

Cross-training and Curiosity Interdisciplinarity and an Open Mind

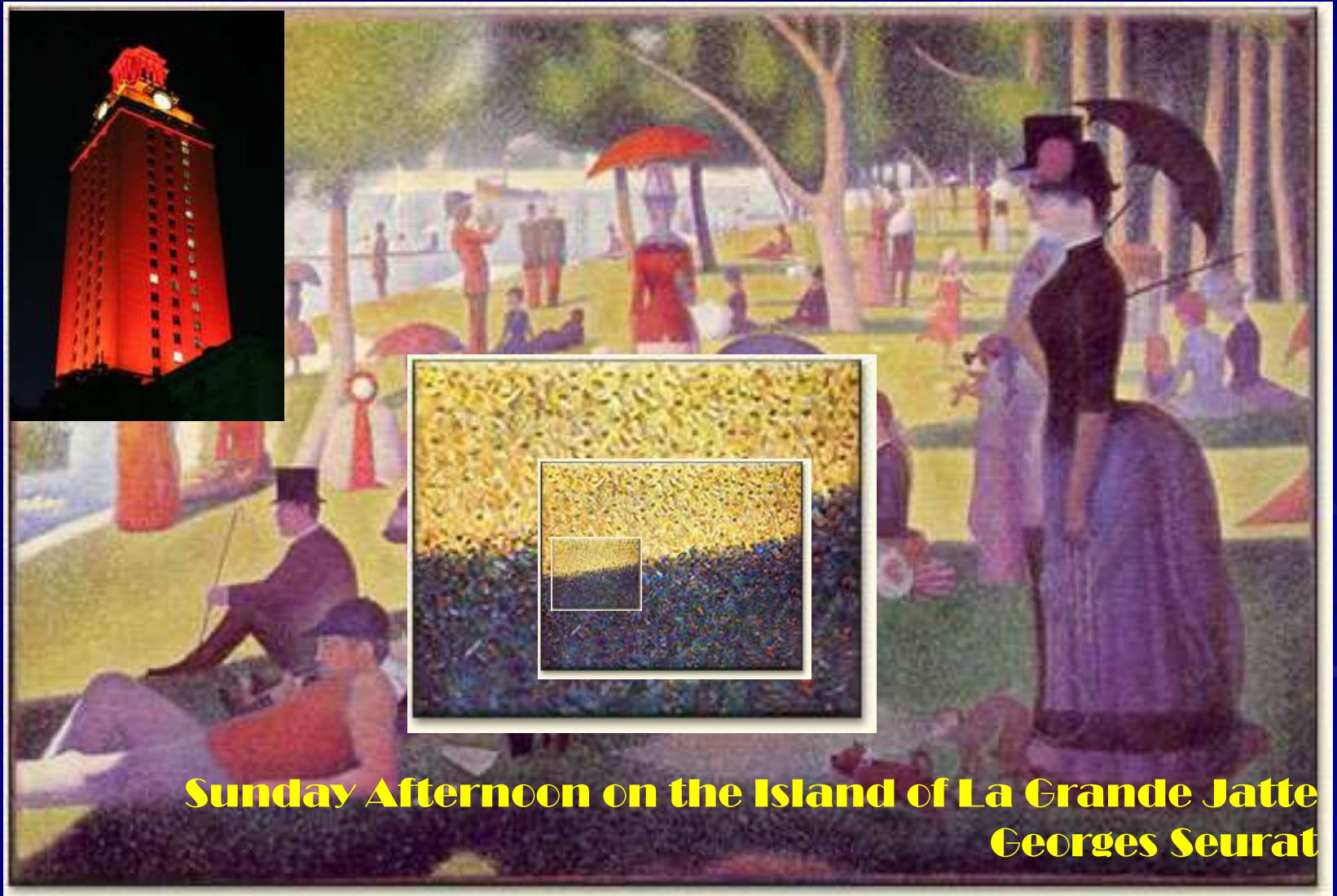


Norman Ellstrand
Professor of Genetics
UC-Riverside



Ph.D years – 1974-1978

Plant Population Genetics + Sex



Sunday Afternoon on the Island of La Grande Jatte
Georges Seurat

“He wasn’t talking about botany.”



