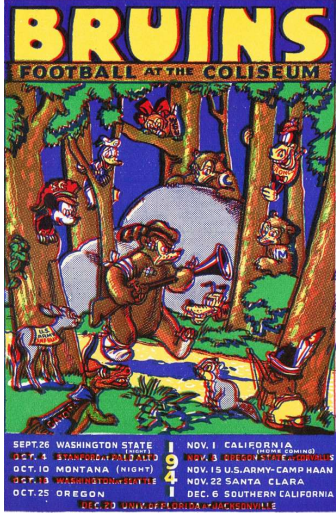
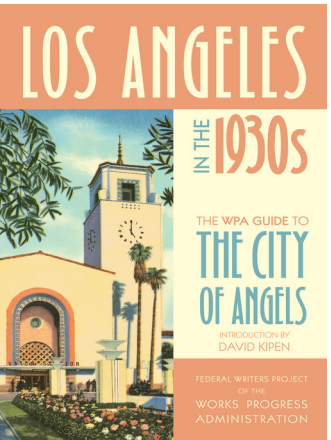
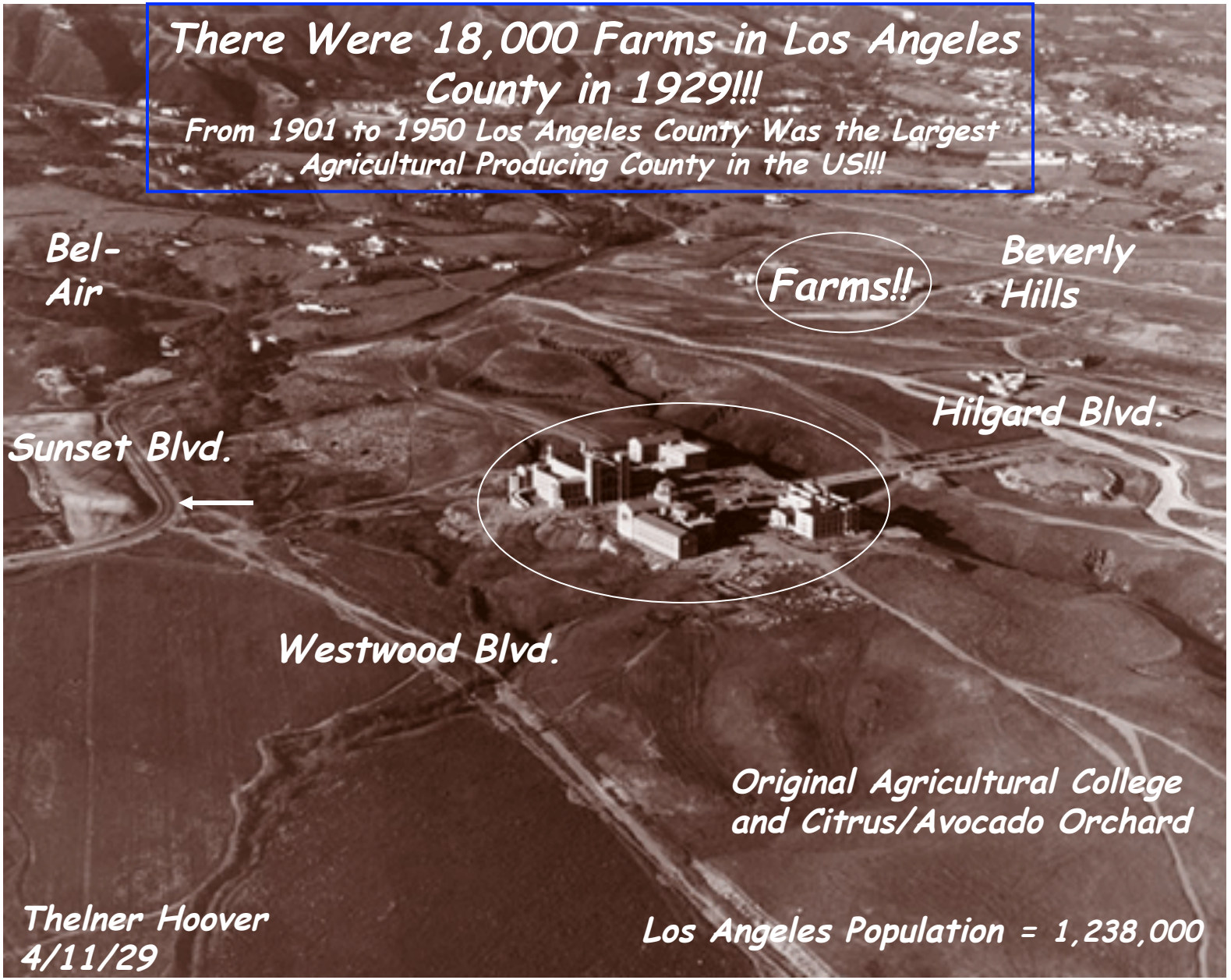

UCLA
DEPARTMENT OF MOLECULAR, CELL, AND DEVELOPMENTAL BIOLOGY
UCLA 100
Bob Goldberg
MCDB Retreat
December 6, 2019
Dissecting Early Plant Embryo Development



