heavy Metal Tolerance
- Mechanisms of Heavy Metal Tolerance (PCs,His, NA)
- Flooding Stress 1
- Flooding Stress 2
- Chilling Stress 1
- Chilling Stress 2
- Freezing Stress
- CBF Cold-Response Pathway 1
- CBF Cold-Response Pathway 2
- Atmospheric Gaseous Stresses
- Ultraviolet-B Stress
- Multiple Stresses

Course No. CSS 610
33 lectures • aprox. 50 minutes/lecture

Physiology and Ecology of Yield

Professor Tim Setter
INSTRUCTOR

PHYSIOLOGY AND ECOLOGY OF YIELD is a study of environmental constraints on crop-plant productivity from the perspective of key biological processes. Acclimation responses and genetic adaptation are examined for temperature, light, water, compacted soil, and mineral nutrient environments. Topics include photosynthesis and nitrogen assimilation, translocation, and partitioning; canopy-scale influences on solar radiation use efficiency; regulation of growth processes in leaf, root, and floral sinks in response to environment; seed set; water transport and stomatal regulation; root growth in flooded and compacted soils; and drought responses. Emphasis is on growth processes of vegetative plant organs.

Lecture Titles

- Introduction
- Why focus on yield?
- Crop Canopy Environment
- Canopy Leaf Display and Architecture
- Canopy Leaf Display and Architecture *(continued)*
- Heliotropic Leaf Movements
- Advantages of Vertically Oriented Leaves
- Shade Avoidance Responses
- Shade Avoidance Responses *(continued)*
- Importance of Leaf Area Growth
- Rate of Individual Leaf Elongation
- Cell Division and Control of Leaf Growth
- Cell Expansion
- Photosynthesis and Photoinhibition
- C_4 Photosynthesis
- Photoinhibition
- Photosynthetic Carbon Metabolism
- Rubisco as a Potential Rate Limitation
- Photosynthetic Carbon Oxidation Photorespiration
- Temperature, C
- Regulation of Carbon Partitioning in a Leaf Cell
- Feedback Inhibition of Photosynthesis
- Phloem Partitioning
- Phloem Transport
- Maize Grain
- Hypothesis of Serial Adjustment of Maternal Investment
- Sugar Sensing
- Partitioning
- Stomatal Responses to Environment
- Stomatal Humidity Response
- Transpiration Flux: From Soil to Leaf via Xylem
- Cavitation and Embolism
- Root Penetration Through Soil
- Root Growth and Nutrient Acquisition
- Roots: Nitrogen
- N_2 Fixation in Rhizobium-legume Symbioses

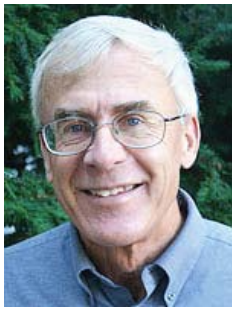
Course No. CSS 613
36 lectures • aprox. 50 minutes/lecture

Mineral Nutrition of Crops and Landscape Plants

Professor H. Christian Wien

INSTRUCTOR

Christian Wien's research is in the area of vegetable crop physiology and the study of physiological disorders of vegetable crops. He also studies the interaction of crops with associated crops and with weeds. Dr. Wien is a professor in the Department of Horticulture at Cornell.



Mineral Nutrition of Crops and Landscape Plants is a modular course on principles of plant mineral nutrition and nutrient management for agronomic crops, vegetables, floriculture, and fruit crops.

Lecture Titles

- Educational Objectives and History of Mineral Nutrition of Plants
- Mineral Nutrient Uptake and Distribution
- Nitrogen
- Phosphorus
- Potassium
- Calcium
- Magnesium and Sulfur
- Iron, Maganese and Baron
- Nutrient Deficiency Lab
- Zinc, Molybdenum and Copper
- Plant Mineral Nutrition Agronomy Module
- Interactions Between Nutrients
- Quality of Forage Crops
- Nutrient Acquisition and Grain Nutrient Content
- Nutrient Deficiencies, Management and Decision Support Systems
- Plant Nutrition in Resistance to Diseases and Pests
- Case Studies with Food Quality
- Food-Systems Based Approaches to Malnutrition
- Mineral Nutrition of Woody Plants in the Urban Landscape
- Nutrient Management Issues Associated with the Nursery and Landscape Industries
- Nutrient Management Issues Associated with the Nursery and Landscape Industries (continued)
- Nitrogen Fertilization in Turfgrass Management
- Disadvantage of Natural Organic Fertilizers
- Potential Environmental Risks in Managed Landscapes
- Vegetable Module: Vegtable Crop Issues
- Fertility Basics for Vegetables
- Options for Feeding Vegetable Crops
- Options for Feeding Vegetable Crops (continued)
- Importance of Early Phosphorus
- Soil Fertility Impacts on Nutritional Quality of Vegetables
- Organic Soil Fertility
- Looking at the Whole System on Vegetable Farms
- Diagnosing Vegetable Problems: Micronutrients
- Fruit Crop Module
- Interpreting Soil and Leaf Analyses
- Nitrogen Fertilization of Apple Trees
- Fertigation of Fruit Crops
- Calcium Nutrition and Storage Disorders of the Apple
- Nutrient Management in Berry Crops

