

**Honors Collegium 70AL Gene Discovery Laboratory  
Identifying Genes Important for Seed Development  
Sponsored by NSF**

**Professor Bob Goldberg  
Dr. Kelli Henry  
Summer 2014**

**OFFICE HOURS:** Friday, 1-2 PM, Terasaki Life Sciences 4121, bobg@ucla.edu

**INTRODUCTION TO LABORATORY RESEARCH:** Monday 1-3 PM, Terasaki Life Sciences 5100

**LABORATORY:** Tuesday & Thursday 1-6 PM, Terasaki Life Sciences 4128

**OPEN LABORATORY & RESEARCH CONSULTATION:** Wednesday & Friday 1-6 PM, Terasaki Life Sciences 4128.

**SEMINAR ROOMS:** Terasaki 5100 (Monday), Terasaki 4100 (Tuesday), Terasaki 2100 (Thursday), Terasaki 1020 (Final Research Symposium).

**ADMINISTRATIVE ASSISTANT:** Lauren Bowman (laurenbowman@ucla.edu), Terasaki Life Sciences 4125

**TEACHING ASSISTANT:** Mike Lyons (lyons24@ucla.edu), Terasaki Life Sciences 4128

**LAB REPORTS:** Lab reports should be written in the form of a mini-journal article and documented with figures and/or tables from your experiments. The lab report should be modeled after an article published in *Proceedings of the National Academy of Sciences (PNAS)*. A sample *PNAS* article will be handed out in the Monday afternoon session. *PNAS* can be accessed online at <http://www.pnas.org/>. Lab reports must be uploaded as a pdf file onto the Webbook and handed in by 1 PM on the Monday that they are due. Limit your lab report to three pages – including figures and tables.

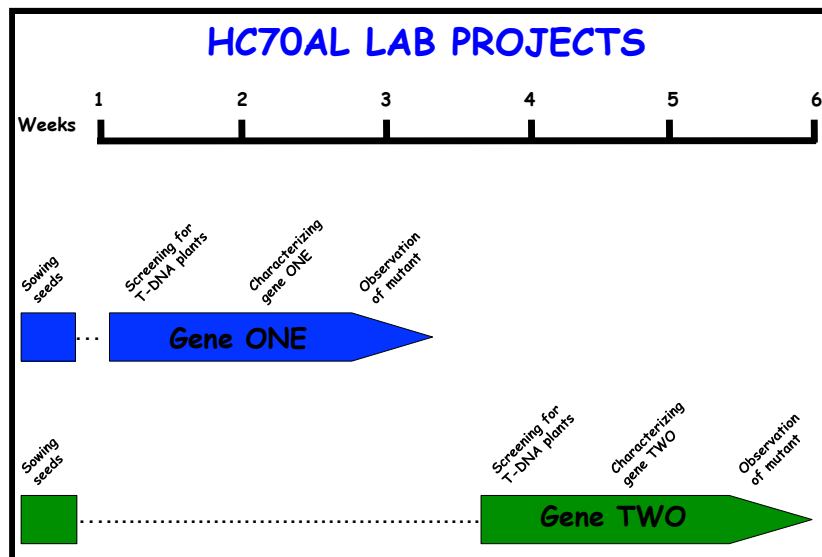
**LAB WEBBOOK & BLUE BOOKS:** Data generated for the week must be logged into the Lab Webbook – including all results, specific methods, and digital images. Protocols, written notes, data, and lab reports must be labeled and organized in your Bluebook Binder. Bluebook Binders with research data must be kept in the lab. The Lab Webbook can be accessed at the following address: <http://estdb.biology.ucla.edu/webbook>. Access to the Lab Webbook is password protected. The username is your Bruin Online (bol) login, and the password is your 9-digit student identification number. Please report any problems, or suggestions, to Min Chen (m.chen@ucla.edu).

**GRADING:** Grades will be based on (1) research results, (2) lab reports, (3) Monday discussion participation, and (4) final oral presentation. The final oral presentations will be on Thursday, September 11 from 1 to 4 PM.