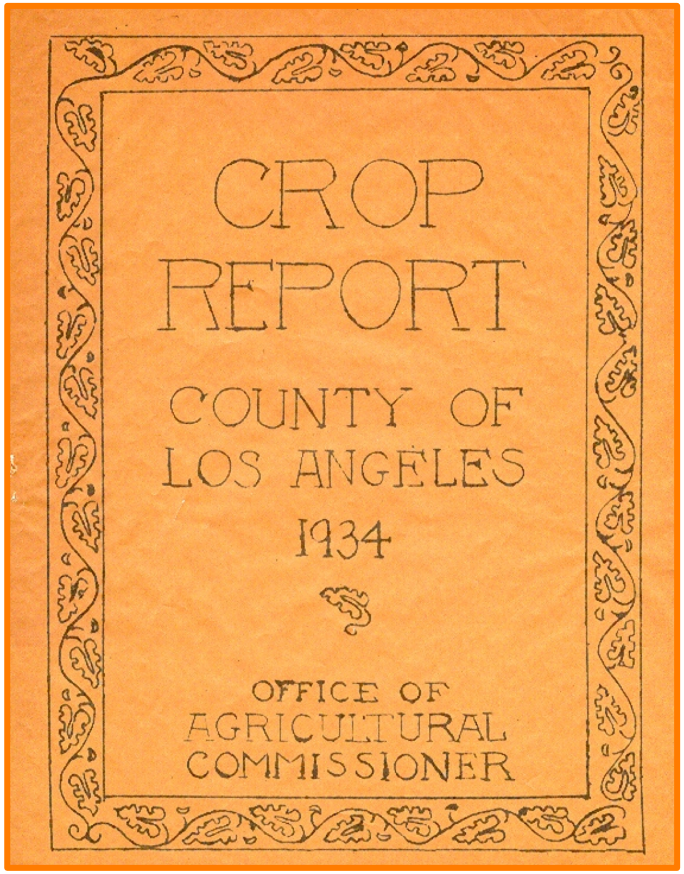
UCLA Plant & Agriculture History



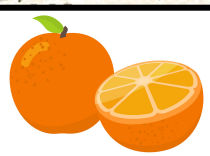
Aerial Photograph of UCLA in 1929



A Sample of LA County Agriculture in the 1930s



CITRUS FRUITS*				
Oranges	44,566	9,211,900	boxes	$ 17,786,100
Lemons	11,134	2,063,000	"	5,923,000
Grapefruit	712	190,800	"	305,700
	56,412	11,465,700		$ 24,014,800
OTHER FRUITS & NUTS				
Apples	441	17,600	boxes	13,200
Apricots	944	2,800	tons (green)	77,000
Almonds	1,008	504,000	lbs	70,600
Avocados**	2,191	4,260,000	lbs	303,100
Figs	772	920	tons	66,000
Grapes-table	1,919	4,800	"	76,800
Grapes-wine	2,550)	7,000	"	91,000
Grapes-raisin	324)			
Olives	1,236	575	"	20,800
Peaches-cling	692	1,200	"	39,600
Peaches-free	986	1,700	"	56,100
Pears	2,481	5,000	"	125,000
Persimmons	226	450	"	18,000
Plums	241	480	"	16,800
Prunes	54	110	"	2,200
Walnuts	25,217	18,947,000	lbs	1,540,000



600,000 Acres ~30% of LA County Total Area!!

Cash Value of $3.1B in 2019 Dollars!!!

Crop Acreage Trends For LA County & Southern California, 1925-1954, Published by LA County Board of Supervisors, Compiled by LA County Chamber of Commerce UCLA Library OCLC21700378

Original UCLA College of Agriculture-1929

UNIVERSITY OF CALIFORNIA

BULLETIN

General Catalogue

1939-40

DEPARTMENTS AT LOS ANGELES

For sale by the

STUDENTS COÖPERATIVE BOOK STORE, LOS ANGELES

PRICE, TWENTY-FIVE CENTS

COLLEGE OF AGRICULTURE

THE COLLEGE OF AGRICULTURE of the University of California offers at Los Angeles the Plant Science curriculum and the major in Subtropical Horticulture leading to the Bachelor of Science degree. Students electing other majors in this curriculum may spend the freshman and sophomore years at Los Angeles and then transfer to the campus where their major work is offered. Graduate work in agriculture is also offered which leads to the degrees of Master of Science and Doctor of Philosophy.

Students electing other curricula in the College of Agriculture—Animal Science, Agricultural Economics, Entomology and Parasitology, Forestry, Soil Science, Home Economics, and Agricultural Education—and those electing the curriculum in Agricultural Engineering, may spend the first two years at Los Angeles and then transfer to Berkeley or Davis without serious loss of time. Students who plan to major in Landscape Design are advised to transfer to Berkeley at the beginning of the sophomore year. Students who register at Los Angeles with the intention of later transferring to Berkeley or Davis to pursue other curricula or to obtain majors in the Plant Science curriculum other than Subtropical Horticulture are requested to consult the PROSPECTUS OF THE COLLEGE OF AGRICULTURE and the appropriate adviser in Agriculture at Los Angeles.