<http://funini.com>



Applied and Basic Science
Silos or a Bridge?...

The dilemma



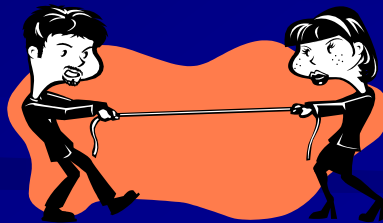
- Basic research – the grand ivory tower, or angels dancing on the head of a pin?
- Applied research – dirty or saving the world?



UT – to – Duke – to UCR September 1979

Department of “Botany and Plant
Sciences”

Applied or Basic?



Department of “Botany & Plant Sciences”? A brief history



1907
**UC Citrus Experiment
Station**

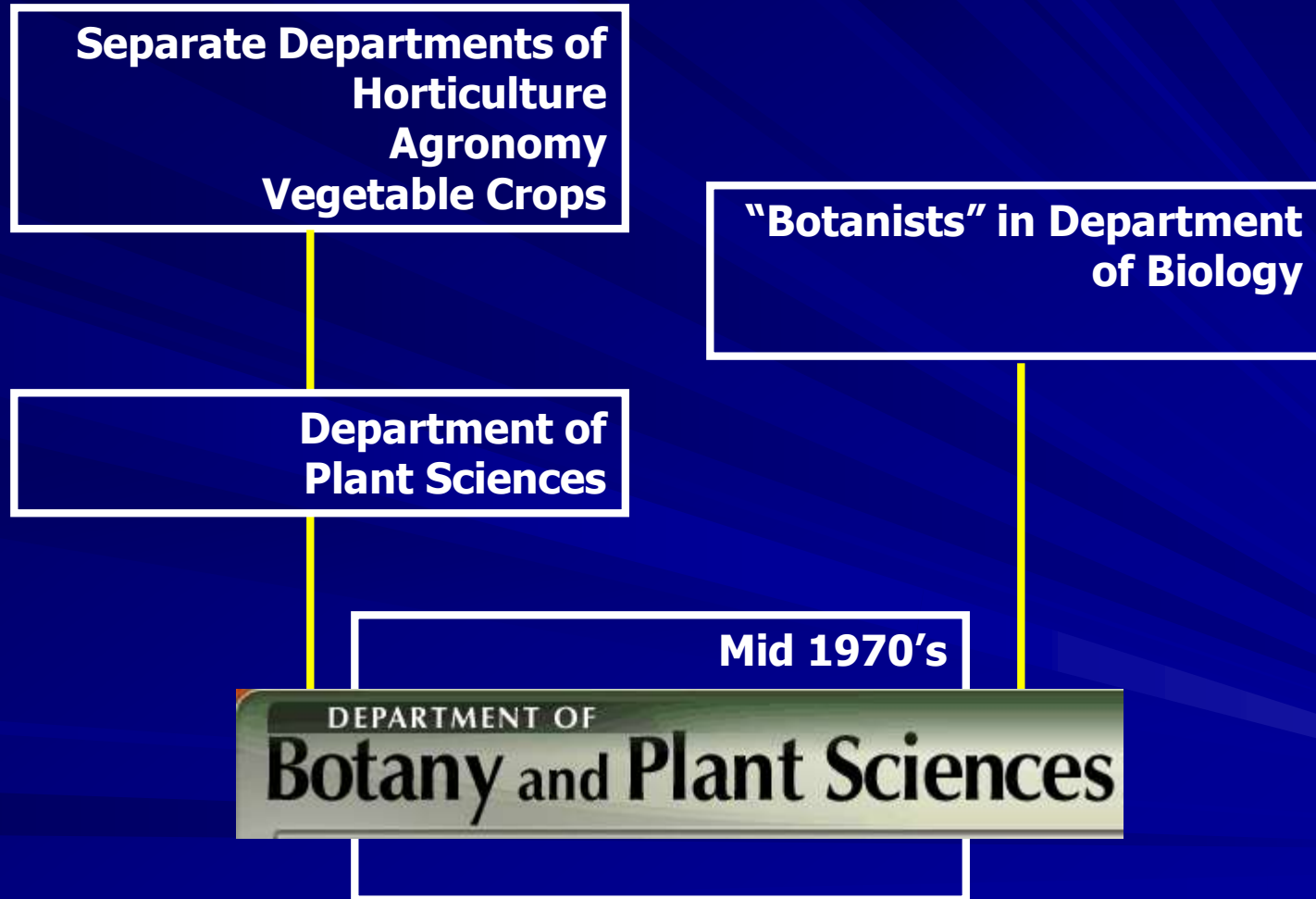


1954
**UC College of Letters &
Sciences in Riverside**



1960
UCR “General Campus”

Department of “Botany & Plant Sciences”? A brief history



UCR

Basic



- Paternity
- Gene flow

Applied



Plant paternity studies at UCR - 1980's

■ Rationale




- Select **small, isolated** population
- Genotype all plants
- Harvest seeds from some plants
- Genotype seed
- Subtract mother's contribution
- Compare remaining contribution to possible fathers
- When you find a match, that's the father!






■ Basic scientific significance

- Precise matching of parents provides information about male fitness, multiple paternity, gender, intermate distance, etc.

Who's the Father? Part 1

Genotype	Gene I	Gene II	Gene III	Gene IV
Mother	AA	AC	BC	DD
Seed 1	AB	AC	AB	AD
Bachelor 1		AC	AC	AD
Bachelor 2	AB	BC	AA	AB 
Bachelor 3	BB	AB		BC

Who's the Daddy? Part 2

Genotype	Gene I	Gene II	Gene III	Gene IV
Mother	AA	AC	BC	DD
Seed 2	AB	AC	AB	CD
Bachelor 1		AC	AC	AD
Bachelor 2	AB	BC	AA	
Bachelor 3	BB	AB		BC

Impossible fathers?

- Could be
 - High mutation rate? No
 - Procedure mistakes? Maybe
 - Long distance mating? Unlikely
 - Distances of hundreds of feet
