TA – Kayla Nygaard

• nygaardk@wustl.edu
• 2nd year MGG
• Dougherty Lab

• Office hours – currently after class on Tuesdays, may change – I’ll notify you via email
If you have difficulty accessing any links below or find errors, please contact Kayla Nygaard at nygaardk@wustl.edu. Please refer to updated schedules for problem set due dates.

**Website**

genetics.wustl.edu/bio5491/spring-2018/

### SCHEDULE

- If you have difficulty accessing any links below or find errors, please contact Kayla Nygaard at nygaardk@wustl.edu.
- Please refer to updated schedules for problem set due dates.

<table>
<thead>
<tr>
<th>JANUARY 2018</th>
<th>ADVANCED GENETICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEEK I</td>
<td></td>
</tr>
<tr>
<td><strong>TUES January 16</strong></td>
<td><strong>2:30-4:15</strong></td>
</tr>
<tr>
<td>Introduction - Tim Schedl</td>
<td><strong>Kornfeld Lecture #1</strong></td>
</tr>
<tr>
<td>C. elegans Genetics - Kerry Kornfeld</td>
<td><strong>Kornfeld Lecture #2</strong></td>
</tr>
</tbody>
</table>

#### READINGS
- Spring 2018 Schedule
- Alberts 2010 Editorial
- Zoghbi 2013 Editorial

#### NOTES
- Course Intro & Expectations
  - Kornfeld Lecture #1
  - **Kornfeld Lecture #2**

#### HOMEWORK
- Readings for HW #1
  - Chapter 2: Mendel
  - Chapter 11: Mutation
  - Sutton 1903
  - opt: Creighton and McClintock 1931
  - opt: McClintock biography excerpt

**THURS January 18**

| C. elegans Genetics - Tim Schedl | 1:30-3:15 |
| C. elegans Nomenclature - Kayla Nygaard |

#### READINGS
- A biologist's guide to stats
- Guarente 1993
- Thomas 1997
- Overview of C.elegans 2015
- Suppressor Genetics 1999

#### NOTES
- **Sched1 Genetic approaches**
- **Nomenclature #1 C.elegans**

#### HOMEWORK
- **HW #1 Principles of Genetics**
- Due Thurs. Jan 25
The Basics

• HW due 1 week after posting by class time
  • highly advised to finish by Tuesday b/c of Genomics.

• For this week: all the papers are up
  • I’ll put the HW assignment up on Thursday
  • Due next Thursday

• Email to me or hand to me in class.
C. elegans
1/18/18 – Class 2
C. elegans Morphology

XX hermaphrodite

- intestine
- oocytes
- sperm in spermatheca
- vulva
- eggs in uterus
- ovary
- anus

XO male

- intestine
- testis
- sperm
- seminal vesicle
- cloaca
- vas deferens
- spicule
- fan
- rays
Life Cycle

- **Gastrula** (approximately 30-cell)
- **Comma**
- **1.5-fold**
- **2-fold**
- **3-fold**

- **L1 (250 μm)**
- **L2 (360-380 μm)**
- **L3 (490-510 μm)**
- **L4 (620-650 μm)**
- **L4/adult molt**

- **Predauer (L2d)**
- **L1/L2d molt**

- **Hatching**

- **Dauer (400 μm)**
- **L2/L3 molt**
- **L3/L4 molt**

- **Adult (1110-1150 μm)** (capable of egg laying)

- **First cleavage (40 min)**

- **in utero development (150 min)**

- **eggs laid at Gastrula**

- **12 hr**
- **crowding starvation high temp**

- **8 hr**

- **10 hr**

- **8 hr**

- **13 hr**

- **up to 4 months**
In the lab
C. elegans Nomenclature

- Strain & Genotype
  - fully identifies worm identity
- Our focus is on genotype:

- Genotype
  - Note: no spaces, all italics
  - him-5(e1490)V
    - Chromosome no. (Roman numeral)
    - allele number, with 1-2 letter lab designation (lowercase) and number
    - three or four letter gene name (lower case), dash, number