108. Fruit Physiology and Storage Problems. (2) I. Mr. Biale

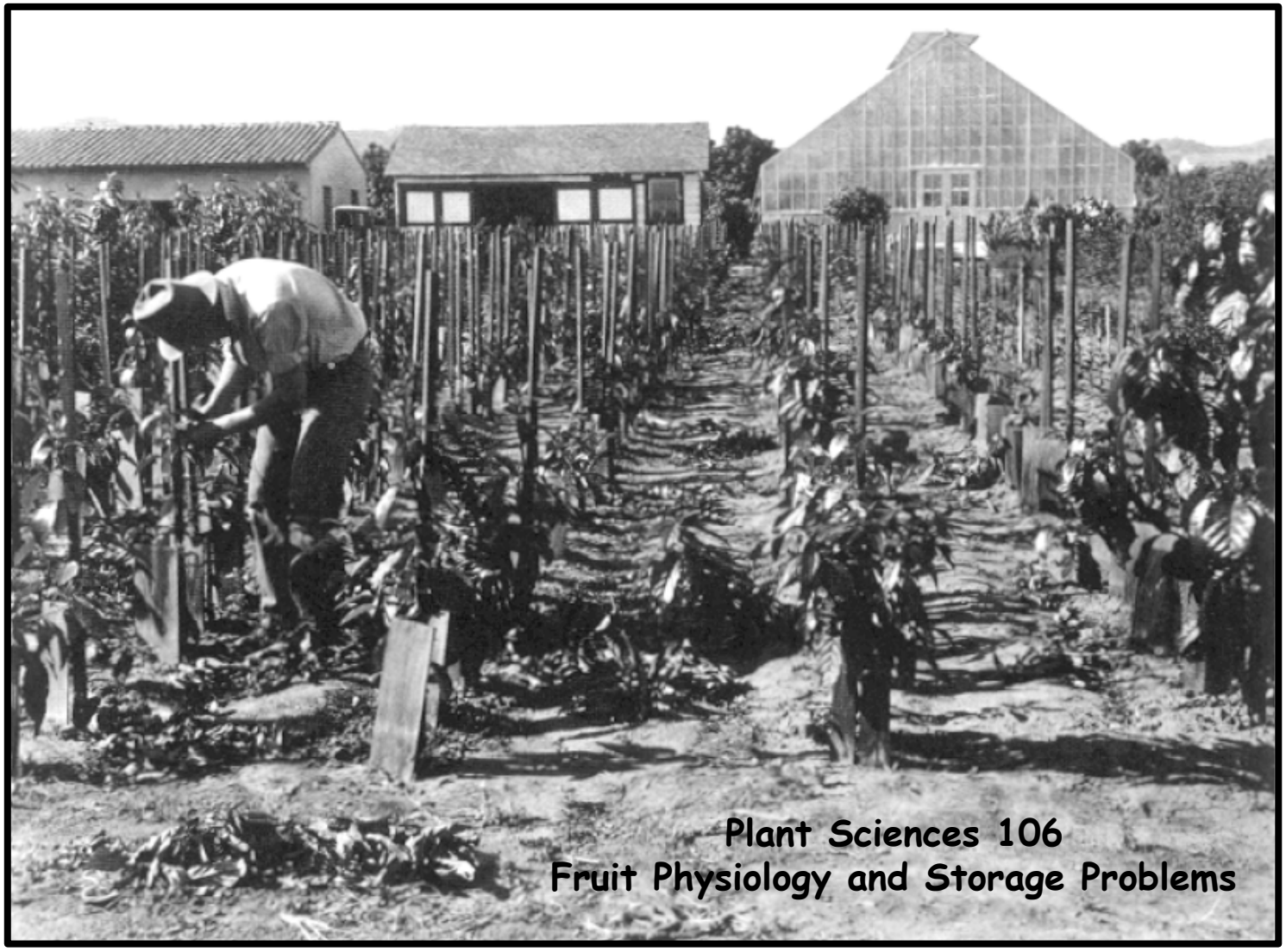
Lectures and discussions, two hours.

Prerequisite: consent of the instructor.

Ripening processes of fruit on the tree; maturity standards and tests; ripening and respiration as affected by ethylene gas treatment; chemical and physiological changes at low temperatures; cold storage and refrigerated gas storage; role of volatile substances; differences in species and varietal responses.

Professor Jacob Biale (1902-1989)

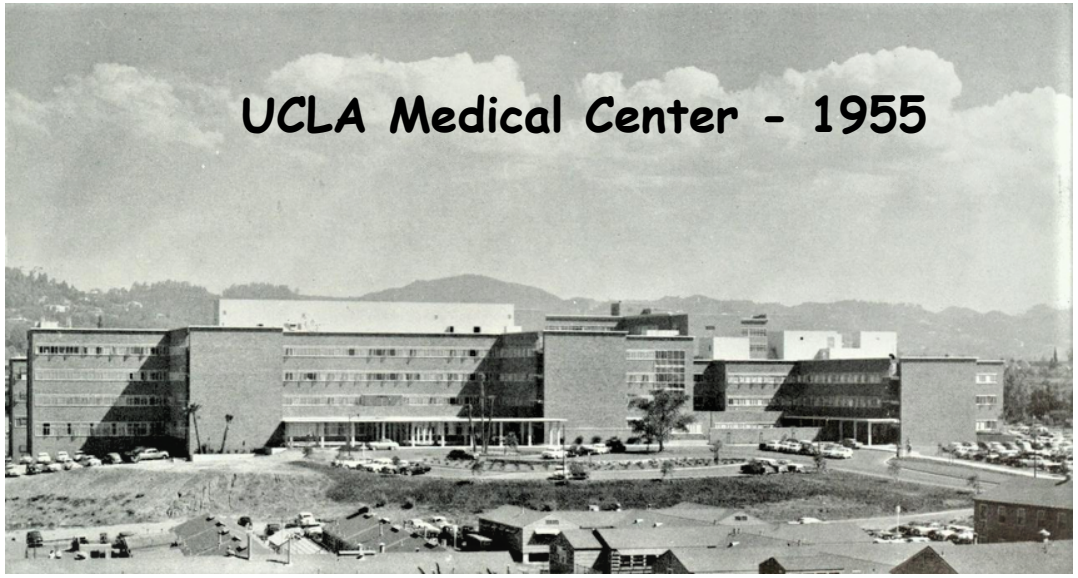
Avocado Rootstock Progeny Nursery on the UCLA Campus in 1936