Course No. HORT 455
39 lectures/labs • aprox. 50 minutes

Physiology of Vegetables and Flowers

Professor H. Christian Wien
INSTRUCTOR

Lecture Titles

- Introduction
- Transplanting
- Controlling Stem Growth in Flowers and Vegetables
- Development Toward Flowering
- Flower Induction Principles
- Flower Induction in Annuals 1
- Flower Induction: Annuals and Biennials
- Juvenility and Flower Induction in Biennials
- Flower Induction in Broccoli and Cauliflower
- Flower Bulb Physiology 1
- Flower Bulb Physiology 2
- Onion Flowering and Bulbing
- Bulbing of Edible Alliums
- Manipulation of Flowering in Greenhouse Floral Crops
- Life Cycles of Herbaceous Flowering Perennials
- Flower Development to Anthesis
- Physiology of Potatoes 1
- Physiology of Potatoes 2
- Flowering and Fruitset
- Fruitset, Part II
- Fruit Growth I: Tomato
- Fruit Growth II
- Sex Expression in Herbaceous Horticultural Plants
- Growth Correlations I
- Growth Correlations II
- Flower Senescence
- Chilling and Freezing Stress in Horticultural Crops
- Freezing Stress of Horticultural Plants
- Light, Temperature and Light, Temperature and CO_2 Effects on Growth
- Head Formation in Lettuce and Cabbage
- Physiology of Perennial Vegetables
- Growth and Development of Perennial Flowers
- Photoperiod control of Flowering
- Effect of Temperature on Flowering in Herbaceous Plants

PHYSIOLOGY OF VEGETABLES AND FLOWERS studies the physiological principles that govern growth, development, and production of reproductive structures of vegetable crops and herbaceous ornamental plants. The course emphasizes processes of flower induction, fruit and seed set, and the balance of vegetative and reproductive growth, especially in perennials. Practical hands-on greenhouse experiments and small group discussions illustrate the lecture material.

courtesy H.C. Wien

Course No. HORT 462
34 lectures • aprox. 50 minutes each

Perspectives in International Agriculture and Rural Development

Professor Rebecca Nelson and Professor Robert Herdt

INSTRUCTORS

Rebecca Nelson is the scientific director for The McKnight Foundation`s Collaborative Crop Research Program (CCRP), a competitive grants program that funds agricultural research in developing countries. At Cornell, her affiliations are with the departments of Plant Pathology and Plant-Microbe Biology and Plant Breeding and Genetics, as well as with the Institute for Genomic Diversity. Dr. Nelson's primary research is focused on understanding the ways in which plants defend themselves against pathogen attack.

Robert Herdt is an adjunct international professor in the Department of Applied Economics and Management at Cornell. He is an advisor to the management team of the Agricultural Biotechnology Support Project II, which supports scientists, regulators, extension workers, and farmers in developing countries to make informed decisions about agricultural biotechnology. For 17 years Dr. Herdt was on the staff of the Rockefeller Foundation as program director in charge of the Foundation's work on agriculture and most recently as Vice President responsible for the Foundation's budget and for oversight of its agricultural, health and overseas programs.

Perspectives in International Agriculture and Rural Development provides a forum to discuss both contemporary and future world food issues and the need for an integrated, multidisciplinary team approach in helping farmers and rural development planners adjust to the ever-changing food needs of the world.

Lecture Titles

- Poverty
- World Hunger and Malnutrition
- The Wealth and Poverty of Nations
- Population and Development
- Foreign Aid
- Globalization
- The Green Revolution
- Energy and Agriculture
- On "Sustainability"
- Sustainability Series: Pests and Pollution
- Millennium Development Goals

T. Tucker

Course No. IARD 300
14 lectures • aprox. 50 minutes/lecture

Agriculture in Developing Nations I & II: India

Professor Ronnie Coffman, Professor Peter Hobbs, and Professor K. V. Raman

INSTRUCTORS

This section of AGRICULTURE IN DEVELOPING NATIONS I & II acquaints students with the major issues and problems in international agriculture and rural development and to demonstrate how problems in development are being addressed in India. The lectures/discussions establish the global and regional contexts for sustainable agricultural development and focus on development challenges in India. A two-week field-study trip in January in India is followed by discussions, written projects and oral presentations dealing with problems in food, agriculture and livestock production in the context of social and economic conditions of the country.

RONNIE COFFMAN is director of International Programs at the College of Agriculture and Life Sciences at Cornell as well a professor in the Department of Plant Breeding and Genetics. He also is director of Durable Rust Resistance in Wheat, a program with seventeen research institutions around the world to aggressively mitigate the threat of wheat rust. I addition Dr. Coffman's work has been important to the development of improved rice varieties grown on several million hectares throughout the world. He has collaborated extensively with institutions in the developing world and has served as a board member for several international institutes.

PETER HOBBS is an adjunct international professor in the Department of Crops and Soil Sciences at Cornell. He also is a consultant with FAO in Tibet looking at the feasibility of double cropping cereals (winter barley and winter wheat) as a way to provide quality fodder for animals during the harsh winter season. As an agronomist with specialty in cropping systems and conservation agriculture, Dr. Hobbs' research in South Asia focused on new and innovative tillage and crop establishment options for wheat and rice.

