

Education of Future Plant Scientists and Breeders – An Industry Perspective

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Why What to expect How to get there Summary



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Why



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Graduation is not the end; it's the beginning. . . .

- The things taught in schools and colleges are not an education, but the means of education. ~Ralph Waldo Emerson
- If you feel that you have both feet planted on level ground, then the university has failed you. ~Robert Goheen, *Time*, 23 June 1961
- Graduates will increasingly need to be ready to apply techniques “tomorrow” that we may not be in a position to seriously consider “today”. The rate of change will continue to accelerate but a solid grounding in the genetic fundamentals is absolutely key.



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Education of Future Plant Scientists and Breeders

- ◆ Many students when receiving their training do so without knowing if they will be a public or private sector plant breeder.
- ◆ Estimates are generally that 2/3rd or greater of the graduates end up in the private sector. The majority of the jobs in the private sector involve cultivar development**
- ◆ IP concerns will continue to hinder the amount of detailed knowledge and germplasm companies can provide back to educators



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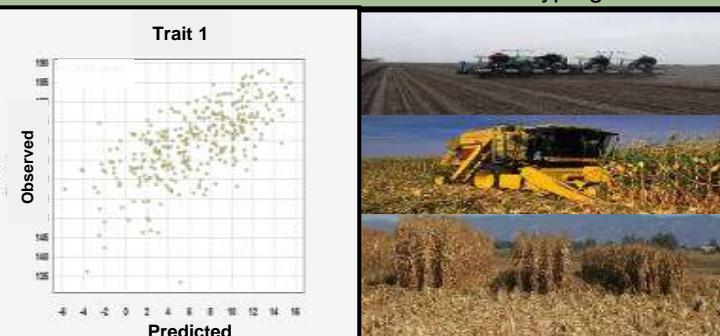
**Hancock Symposium at MSU 2005 for example has various breakouts.

Education of Future Plant Scientists and Breeders

- **Modern plant breeding is complex and multidisciplinary and will become increasingly so in the future. Plant breeders today need to integrate :**
 - ♦ Genetics, information management, experimental design and analysis, plant physiology, pathology, entomology all in a precise research environment.
 - ♦ Newer methodologies :
 - » Have increased the need for precision phenotyping to help identify genetic signal better.
 - » Placed increased emphasis on people skills, increasingly team work orientated.

Prediction

Phenotyping



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What to expect



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- **Plant breeders today . . . :**
 - ♦ Have an increased need for legal acumen/awareness, regulatory and compliance awareness all operating in a business savvy decision framework.
 - ♦ Need a keen observation -- high interest/curiosity -- prepared to look for and find novel or rare alleles either in the field or the lab and design procedures to capitalize on those and create enriched populations
 - ♦ Juggle back and forth breeding tools as a golfer does his clubs
 - ♦ Negotiate with other team members operating some of their “clubs” and all the time realizing the value of a plant variety is ultimately determined by its performance in a farmers field.
 - ♦ All this and still make it home by 6pm ?



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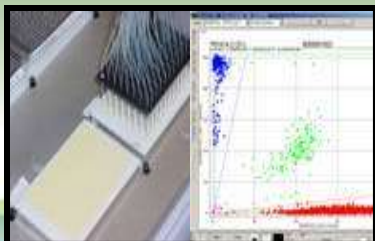


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Education of Future Plant Scientists and Breeders

- **Plant breeders today . . . :**

- They now have to work increasingly on cross-functional teams and be prepared to manipulate incredibly large data sets.
- Be much more sophisticated.
- They need to understand super-computing and modeling systems that can analyze genetic sequences thousands of characters long.
- They must be able to process molecular information AND field information.



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Education of Future Plant Scientists and Breeders

- ◆ Commercial germplasm in the US and increasingly Internationally has developed to be very separate and distinct from public germplasm so specific training/mentoring on the former is absolutely essential for someone entering the private sector today.
- ◆ Education is the big picture, the broad conceptual framework to make good decisions or choices in the context here of plant genetics. Education incorporates training, but not visa versa.
- ◆ The specific detail on crop/germplasm, environment and trait is best served in the post graduate experience (referring to private sector in this case).



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How do we get there



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Education of Future Plant Scientists and Breeders

- Funding endowed chairs and providing funds/and or equipment individually or in consortiums to keep departments functioning
- In kind support for example winter nurseries or marker data points for thesis's. Hybrid seed for trials
- Fellowships and scholarships for graduate training including internships/sandwich programs
- Mentoring either directly or indirectly



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Education of Future Plant Scientists and Breeders

- Financial support for academic meetings and research conferences
- Travel scholarships for sabbaticals, support for continuing education
- Undergraduate Professional internships -- opportunity to work in industry 3 to 12 months for example
- Postdoctoral fellowships



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Education of Future Plant Scientists and Breeders

- **Industry employees serving as thesis advisors or serving on curriculum and degree advisory committees.**
- **Industry employees lecturing**
- **Public/Private sector collaborations, with Industry employees serving on public sector advisory boards.**



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Education of Future Plant Scientists and Breeders

- **Preparing new university graduates to work on large, cross-functional teams**
- **Graduates must be prepared to handle:**
 - Molecular information
 - Field information
 - Large data sets and high-performance computing
- **Traditional breeding skills are only minimum entry requirement today**
- **Knowledge Intensity**
 - Ability to integrate information from multiple sources
 - Genetics, phenotypes, germplasm, environments
- **The student, the industry and the academic institutions all have a role to play in getting there**

Challenge: Align academic training with evolving, complex breeding programs



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Thank you !



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