



Plant Breeding, Genetics and Physiology

Interdepartmental Graduate Degree Program

Agenda

- Review current curriculum - What can we do with existing resources?
 - to address critical needs
 - to achieve better integration across departments
- Review the Program proposed by students in 2004
 - Is it attainable?
 - Does the plan need to be modified?
- Discuss possible models for administering a Plant Breeding, Genetics, and Physiology Program
- Identify additional resources that may be needed
- Identify next steps towards implementation of the Program

Rationale for an integrated PBGP

- Plant breeding efforts are dispersed across departments
 - better visibility
 - improve coordination and interaction across departments
- Attract more students
- Attract and retain good faculty
- Extramural funding

Existing Curriculum - Strengths

- Diversity of crops and environments
- Good basic breeding course (HORT/CSS 450)
- Many course offerings in related programs
 - Molecular and Cellular Biology
 - Genetics
 - Botany and Plant Pathology
- Good opportunities for research experience in molecular genetics
- Proximity to other research organizations
 - USDA – Forestry
 - USDA – ARS
- Numerous private seed companies in the region

Plant Breeders by Crop

- Chad Finn – small fruits
- Patrick Hayes – barley
- John Henning – hops
- Glenn Howe – trees
- Jennifer Kling – meadowfoam
- Shawn Mehlenbacher – nut and tree fruit
- Jim Myers – vegetable crops
- Jim Peterson – wheat
- Steve Strauss – trees
- Isabel Vales – potatoes
- Others?

Applied Genetics and Physiology

- Erica Bakker – Plant Genomics, Bioinformatics
- Barbara Bond – Tree Physiology and Ecology
- Tony Chen – Plant Physiology, Biotechnology
- Chris Mundt – Plant Pathology
- Oscar Riera-Lizarazu – Cytogenetics
- Carol Riven – Molecular Genetics
- Andrew Ross – Food Technology
- Mary Slabaugh – Biochemical Genetics
- Others?
- Whom should we ask for input?

Existing Curriculum - Weaknesses

- Plant physiology does not have a departmental home, and staffing is very limited
- Students may not get much exposure to conventional breeding techniques needed to run a plant improvement program
- Little emphasis on cross-pollinating species
- Quantitative skills are not well-developed
 - biometrics
 - quantitative genetics

Immediate Concerns

- **Introductory Plant Genetics courses**
 - CSS/HORT 430/530 Plant Genetics will be offered at the 430-level only in 2007
 - HORT 611 will no longer be offered
 - FS 444/544 has not recently been offered
- **Do we need a graduate level Plant Genetics course?**

Advanced Plant Breeding Courses

- HORT 505b – Breeding clonally propagated crops
- CSS 620, 621, 622 – DNA fingerprinting, mapping, QTL analysis
- CSS 630 Current Topics in Plant Breeding
 - Will be offered as R&C (journal club) in 2006
- CSS 650 – Advanced Plant Breeding (Quantitative Genetics in Plant Breeding)
- Is this adequate??

Possibilities

- John Henning would like to see
 - One advanced course for outcrossing and one for inbreeding species
 - Relevant quantitative genetic theory, practical breeding techniques and experimental design taught in both
 - He is willing to teach!!!

Alternative

- Require Population Genetics
- Teach CSS 650 as “Applications of Quantitative Genetics in Plant Breeding”, including recitation on analysis of genetic data (Kling)
- Work with John Henning to strengthen CSS 650 and develop another course on practical techniques in plant breeding
 - Mating designs, selection techniques, breeding for disease and insect resistance, etc.
 - Integrate examples from Forestry

Good News

- Courses to be taught by Jim Myers
 - Crop Domestication
 - Intellectual Property in Plant Breeding
 - He is willing to do more!!!

Gaps

■ Other courses

- Management of genetic resources?
- Basic plant physiology?
- Stress physiology?
- Breeding for disease and insect resistance?
- Weak on whole systems - evolution, ecology, pathosystems, crop modeling, GIS, seed supply systems?

■ Biometric support

- Forestry has staff dedicated for this purpose
- Statisticians from Statistics Department are not very familiar with agriculture and genetics
- Inter-departmental interactions could help

Key features of student proposal 2004

- Goal 1: *Provide an enhanced PBGP program integrating OSU plant science faculty and resources*
 - Core curriculum of PGBP courses
 - A PGBP seminar series
 - Practical Modules
 - Professional development modules

Key features of student proposal 2004

- Goal 2: *Attract outstanding graduate students and researchers and encourage their professional development*
 - Competitive travel grants
 - Program website
 - Collaboration Resources
- Goal 3: *Enhance funding potential from extramural sources*

Coursework Proposed

- Three core courses
 - Plant Breeding
 - Genetics
 - Physiology
- Two capstone courses
 - Theoretical approach to integration of disciplines
 - Hands-on Group project
- Elective courses

Nontraditional learning modes

- Modules - 3 week courses on specific topics, both theoretical and practical
- Tutorships – working in another program for 2-3 weeks (“job shadowing”)
- Exchange programs with other institutions
- Field trip courses
- Professional development

Student proposal 2004

- Is it attainable?
- Does the plan need to be modified?

Models for interdisciplinary programs

■ Other Interdepartmental Programs

- MCB
- Genetics
- Others?

■ Possible strategies

- Virtual program
- Actual program – Category I proposal

Resources needed

- Additional research faculty?
- Administrative support?
- Other funding requirements?
- Departmental home?

Discussions for another day

- Potential interactions with other universities and institutions in the US and overseas
 - Curriculum development and exchange
 - Distance education, web-based training materials
- USDA initiative on educating plant breeders
- Training students for private industry
- Links to agricultural development programs in developing countries
 - Post-graduate students
 - Short-term training opportunities
- Potential funding sources
- Evolution to a Plant Sciences Program

Next Steps

- 0.15 FTE x 9 months \approx 5+ weeks for J. Kling
- Tasks
 - Review plans that have already been developed
 - Investigate programs at other universities and around the world
 - Identify potential channels for recruiting students
 - Define core curriculum
 - Develop rough course outlines and syllabi
 - Review plans with faculty and graduate students
 - (Develop necessary Category I or II proposals)
 - (Investigate funding opportunities and write proposals)
- **Volunteers for a committee?**
 - Good representation of disciplines, departments, students, faculty