K. V. RAMAN is associate director of Agricultural Biotechnology Support Project II located at Cornell University. He is an adjunct international professor in the Department of Plant Breeding and Genetics. Dr. Raman also developed and implemented many projects related to potato improvement in developing countries as the program leader of the Integrated Pest Management Program at the International Potato Center in Lima-Peru.

Lecture Titles

- Global Food Trends and the Green Revolution
- Nutritional Issues
- Cropping Systems/ Environmental and Water Issues
- Biotechnology
- Animal Health Issues
- Agricultural Finance
- Food Processing - Value Addition
- India Prastha Ice and Cold Storage Ltd.
- Livestock In Development
- Mobilizing Digital Resources for Social Change and Development
- Agricultural Extension's Efficacy in Advancing Rural Development
- Population and Inequalities
- Understanding Agricultural Development in the 21st Century
- Veterinary Public Health in India / Animal Health Group 1
- Veterinary Public Health in India: Milk Safety / Animal Health Group 2
- Value Addition & Global Marketing Themes / Value Addition & Global Marketing Group

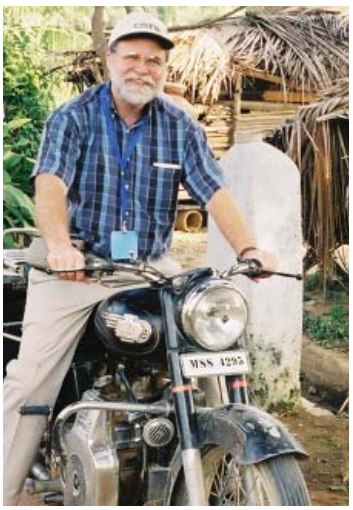
Course No. IARD 402 & 602 (India section)
16 lectures • aprox. 75 minutes/lecture

Agriculture in Developing Nations I & II: Mexico

Professor Robert Blake and Professor Terry Tucker

The Mexico section of Agriculture in Developing Nations I & II acquaints students with the major issues and problems in international agriculture and rural development and to demonstrate how problems in development are being addressed in the Gulf region of Mexico. The lectures and discussions establish the global and regional contexts for sustainable agricultural development and focus on development challenges in the Gulf region. A two-week field-study trip in January to Mexico is followed by discussions, written projects and oral presentations dealing with problems in food, agriculture and livestock production in the context of social and economic conditions of the Gulf region.

Robert Blake is an international professor in the Department of Animal Sciences. His research is aimed at economic, nutritional and genetic management of livestock and mixed farming systems in Latin America and Africa. Dr. Blake also is the director of the Latin American Studies Program at Cornell.



Terry Tucker is director of academic and professional development programs for International Programs in the College of Agriculture and Life Sciences. He also is associate director of the Cornell International Institute for Food, Agriculture and Development where he provides leadership for collaborative research and outreach programs in Southeast Asia and Central America.

Lecture Titles

- Mexican Ejido System and Rural Issues of Smallholder Farmers in the Gulf Region
- "Yucatan" Bienestar del hombre en del campo
- Enlaces
- Ties Photo Exhibit
- Mayan Civilization and Household Organization
- Agriculture and Development in the Mexican Tropics with Emphasis on the Yucatan Peninsula
- Extension Reforms for Mexican Agriculture
- Fundamental Globalization and Trade Issues and Their Impacts on Latin America's Rural Sector.
- Agricultural Extension's Efficacy in Advancing Rural Development: A perennial search for "the approach"
- Livestock in Development
- Maize in Mexico
- Centro Investigagiones Tropicales
- Mexico's Rural Investment Challenges
- Agriculture as a Complex Dynamic System: Mexico's Sheep Production Systems
- Of Maize and Manure Leonardo Cocom
- NAFTA
- Biocomplexity: Economic and Environmental Sustainability

Course No. IARD 402 & 602 (Mexico section)
17 lectures • aprox. 75 minutes/lecture

Plants, Genes and Global Food Production

Professor Susan McCouch

Lecture Titles

- Introduction
- Domestication
- Reproduction in Crop Plants
- Pollination Presentations
- Cross Pollination and Self Fertilization
- Video on Germ Plasma Collections
- Lecture on Germ Plasma Collection
- Inbred Variety Development
- Breeding Hybrids
- Segregation Analysis
- Lecture on Clonal Propagation
- Plant Breeding Revolutions
- Starting of Biotechnology
- Social, environmental, and economic consequences of Biotechnology
- Identifying disease resistance genes
- Golden rice, a case history
- Golden Rice *(continued)*
- Golden Rice *continued)*
- Discussion on the links between poverty and malnutrition
- Review of Exam and Discussion on Poverty

Plants, Genes and Global Food Production provides an introduction to plant breeding. It offers a sense of the historical and social importance of the field, tracing its evolution from the pre-scientific days of crop domestication to modern applications of biotechnology. The course offers specific examples of how breeding objectives are realized and raises questions about the environmental, social and economic consequences of intensive food production systems.

Susan McCouch is an international professor of plant breeding and genetics and of plant biology at Cornell. Her research focuses on the identification and characterization of genes and quantitative trait loci from low-yielding wild and exotic Oryza species that enhance the performance of modern rice cultivars. She was recently elected a fellow of the American Association for the Advancement of Science and has received numerous teaching and faculty awards.