SUMMARY OF HC70AL EXPERIMENTS – SUMMER 2014

Experiment 1	<i>Introduction to General Molecular Biology Techniques</i>
Experiment 2	<i>Screening Salk T-DNA Mutagenesis Lines (GENE ONE)</i>
Experiment 3	<i>Identifying Features of Mutant Seeds Using Nomarski Microscopy (GENE ONE)</i>
Experiment 4	<i>Screening Salk T-DNA Mutagenesis Lines (GENE TWO)</i>
Experiment 5	<i>Identifying Features of Mutant Seeds Using Nomarski Microscopy (GENE TWO)</i>

HC70AL SUMMER 2014 – EXPERIMENTAL TIMELINES



## WEEK ONE

<b>Mon</b>	<b>8/4/14</b>	<i>Data Recording &amp; Organization - Introduction to the Webbook and Lab Research Notebook – Kelli Henry &amp; Min Chen</i> <i>Introduction 1: Lab Safety – Kelli Henry &amp; Min Chen</i> <i>Introduction 2: Proper Micropipetting Techniques – Kelli Henry &amp; Min Chen</i>  <b>EXPERIMENT ONE – Introduction to General Molecular Biology Techniques</b>  <b><u>I. Pipetting Exercise</u></b>  <b><u>II. Serial Dilution Experiment</u></b> Serial Dilution of a DNA Stock Determination of Pipetting Accuracy Using a Spectrophotometer
<b>Tue</b>	<b>8/5/14</b>	<b>EXPERIMENT ONE – Introduction to General Molecular Biology Techniques</b> <i>Introduction 1: Sizing DNA on Agarose Gels – Mike Lyons</i>  <b><u>II. Serial Dilution Experiment</u></b> Determination of Pipetting Accuracy by Gel Electrophoresis  <b>EXPERIMENT TWO - Screening Salk T-DNA Mutagenesis Lines (GENE ONE)</b> <i>Introduction 2: Genomic DNA Isolation - Mike Lyons</i>  <b><u>II. Isolation of Genomic DNA</u></b> Tissue Collection from Plants Isolating Genomic DNA from Wild-Type and Salk Lines Determining DNA Concentration Using Nanodrop Spectrophotometer Gel Electrophoresis of Genomic DNA
<b>Thu</b>	<b>8/7/14</b>	<b>EXPERIMENT TWO - Screening Salk T-DNA Mutagenesis Lines (GENE ONE)</b> <i>Introduction 1: Polymerase Chain Reaction (PCR) - Mike Lyons</i> <i>Introduction 2: Plant Genotyping - Mike Lyons</i>  <b><u>III. Determination of Genotype</u></b> Determining Genotype of Salk Plants Using PCR Gel Electrophoresis of PCR Product

## WEEK TWO

<b>Mon</b>	<b>8/11/14</b>	<i>Introduction to Seed Development &amp; Research - Professor Bob Goldberg</i> <i>Introduction to Knockout Screens and Genetics - Professor Bob Goldberg</i> <i>Discussion of Data from Experiment ONE – Professor Bob Goldberg</i> <b>EXPERIMENT ONE LAB REPORT DUE</b>
<b>Tue</b>	<b>8/12/14</b>	<b>EXPERIMENT TWO - Screening Salk T-DNA Mutagenesis Lines (GENE ONE)</b> <i>Introduction: Review of Plant Genotyping - Mike Lyons</i>

### III. Determination of Genotype

Discussion of PCR Results  
Label T-DNA-Tagged Plants

### IV. Determination of T-DNA Insertion Site

Purification of PCR Products  
Sequencing PCR Product with T-DNA and Gene-Specific Salk Primer

**Thu**      **8/14/14**      **EXPERIMENT TWO - Screening Salk T-DNA Mutagenesis Lines (GENE ONE)**

*Introduction: Using Bioinformatics to Analyze DNA Sequences - Kelli Henry*

### IV. Determination of T-DNA Insertion Site

Analysis of Sequenced PCR Product – *Kelli Henry*  
Gene Annotation Worksheet for Gene 1

## WEEK THREE

**Mon**      **8/18/14**      *Discussion of Data from Experiment TWO – Professor Bob Goldberg*  
**EXPERIMENT TWO LAB REPORT DUE**  
**Gene Annotation Worksheet for Gene 1 Due**