CA Schroeder, Cal. Avocado Year Book, 1992

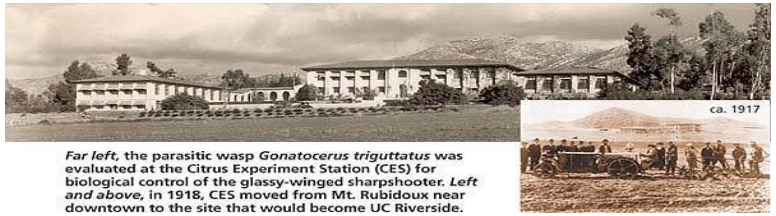
Legacy of UCLA Plant Sciences Avocado Research

What Happened to the UCLA College of Agriculture?



UC RIVERSIDE | UNIVERSITY OF CALIFORNIA College of Natural & Agricultural Sciences

Agricultural Experiment Station
1907 2007
University of California, Riverside



Far left, the parasitic wasp *Gonatocerus triguttatus* was evaluated at the Citrus Experiment Station (CES) for biological control of the glassy-winged sharpshooter. *Left and above,* in 1918, CES moved from Mt. Rubidoux near downtown to the site that would become UC Riverside.

Botany Building Designed By Paul Williams Built for $859,000 and Opened in 1959!

UCLA Daily Bruin

Vol. LII—No. 10 Los Angeles, California Thursday, Oct. 3, 1957

Ground-Breaking Date Set For Botony Bldg. Project

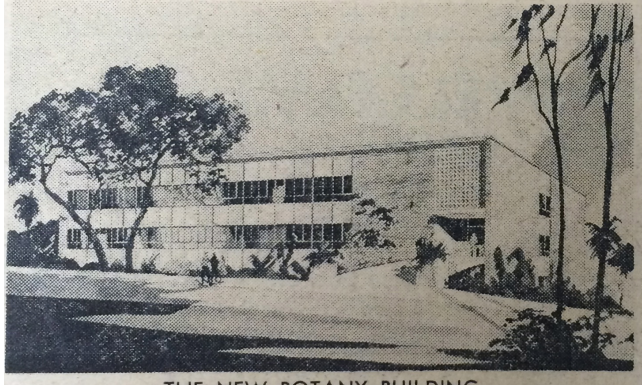
Ground-breaking for the new $750,000 Botany Building has been tentatively set for the beginning of 1958. Completion is scheduled for early in 1959.

This four-storied, glass-faced building will be located in the northwest corner of the Botanical Garden, immediately south of the Plant Physiology Bldg. The existing garden will completely surround the new building and many of the plants now growing on the slope of the bank between the sidewalk and the north facade of the building will be preserved.

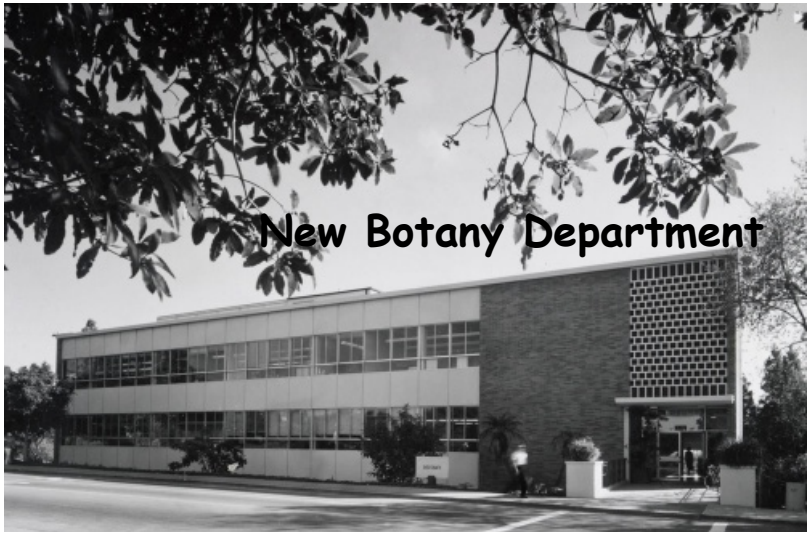
The building will be able to accommodate 212 full-time students. It will be used for both under-graduate and graduate students, having 15 teaching and research laboratories as well as administrative offices and a three-level herbarium.

Both basic research in various fields of botany and research connected with the activities of the University's Agricultural Experiment Station will be provided for.

One unique feature of the new building will be two controlled-growth rooms, in which exact climate control will enable researchers to set up ideal grow-



THE NEW BOTANY BUILDING
Artist's conception of the new Botany Building which is scheduled to be completed by 1959.