Course No. PLBR 201
23 lectures • aprox. 50 minutes/lecture

Plant Cell and Tissue Culture

Professor Elizabeth Earle
INSTRUCTOR

PLANT CELL AND TISSUE CULTURE provides broad coverage of techniques of plant tissue, cell, protoplast, embryo, and another culture and the applications of those techniques to biological and agricultural studies. Examples used include horticultural, agronomic and endangered species. Genetic modification of plants via gene transfer and other manipulations of cultured cells is a major topic.

ELIZABETH EARLE'S research has produced many types of crucifers resistant to lepidopteran pests through introduction of endotoxin genes from Bacillus thuringiensis. Another research area is the production of haploid and doubled haploid plants from several horticultural crops. Dr. Earle is a professor in the Department of Plant Breeding and Genetics at Cornell.

Lecture Titles

- Introduction and Plant Tissue Culture Pathways
- Suitable Culture Media and Aseptic Culture Systems
- More on Nutrient Media
- Uses of Haploid Material and Start Embryo Cultures
- Morphogenesis Plant Regeneration in Vitro
- Shoot Tip Cultures
- One Small Shoot Tip to One Virtus-Free Plantlet
- Stages of In Vitro Propogation
- Germplasm Storage in vitro
- Floral and Reproductive Tissues
- Formation of Embryoids in Cultures
- Zygotic Embryos
- Resuscitating Rice
- Root Cultures
- Secondary Metabolites
- Secondary Metabilites *(continued)*
- Primary Metabolism in vitro
- Protoplast Isolation
- Applications of Plant Tissue Culture to Crop Improvement
- Somaclonal Variation and in vitro Selection
- In vitro Selection
- Protoplast Fusion
- Protoplast Fusion *(continued)*
- Gene Transfer
- Obtain Suitable DNA Constructs
- Gene Transfer *(continued)*
- Finish Gene Transfer

Course No. PLBR 401
27 lectures • aprox. 50 minutes/lecture

Genetic Improvement of Crop Plants

Professor Vernon Gracen
INSTRUCTOR

Vernon Gracen is a professor in Cornell's Department of Plant Breeding and Genetics and is the associate director of the West African Center for Crop Improvement based at the University of Ghana, Legon. Dr. Gracen also is involved with distance learning curriculums in southern Africa and Thailand. His past research has focused on maize breeding for disease and insect resistance as well as on cassava, beans, and other international crops.

Genetic Improvement of Crop Plants describes the genetic enhancement of crop value to humans that began with domestication and continues with farmers' variety development and scientifically trained plant breeders' applications of Mendelian, quantitative, and molecular genetics. The course examines crop genetic improvement methods by discussing the history and current practice of plant breeding, tools available to breeders, choices and modifications of those tools to meet specific objectives, and challenges plant breeders face in developing varieties for the future.

Lecture Titles

- Genetic Improvement of Crop Plants
- Review of Genetics
- Mutations and Complex Patterns of Inheritance
- Polyploids
- Reproduction in Crop Plants
- Fertility Regulating Mechanisms
- Breeding Self Pollinated Crops I
- Breeding Self Pollinated Crops II
- Breeding Cross Pollinated Crops
- Inbreeding Depression and Heterosis
- Breeding Hybrids
- Sorghum breeding: producing hybrids with a self-pollinating crop
- Breeding Maize
- Rice Breeding
- Public vs. Private Plant Breeding Programs
- Breeding for Resistance to Biotic Stresses
- Breeding Vegetable Crops
- Breeding Fruit Crops
- Genetic Resources
- Development of Hybrids
- Interspecific Hybridization
- Breeding Polyploid Crops
- Cornell Marker Assisted Selection Breeding Program
- Breeding for Abiotic Stress Tolerance
- Breeding for Micronutrient Enhancement
- Breeding for end user traits
- Tissue Culture and Plant Transformation
- Benefits and Risks of GMO Crops in Developing Countries
- Intellectual Property Protection and Plant Breeding
- Population Improvement. Lecture 1
- Population Improvement. Lecture 2
- Population Improvement. Lecture 3
- Population Improvement. Lecture 4
- Population Improvement. Lecture 5

Guest lecturers include Maria Salas, Margaret Smith, Luis Maas, Phillip Griffiths, and Mark Sorrells.

Course No. PLBR 403
34 lectures • aprox. 50 minutes/lecture

Concepts and Techniques in Plant Molecular Biology

Professor Susan McCouch, Professor Jim Giovannoni, and Professor Joss Rose
INSTRUCTORS

CONCEPTS AND TECHNIQUES IN PLANT MOLECULAR BIOLOGY provides a broad overview of molecular biology concepts relevant to the plant sciences. The course covers genetic, molecular, and genomics approaches to the isolation of plant genes, DNA sequence analysis, assessment of gene expression, functional genomics approaches, production of transgenic plants, proteomics approaches to the analysis of plant proteins, protein-protein interactions, and metabolic profiling through emerging metabolomic techniques. Three instructors emphasize techniques and approaches appropriate for different experiments and objectives.

SUSAN MCCOUCH is a professor of plant breeding and genetics and of plant biology at Cornell. Her current work focuses on both forward and reverse genetics approaches to the identification, functional characterization and evolutionary history of genes and quantitative trait loci of interest for plant improvement.