**Tue**      **8/19/14**      **EXPERIMENT THREE - Identifying Features of Mutant Seeds Using Nomarski Microscopy (GENE ONE)**  
*Introduction 1: Observing Plants & Seeds for Mutant Phenotypes – Mike Lyons*  
*Introduction 2: Chi-Square Analysis – Mike Lyons*  
*Introduction 3: Light Microscopy & Nomarski Microscopy – Kelli Henry*

### I. Observation of Seed Phenotypes by Light Microscopy

Examine and Compare Wild Type and Mutant Seeds  
Fix seeds for Nomarski Microscopy  
Make Appointment to Use Nomarski Optics Microscope

### III. Observation of the Mature Plant Phenotype

**Thu**      **8/21/14**      **EXPERIMENT THREE - Identifying Features of Mutant Seeds Using Nomarski Microscopy (GENE ONE)**

### II. Observation of Seed Phenotypes by Nomarski Microscopy

**EXPERIMENT FOUR - Screening Salk T-DNA Mutagenesis Lines (GENE TWO)**

### II. Extraction of Genomic DNA

Tissue Collection from Plants  
Isolating Genomic DNA from Wild Type and Salk Lines  
Determining DNA Concentration Using Nanodrop Spectrophotometer  
Gel Electrophoresis of Genomic DNA

#### WEEK FOUR

- Mon**      8/25/14      *How to Prepare and Present Research Data - Professor Bob Goldberg*  
*Discussion of Data from Experiment THREE – Professor Bob Goldberg*  
*Discussion of Science Ethics – Professor Bob Goldberg*  
**EXPERIMENT THREE LAB REPORT DUE**
- Tue**      8/26/14      **EXPERIMENT FOUR - Screening Salk T-DNA Mutagenesis Lines (GENE TWO)**  
*Introduction: Review of Data Organization - Mike Lyons*
- III. Determination of Genotype**  
Determining Genotype of Salk Plants Using PCR  
Gel Electrophoresis of PCR Product
- Thu**      8/28/14      **EXPERIMENT FOUR - Screening Salk T-DNA Mutagenesis Lines (GENE TWO)**
- III. Determination of Genotype**  
Discussion of PCR Results  
Label T-DNA-Tagged Plants
- IV. Determination of T-DNA Insertion Site**  
Purification of PCR Products  
Sequencing PCR Product with T-DNA and Gene-Specific Salk Primer

#### WEEK FIVE

- Mon**      9/1/14      *Labor Day – No Class*
- Tue**      9/2/14      **EXPERIMENT FOUR - Screening Salk T-DNA Mutagenesis Lines (GENE TWO)**
- IV. Determination of T-DNA Insertion Site**  
Analysis of Sequenced PCR Product  
Gene Annotation Worksheet for Gene 2
- EXPERIMENT FIVE - Identifying Features of Mutant Seeds Using Nomarski Microscopy (GENE TWO)**
- I. Observation of Seed Phenotypes by Light Microscopy**  
Examine and Compare Wild Type and Mutant Seeds  
Fix seeds for Nomarski Microscopy  
Make Appointment to Use Nomarski Optics Microscope
- III. Observation of the Mature Plant Phenotype**

Thu 9/4/14 EXPERIMENT FIVE - Identifying Features of Mutant Seeds Using Nomarski Microscopy (GENE TWO)

II. Observation of Seed Phenotypes by Nomarski Microscopy

WEEK SIX

Mon 9/8/14 *Discussion - What Did I Learn in HC70A and HC70AL? – Professor Bob Goldberg*  
*Discussion of Data from All Experiments – Professor Bob Goldberg*  
EXPERIMENTS FOUR & FIVE LAB REPORTS DUE  
Gene Annotation Worksheet for Gene 2 Due

Tue 9/9/14 GENERAL LABORATORY  
Finish Experiments, Summarize Data & Prepare PowerPoint Presentation  
Clean-Up Benches, Summarize Data, & Organize Lab Notebook & Webbook  
Organize & Practice Research Talks

Thu 9/11/14 All-Class Research Symposium  
LAB NOTEBOOK, WEBBOOK AND CD WITH DIGITAL DATA FILES DUE