 - **That would mean that everything we knew about gene flow was possibly wrong!**
 - Solution? Try another year or years



Long distance mating? Yes!
Ellstrand + Marshall (1985) American Naturalist
Ellstrand et al. 1987. PNAS

Pollen immigration rates (min.) estimated

Year	Pollen gene flow	<u>m</u>	Isolation (ft)
1982	8.6%	4.3%	1980
1983	8.2%	4.1%	3300
1984	17.9%	8.9%	330

Note **m** >> 1% (evolutionarily significant) at surprising distances.



Fusion!

Basic



Applied

Gene Flow & Conservation Genetics

Restoration Genetics as Gene Flow (at Arlee Montalvo's invitation)

"Escape" of Transgenes into Natural Populations

Hybridization as a Stimulus for the Evolution of Invasiveness

Some perspective
from 40 years (YIKES!)

The 21st century ain't no place for specialists.

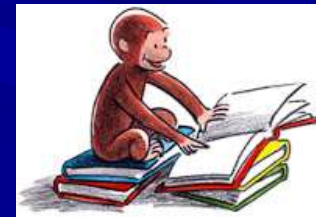


Lessons: Cross-Training + Curiosity

- Cross-training: “The best thing for being sad (that is, *bored, frustrated, anxious, pi\$\$ed-off*) is to learn something” – T. H. White as Merlin to Arthur in *The Once and Future King*



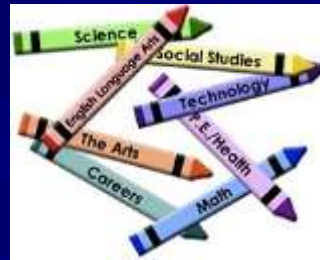
- *But not just anything ...*



- Curiosity: “Do what gives you energy” – Antonovics to Ellstrand

Lessons: Interdisciplinarity + Open Mind

- Interdisciplinarity “The most exciting science is at the interface of different fields” – Gottlieb to Ellstrand



- Open mind “There is no such thing as a problem without a gift for you in its hands. You seek problems because you need their gifts.” – according to The Messiah’s Handbook in Richard Bach’s *Illusions*



“I couldn’t have done it without ...”

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and more!

Thank you!



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