JIM GIOVANNONI is a plant molecular biologist at the USDA-ARS Plant, Soil and Nutrition Laboratory. He is an adjunct professor in Cornell's Department of Horticulture and its Department of Plant Breeding and Genetics. Dr. Giovannoni's laboratory is focused on molecular and genetic analysis of fruit ripening and related signal transduction systems with emphasis on the relationship of fruit ripening to nutritional quality.

JOSS ROSE is an associate professor in Cornell's Department of Plant Biology. His research centers on the structure, function and metabolism of plant cell walls and their pivotal role in growth, development and interactions with pathogens.

Lecture Titles

- Introduction to Plant Molecular Biology
- Cytological, Genetic, Physical & Sequence maps
- Genetic Mapping: Types of Markers and Populations
- QTL analysis, fine mapping, NIL development, gene identification
- cNDA libraries, ESTs, and EST projects
- cNDA libraries, ESTs, and EST projects *(continued)*
- Positional cloning: down to the functional nucleotide polymorphism (FNP)
- Mutagenesis: Constraction of functional genomics populations using radiation and transposable elements
- Mutagenesis: construction on functional genomics populations using T-DNA
- Open vs. closed architecture systems for gene expression profiling
- cNDA libraries, ESTs, and EST projects *(continued)*
- cNDA libraries, ESTs, and EST projects *(continued)*
- cNDA libraries, ESTs, and EST projects *(continued)*
- Protein Extraction electrophoresis and immunological analysis
- Proteomics I: Strategies for global protein expression profiling and quantitative analysis
- Protein sequencing and structural analysis
- Plant Transformation Proteomics *(continued)*; Recombinant proteins and protein interactions
- Recombinant proteins and protein interactions *(continued)*
- Recombinant proteins and protein interactions *(continued)*
- Metabolite Profiling

Course No. PLBR 483.1
22 lectures • aprox. 50 minutes/lecture

Plant Genome Organization and Function

Professor Steven Tanksley

INSTRUCTOR

PLANT GENOME ORGANIZATION AND FUNCTION covers the structure and variation of plant nuclear genomes, including changes in genome size, centromere/telomere structure, DNA packaging, transposable elements, genetic and physical mapping, positional gene cloning, genomic sequencing and comparative genomics.

Lecture Titles

- Characteristics of Plant Nuclear Genomes
- Transposable Elements
- Methylation, Heterochromatin & Gene Silencing
- Polyploidy
- Genome Mapping
- Genetic Recombination in a Genomic Context
- Comparative Genomics
- Comparative Genomics
- Genome Sequencing and Analysis
- Functional Genomics: Attaching Function to Sequence
- Functional Genomics: Attaching Function to Sequence
- Plant Genome Databases

STEVEN TANKSLEY'S laboratory is involved in unraveling the molecular and developmental processes underlying tomato fruit development in order to understand the molecular basis of quantitative trait variation and to determine whether these same genes control fruit development/evolution in other domesticated plants. He also is engaged in identifying and sequencing the majority of the genes in tomato and other nightshade crops and to use that information to understand how the gene content and gene order is evolving in plants over long periods of time. And he is developing and testing new breeding methodologies based on molecular marker technology. Dr. Tanksley is a professor in the Department of Plant Breeding and Genetics

Course No. PLBR 483.3
12 lectures • aprox. 75 minutes/lecture

Molecular Breeding

Professor Steven Tanksley
INSTRUCTOR

MOLECULAR BREEDING discusses the application of DNA markers to the identification, manipulation, and isolation of genes important to plant and animal productivity using molecular genetic techniques. Students learn how to design and execute experiments to identify quantitative trait loci, as well as how to apply molecular markers to plant and animal breeding programs.

Cornell plant breeder Steven Tanksley receives international Wolf Prize in Agriculture

STEVEN D. TANKSLEY, the Liberty Hyde Bailey Professor of Plant Breeding and chair of the Genomics Initiative Task Force at Cornell University, is one of two scientists to share the prestigious 2004 Wolf Foundation Prize in Agriculture for "innovative development of hybrid rice and discovery of the genetic basis of heterosis in this important food staple."

Tanksley was cited by the Wolf Prize Committee as "one of the world leaders in plant genomic research. He has contributed to the understanding of heterosis in rice by identifying genes in a wild ancestor that significantly increased yields... Tanksley's research has led to the discovery of the genetic basis of hybrid vigor in this important food staple – a discovery with profound implications for promoting the science of plant breeding for the benefit of humankind."

"The Wolf Prize is one of the most important medals a scientist can receive. The recognition of Steve for the work he has done at Cornell brings great credit to us and enhances our reputation in plant genetics as one of the great research centers of the world," said Robert Richardson, vice provost for research at Cornell and a winner of the 1996 Nobel Prize in physics.

"Tanksley has demonstrated that quantitatively inherited traits spanning an entire genome can be dissected into their corresponding Mendelian factors, called quantitative trait loci (QTL). This enables identification of rate-limiting genes associated with crop performance. His demonstration has led to a cascade of experiments by other researchers, who detected and mapped QTLs in a wide array of other organisms. Within Tanksley's own group, QTL analysis in rice led to the discovery of the genetic basis of hybrid vigor in this important food staple, allowing further developments to increase rice yields."