Professor & Chair Jacob Biale (1902-1989)

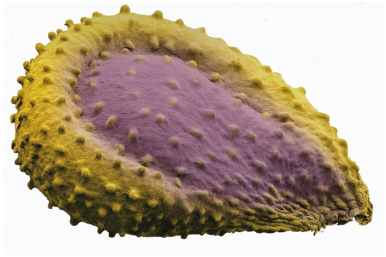
Professor Sam Wildman (1912-2004)

Professor Bernie Phinney (1917-2009)

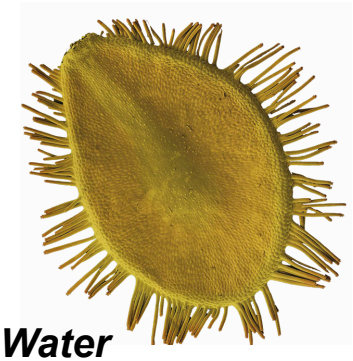
Ninety Three Years of Plant Research at UCLA

Agriculture 1927-1955 → Botany 1955-1972 → Biology 1972-1995 → Molecular Cell & Developmental Biology 1995 to Present

So……Why Study Seeds??

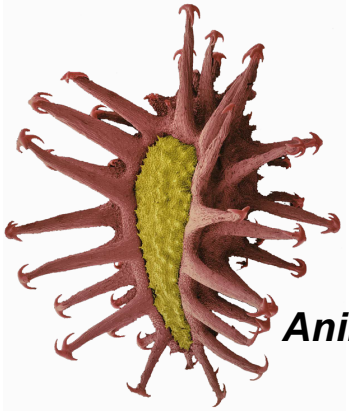




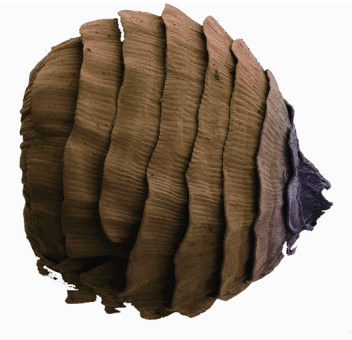



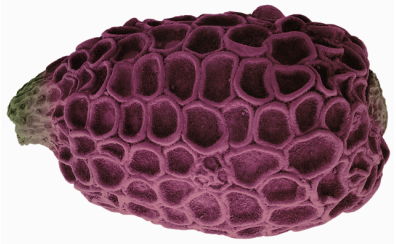
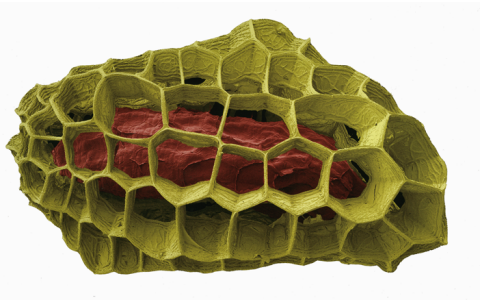
Water


Wind



Animals


Seeds Protect and Disperse Plant Embryos
and Come in Many Shapes and Sizes!

Our Food is Derived From Fifteen Crops & Over Half Produce Seeds For Human and Animal Consumption

Seed Crops

- Wheat
- Rice
- Corn
- Barley
- Sorghum
- Soybean
- Common Bean
- Coconut
- Canola

Non-Seed Crops

- Potato
- Sweet Potato
- Cassava
- Sugar Beet
- Sugar Cane
- Banana

In Some World Populations 75% of Calories Are Derived From Seeds!