In addition to developing the first molecular map of rice, Tanksley also developed the first molecular map of tomatoes. He was the first plant geneticist to use map-based cloning of a pest-resistance gene in a crop plant. He also developed computer programs and databases for the management and analysis of molecular genetic data. As the chair of the Genomics Initiative Task Force at Cornell, Tanksley leads 75 faculty members from 25 departments and six colleges in a coordinated web of research and learning focused on genomics.

by Susan S. Lang, excerpted from the Cornell News, *© January 19, 2004*

Lecture Titles

- DNA Variation and Marker Technology I
- DNA Variation and Marker Technology II
- Quantitative Trait Analysis: controlled crosses I
- Quantitative Trait Analysis: controlled crosses II
- Quantitative Trait Analysis: controlled crosses III
- Quantitative Trait Analysis: controlled crosses IV
- Quantitative Trait Analysis: association mapping
- Molecular Basis of Quantitative Traits
- Examining Genetic and Molecular Bases of Heterosis
- Marker Assisted Breeding I
- Marker Assisted Breeding II
- Introgression: selective enrichment of gene pools

Course No. PLBR 483.5
12 lectures • aprox. 75 minutes/lecture

Advanced Plant Genetics

Professor Molly Jahn
INSTRUCTOR

Molly Jahn is an expert in plant breeding, gene discovery and genetic mapping of agricultural plants. She was professor of plant breeding at Cornell until 2006 where her lab focused on on gene discovery, the analysis of genome structure and function and the relevance of this information for the improvement of useful plants. Professor Jahn now is the dean of the University of Wisconsin-Madison, College of Agricultural and Life Sciences.

Guest lecturers are Georg Jander, Jerrold Davis, and Edward Buckler.

Advanced Plant Genetics provides an advanced survey of Mendelian analysis, developmental genetics, cytogenetics, and genetic topics unique to plants. Emphasis is on subjects and experimental approaches of particular significance to plant, but examples are drawn from a diversity of systems as appropriate. The development of critical analytical skills applied to scientific reading and writing is stressed through class participation, in-class exercises, and the course project.

Lecture Titles

- Mendel's Story
- Extensions of Mendelism: Inheritance and Linkage
- Genetic Linkage and Mapping
- Genetic Mapping Mutants and Mutagenesis
- References, Genetic and Genomic Tools for Arabidopsis
- Searching for Amino Acid Biosynthesis Mutants in Arabidopsis
- Developmental Genetics in Plants I: Mutant Scheme
- General Mutant Scheme 1
- Systematic Principles and Plant Diversity
- Floral Development and Sexual Reproduction in Angiosperms I
- Floral Development and Sexual Reproduction in Angiosperms II
- Nuclear Constituents and Nuclear Architecture
- Cytogenetics: Cromosomes in the Nucleus
- Cytogenetics: Cromosomal Features
- Cytogenetics: Nuclear Organizing Region and Meiosis
- Meiosis in Plants
- Changes in Chromosome Structure, Aneuploidy
- Developing a Platform to Dissect Complex Traits in Maize
- Aneuploidy and Polyploidy
- Transposable Elements at Work and at Play
- Aneuploidy and Polyploidy

Course No. PLBR 606
22 lectures • aprox. 50 minutes/lecture

Quantitative Genetics in Plant Breeding

Professor Donald R. Viands
INSTRUCTOR

QUANTITATIVE GENETICS IN PLANT BREEDING begins with discussion about quantitative genetics and quantitative trait loci for more efficient plant breeding. Specific topics include components of variance (estimated from various mating designs), theory and computer analysis for QTL, population structure, multiple locus regressions, and interval analysis; heritability; theoretical gain from selection; and genotypic and phenotypic correlation coefficients. Plants in the greenhouse are evaluated for computing quantitative genetic parameters.

DONALD R. VIANDS is a professor in Cornell's Department of Plant Breeding and Genetics and is associate dean and director of academic programs for the College of Agriculture and Life Sciences. Dr Viands' research focuses primarily on breeding and genetic research of alfalfa and on evaluating legume and grass cultivars for forage yield and quality. Breeding objectives on alfalfa are to improve yield, quality, and persistence. Forage yield is being improved by developing plant populations from both adapted and unadapted sources, followed by selecting vigorous plants with good agronomic characteristics.

Lecture Titles

- Introduction
- Population Genetics
- How does the Gene Frequency Change with Selection in a Population?
- If a Different Number of Males and Females Contribute to the Development of a Population
- Population Mean
- Linkage
- Linkage *(continued)*
- Expectation of Mean Square
- Finish Statistical Procedures and New Problem Set
- Covariance of Relatives
- Mating Designs and Complete Diallel
- Complete Diallel *(continued)*
- Mating Designs Design II: Cross Classified
- Mating Designs Design I: Nested
- Computer Analyses of Mating Designs
- Design II
- Replicated Clonal Evaluation and Heritability
- Heritability *(continued)*
- Narrow Sense Heritability
- Theoretical Gain
- Genetic Correlation Coefficients
- Final Class