Bean Embryo Shortly After Fertilization

Post-Fertilization Embryo

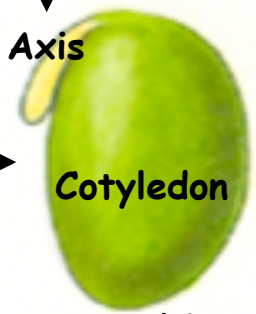
Embryo Proper

Suspensor

Provides Nutrients & Growth Regulators

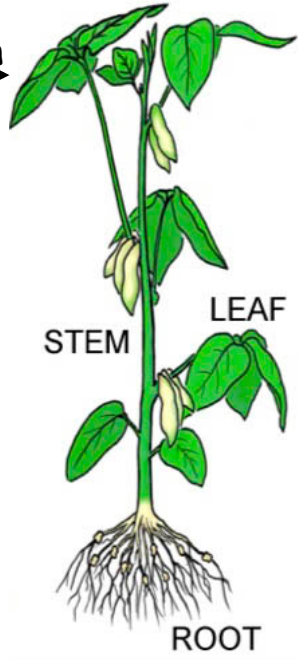
Degenerates During Seed Development

Next Plant Generation

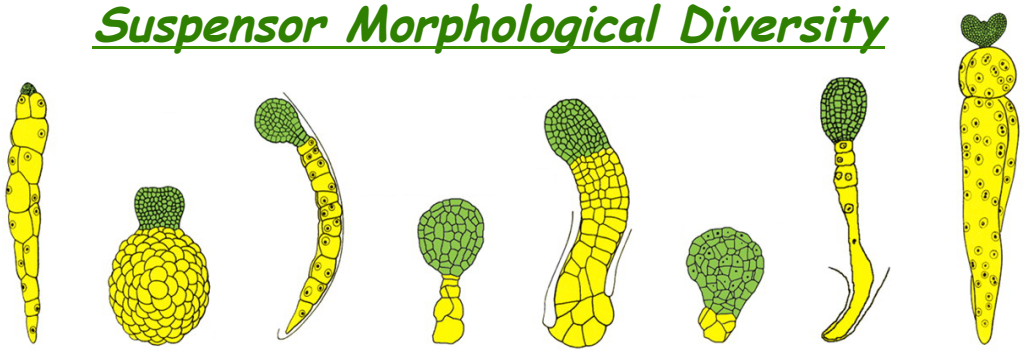


Mature Embryo

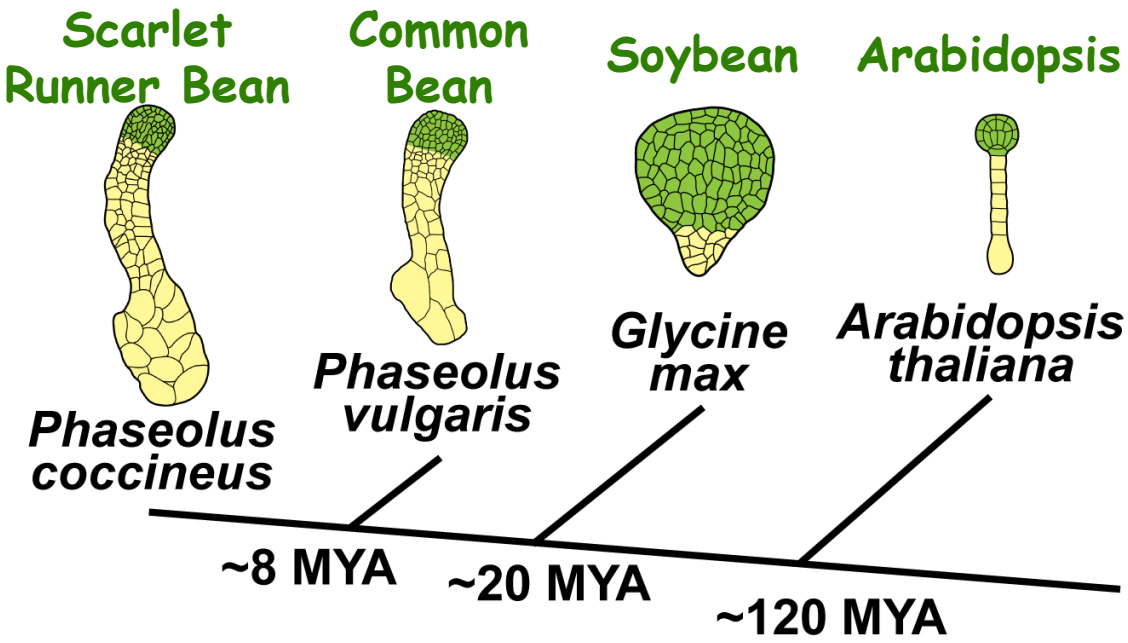
Consumed During Germination

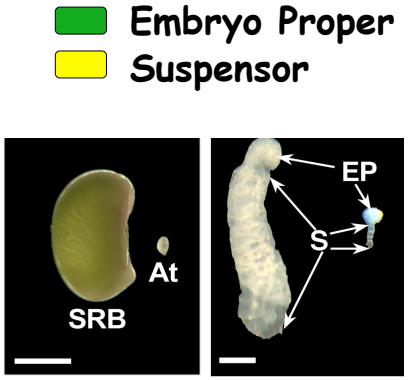


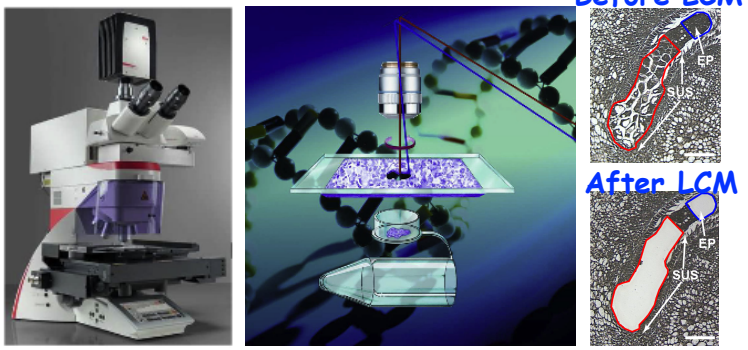
Suspensor Morphological Diversity



Using Comparative Genomics To Uncover Regulatory Networks Programming Suspensor Development

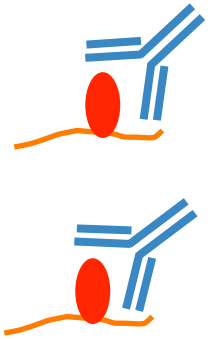






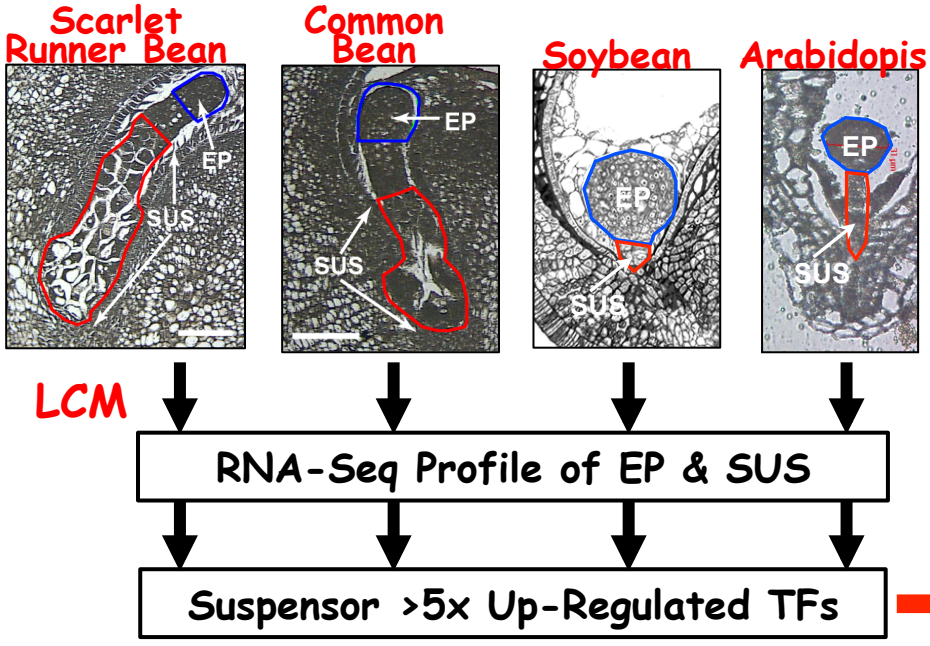
Laser Capture Microdissection (LCM) Using Leica LMD System

RNA-Seq



ChIP-Seq

Identification of Suspensor Transcription Factors That Are Up-Regulated in All Four Plant Species After Fertilization

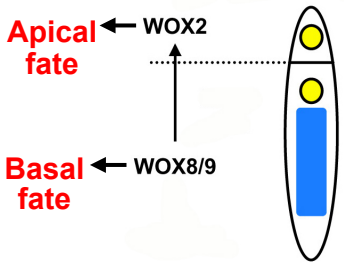


Suspensor (SUS) Embryo proper (EP)

SHARED Suspensor-Specific TFs

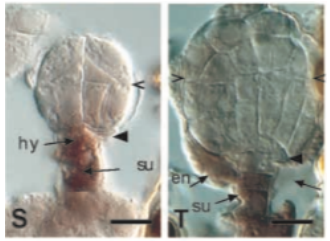
- WOX8/9
- ARF16
- WRKY6
- HDG11
- FEZ
- C2C2-Dof TF
- ARF10
- CDF3
- WIP2/NTT
- HB17
- ZFN1
- AGL11
- AGL9/SEP3
- SRS5
- ANAC087
- ANAC002
- ERF/AP2 TF
- GATA9
- C2H2 TF

WOX8/9 Regulates The Development Of The Basal Embryo Lineage



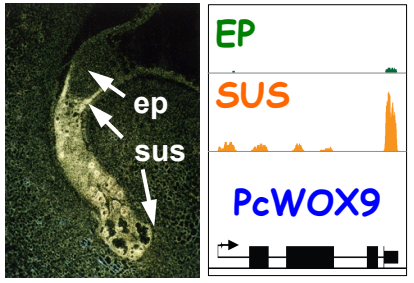
(Modified from Developmental Cell, 2011)

Arabidopsis



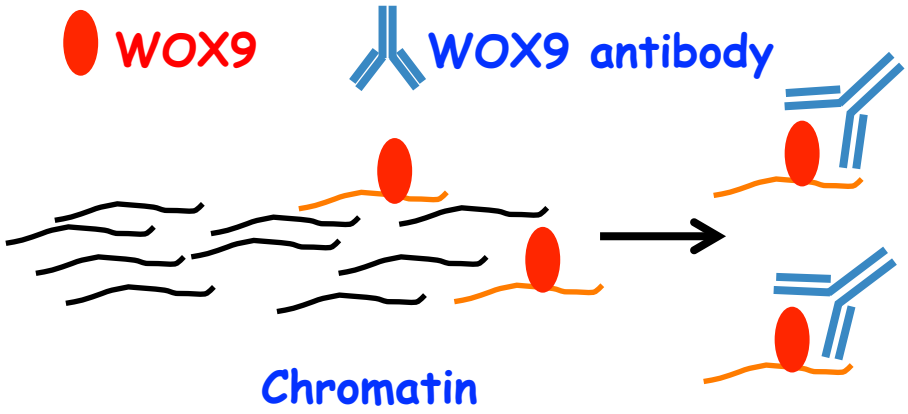
(Development, 2003)

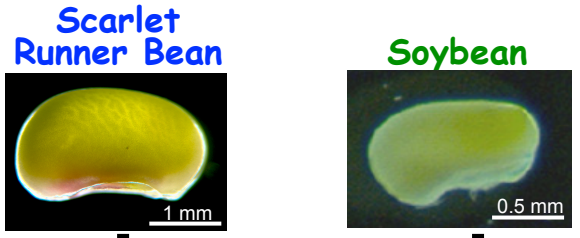
Scarlet Runner Bean



Does WOX9 Target SHARED Suspensor Up-Regulated TFs?

Chromatin Immunoprecipitation (ChIP) → ChIP-Seq Libraries





ChIP-Seq with WOX9 antibody

WOX9 → Gene/TF

305 Genes (32 TFs) | 828 Genes (99 TFs)s

WOX9 Target Genes

SHARED Suspensor-Specific TFs Targeted by WOX9

- WOX8/9 ❖
- ARF16 ❖✳
- WRKY6 ❖✳
- HDG11 ❖✳
- FEZ ❖✳
- C2C2-Dof TF ❖
- ARF10 ✳
- CDF3 ✳
- WIP2/NTT
- HB17 ✳
- ZFN1
- AGL11 ✳
- AGL9/SEP3 ✳
- SRS5 ✳
- ANAC087
- ANAC002 ✳
- ERF/AP2 TF
- GATA9
- C2H2 TF