Course No. PBLR 717
22 lectures • aprox. 75 minutes/lecture

Concepts of Plant Pathology

Professor Alan Collmer
INSTRUCTOR

Lecture Titles

- Introduction: Key concepts and terms
- Key molecular biological manipulations of pathogens and plants: Prokaryotes
- Eukaryotes
- Discussion: Practice in decoding molecular plant-microbe abstracts
- Genomics
- Model pathosystems
- Pathogen attack: Attachment and penetration of the host I
- Penetration of the host II
- Destroying cell wall and tissue structure I
- Discussion: Evaluating primary literature
- Activities of fungi and oomycetes in the rhizosphere
- Destroying cell wall and tissue structure II
- Disrupting host metabolism and membrane integrity with small molecules I
- Discussion: Evaluating primary literature
- Disrupting host metabolism and membrane integrity with small molecules II
- Altering growth and morphology of the host by injecting T-DNA
- Injecting virulence effector proteins into host cells
- Molecular basis of nematode-plant interactions
- Gene-for-gene interactions: the genetic basis
- Discussion: Integrating R-gene defense concepts
- Gene-for-gene interactions: the molecular basis
- Basal resistance
- Layered defenses and their suppression
- Systemic acquired resistance
- Reactive oxygen and nitrogen species
- Defense proteins and phytoanticipins
- Resistance to plant disease in an agricultural context
- Phytoalexins and their detoxification
- Conclusions and future prospects for disease control
- Discussion: Big picture game

CONCEPTS OF PLANT PATHOLOGY concerns concepts in host-pathogen relationships with an emphasis on the roles of molecules and cell structures in determining the outcome of an interaction. Evidence for the role of putative disease determinants is explored in the context of universal stages of pathogenesis and representative pathosystems. Discussion sessions are used to examine current research literature and conduct exercises complementary to lecture topics; emphasis is on critical thinking in science.

ALAN COLLMER is a professor in the Department of Plant Pathology and Plant-Microbe Biology. His research focus is on the functional genomics of virulence in the plant pathogenic bacterium Pseudomonas syringae. His goal is to understand the molecular mechanisms that enable bacteria to attack plants. Dr. Collmer's collaborative worked has been to characterize the genome sequence of DC3000 and developing a variety of bioinformatic, biochemical, genetic, and cell biological tools to support a genome-wide study of virulence mechanisms and to foster functional genomic investigations by the worldwide research community.

GUEST LECTURERS are Eric Nelson, Xiaohong Wang, Rebecca Nelson.

Course No. PLPA 601
30 lectures • aprox. 50 minutes/lecture

Biology of Plant Pathogens

Professor Michael Milgroom and Professor Keith Perry
INSTRUCTORS

BIOLOGY OF PLANT PATHOGENS describes the biology and ecology of four major groups of plant pathogens: fungi, bacteria, viruses, and oomycetes. Model plant pathogens are used to illustrate concepts of pathogen diversity, evolution, reproduction, life cycles, movement, diagnosis, and control. Lectures are coordinated with PL PA 601 to provide students with a comprehensive treatment of pathogen–host interactions at all levels from molecular to ecological. Discussion sessions discuss current literature relevant to lecture topics.

Lecture Titles

- Introduction
- Prokaryotic Plant - Associated Microbes
- Discussion Session
- Quorum-sensing regulation in Pantoea stewarti subspecies stewartii
- Biology of Plant Pathogens
- Discussion Session
- Establishing Disease Etiology
- Spiroplasmas
- Population Biology
- Spermosphere Ecology
- Epidemiology and Evolution of Plant Pathogens

MICHAEL MILGROOM, a professor in the Department of Plant Pathology and Plant-Microbe Biology, is interested in population biology, genetics and evolution of plant pathogens, with applications to plant disease epidemiology and management. These interests integrate disciplines that are traditionally considered separately in the context of either biology or agriculture. Dr. Milgroom's current research focuses on the genetics and evolution of vegetative incompatibility in the chestnut blight fungus, Cryphonectria parasitica, and genetic variation within the grapevine powdery mildew fungus, Erysiphe necator. His goals are to develop genetic tools for studying E. necator and to determine whether genetically distinct lineages are reproductively isolated in the process of forming new species.

KEITH PERRY has worked for the past 18 years on plant viruses: the diagnosis of plant diseases and the detection of plant pathogens. His primary research focus is on Cucumber mosaic virus and the insect vector transmission of plant viruses. His goal is to understand molecular mechanisms underlying vector transmission. The other main area of research is the development of diagnostic technologies for plant pathogens, with on emphasis on array-based approaches and integrating multipathogen detection methods. Dr. Perry, a professor in the Department of Plant Pathology and Plant-Microbe Biology at Cornell, also works with potato growers in New York State to make available disease-tested germplasm and potato varieties.

GUEST LECTURERS include Eric Nelson.