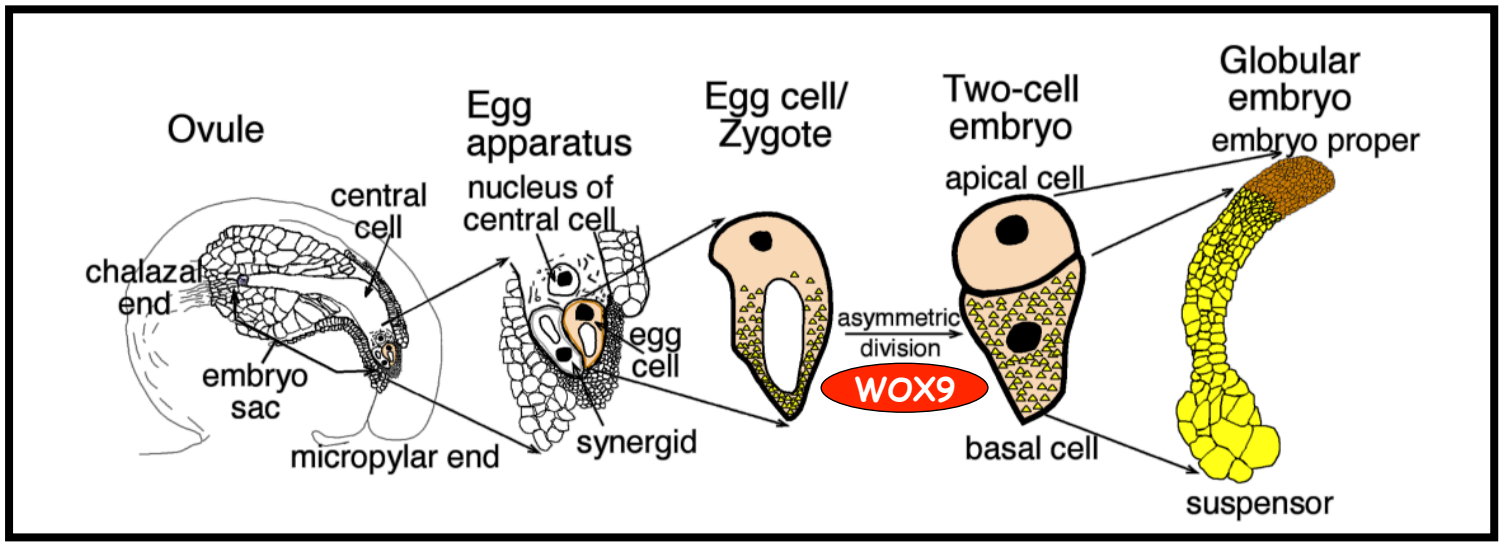
← Any WOX9 Target Genes???

YES!

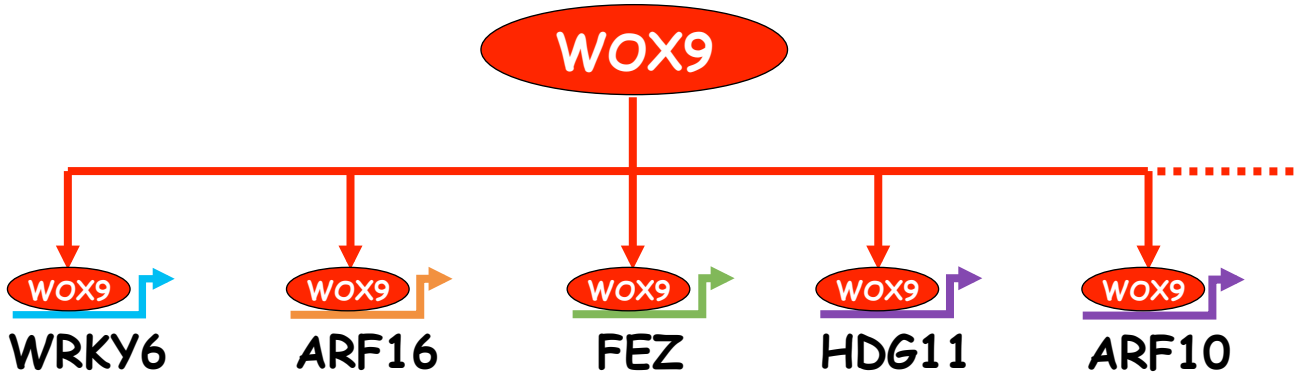
❖ 6 TFs in Scarlet Runner Bean

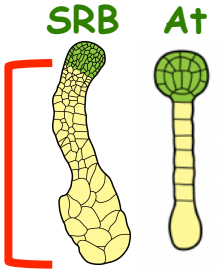
✳ 14 TFs in Soybean

Gaining Entry Into the Regulatory Network Controlling Suspensor Differentiation & Function

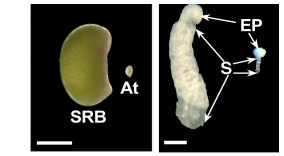


Weterings, Plant Cell, 2001





Suspensor Differentiation & Function



Many Thanks To…..

UCLA

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Jer-Young Lin
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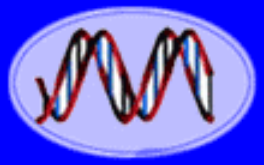
Lauren Bowman
Matteo Pellegrini

UCDAVIS

John Harada
Julie Pelletier

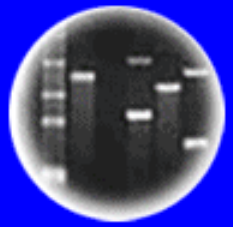
NSF

One Final Comment……



DNA
Genetic Code of Life

Entire Genetic Code
of a Bacteria



DNA Fingerprinting

Cloning: Ethical Issues
and Future Consequences

Plants of Tomorrow

Honors Collegium 70A
Genetic Engineering in Medicine, Agriculture, and Law