Course No. PLPA 602
11 lectures • aprox. 75 minutes/lecture

Seminar Series

Lecture Titles

Applied Economics and Management

- China Strategic Power Sector Model Background & Scenarios
- VLS Generation 2: For Insights on Poverty Dynamics and Development Pathways

Agriculture and Life Sciences

- CALS Centennial Symposium: Maxine Singer
- CALS Centennial Symposium: Norman Borlaug
- CALS Centennial Symposium: Per Pinstrup-Andersen
- CALS Centennial Symposium: Susan Henry and Jeffrey Lehman

Cornell International Institute for Food, Agriculture, and Development

- New Directions for CIIFAD
- CIIFAD's First 15 Years
- Agricultural Technology, Productivity, and Poverty in Madagascar
- Reflections on Innovation Systems for Conservation Agriculture
- Overcoming Poverty Through Improved Agricultural Technology
- Sustainable Rice Production Strategies
- African Perspectives on Food Security in Africa
- Soil Nutrient Depletion and Repletion in the Tropical Highland Agroecosystems of Kenya

Crop and Soil Sciences

- Progress in Breeding for Drought Tolerance in Rice
- Changing Soil Water and Oxia Regimes and their Implications for Nutrition of Rise

IRRI MAS Conference (2005)

- Finding Useful Alleles from an Array of Genetic Resources

Plant Breeding and Genetics Seminar Series

This seminar series presents new research involving the development of improved gene mapping methods, functional genomics, bioinformatics, quantitative genetics applications, utilization of wild germplasm, gene cloning strategies, genetics of crop quality, disease and insect resistance, and new breeding strategies.

Lecture Titles

Fall 2005

- Progress of the ACCI Plant Breeders Towards Improvement of the Food Security of the Small Scale Farmer
- Sustainable Coffee Production in Colombia
- Trends in Indian Agriculture - Challenges and Strategies
- Development and Identification of High-Value Cassava Clones
- Flavor Perception and Health Value
- Breeding for Abiotic Stress Tolerance in Tropical Maize
- ABSPII Project Update & Benefits to CALS
- Corn Breeding
- Improvement and Genetics of Nutritional Quality in Common Bean
- Participatory Plant Breeding in Water-Limited Environments
- Integrated Analysis of Aluminum Tolerance in Maize

Spring 2006

- Opportunities for application of molecular markers for sustainable crop production in stress environments: sorghum and pearl millet
- Functional foods and potential health-promoting attributes of apples
- Understanding genetics and evolution of arbuscular mycorrhizal fungi: Are they an ancient asexual scandal?
- Novel approaches for marker-assisted selection, results and perspectives for drought tolerance in maize
- Characterizing genetic structure and flux in non-temperate maize germplasm
- Domestication gene for white pericarp sweeps across the rice world
- Genetic architecture of quantitative resistance in the cereals
- From complex phenotypes to candidate genes – Bioinformatics tools in Gramene
- A brief history of plant breeding at Johnny's Selected Seeds
- Detecting pathogenic organisms via their RNA: from lateral-low assays to micro-total analysis systems
- Map-based cloning and characterization of AltSB, a major aluminum tolerance gene in sorghum
- Mutations in translation initiation factor eIF4E confer resistance to potyviral infection in pepper and tomato
- The rice bacterial blight gene Xa5 encodes a novel form of disease resistance

Fall 2006

- A Small Scale Farmer in Africa
- Harvesting Health
- Genetic and Genomic Analysis of NARROW SHEATH 1 Function During Maize Leaf Development
- The Magic of Heterosis
- Genetic evidence for a second domestication of barley (Hordeum vulgare) east of the Fertile Crescent
- Mapping phenotypic and gene expression QTL for preharvest sprouting resistance and seed dormancy in wheat

Lecture Titles

- Tocopherol Synthesis and Function in Plants
- Building bioinformatics capacity in eastern and central Africa
- Gramene Database - A Hotspot for Comparative Grass Genomics
- The Development of a Two-Component Ac/Ds Gene System in Maize

Spring 2007

- Sorghum Improvement: Beyond a Feed Grain and Forage
- Cloning genes underlying "wild QTLs" offers new insights into the process of rice domestication
- Activator/Dissociation (Ac/Ds) Mutagenesis and Regulation in Maize
- Soil Nutrient Depletion and Repletion in the Tropical Highland Agroecosystems of Kenya

Fall 2007

- Genomics and Selection for Complex Traits: Learning from the Last 20 Years
- The evolutionary history of GS3, a grain size gene in rice
- Towards a 20 tonne wheat: Discovering genes controlling development and yield by Meta-QTL and transcriptomal analyses
- Introduction to Food Safety Assessments and the CODEX Alimentarius Gyidelines
- Understanding Plant Disease Resistance Genes: 'R' We There Yet?
- Dissecting heterosis in guinea race sorghum by conventional breeding and molecular merker approaches
- Apple Breeding and the Tree Fruit Genomics Initiative
- Genetic analysis of meiotic chromosome pairing and recombination in plants
- Corn Breeding in the 21st Century
- The Long Slow Road to Association Analysis in Soybean

Spring 2008

- Genetic regulation of tomato fruit ripering
- QTL Detection of Pervasive Synergistic Epistasis
- Linking Solanaceae Genomes with Phenotype Variation
- Assessment of Food Iron Bioavailability from Staple Food Crops
- Conventional and Molecular Breeding of Small Grains at IFVC.
- Evolution of a research portfolio: epigenetics, aluminum tolerance, iron nutrition and biotech risk assessment.
- Breeding Chilean geophytes for the development of novel ornamental plants
- Beyond introgression: integrating genome sequence information and plant breeding for tomato improvement
- Discovery of Genome - Wide SNPs in Diverse Rice: A Foundation for Whole-Genome Association Studies