- Strain number
  - Note: no spaces
  - CB1490
    - Two or three letter (capital) laboratory strain designation
Notes on *C. elegans* nomenclature

- **Primary source:** “A uniform genetic nomenclature for the nematode *C. elegans*” by Horvitz H, Brenner S, Hodgkin J, Herman R (1979)

- **Common Strain designations**
  - CB = Cambridge (Brenner & colleagues)
  - MT = MIT (Horvitz Lab)
  - BC = Baillie lab (British Columbia)

- **Genotype**
  - **Common allele designations**
    - *e* = Cambridge (England)
    - *n* = Horvitz lab
    - *s* = Baillie lab
    - *st* = Waterston lab (St. Louis!!)
Gene Name Examples

• 3 letter
• Named for mutants
  • Gene function is **opposite** of name

<table>
<thead>
<tr>
<th>Gene</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>aex</td>
<td>Anterior contraction and EXpulsion defect in defecation</td>
</tr>
<tr>
<td>age</td>
<td>AGEing alteration</td>
</tr>
<tr>
<td>bli</td>
<td>BListered cuticle</td>
</tr>
<tr>
<td>ced</td>
<td>CELL Death abnormality</td>
</tr>
<tr>
<td>daf</td>
<td>abnormal DAuer Formation</td>
</tr>
<tr>
<td>dpy</td>
<td>DumpY: shorter than wild-type</td>
</tr>
<tr>
<td>dyf</td>
<td>abnormal DYe Filling (fails to stain amphid neurons with FITC)</td>
</tr>
<tr>
<td>eat</td>
<td>EATing: abnormal pharyngeal pumping</td>
</tr>
<tr>
<td>egl</td>
<td>EGg Laying defective</td>
</tr>
<tr>
<td>him</td>
<td>High Incidence of Males (increased X chromosome loss)</td>
</tr>
<tr>
<td>let</td>
<td>LEThal</td>
</tr>
<tr>
<td>lin</td>
<td>abnormal cell LINEage</td>
</tr>
<tr>
<td>osm</td>
<td>OSMotic avoidance abnormal</td>
</tr>
<tr>
<td>rol</td>
<td>ROLier: helically twisted body, animals roll when moving</td>
</tr>
<tr>
<td>sle</td>
<td>SLow embryonic development</td>
</tr>
<tr>
<td>sma</td>
<td>SMALL (body size)</td>
</tr>
<tr>
<td>syd</td>
<td>SYnapse Defective</td>
</tr>
<tr>
<td>unc</td>
<td>UNCoordinated</td>
</tr>
<tr>
<td>vab</td>
<td>Variable ABnormal morphology</td>
</tr>
<tr>
<td>zyg</td>
<td>ZYGote defective: embryonic lethal</td>
</tr>
</tbody>
</table>
Resources

- http://home.sandiego.edu/~cloer/loerlab/nomenclature.html
- http://www.wormbase.org/#012-34-5
- http://www.wormatlas.org/
S. cerevisiae
1/30/18 – Class 6
Life Cycle
Yeast Nomenclature

• Mutant Gene Name:
  • three letters (the gene symbol)
  • integer
  • Dominant alleles - uppercase letters
  • recessive alleles - all lowercase letters.
  • italicized
  • e.g. ADE12 vs. ade5
Yeast Nomenclature

• Full Gene Name uses ORFs to define:

- Yeast unknown sequence
- A, B-P for chromosome I, II through XVI
- Left or right arm
- 25th ORF from centromere
- Watson (5’ → 3’) or Crick strand
Alleles

• Ordinary Alleles:
  • Gene symbol, Hyphen, Number
  • *act1*-606

• Disruption by Integration of a functional gene
  • *ade6::URA4*

• Deletion (#1)
  • *ade6-Δ1*

• Replacement by a gene
  • *ade6Δ::URA4*
Protein

• Use the gene symbol
  • without italics
  • initial letter is capitalized
  • followed by a p

• Example:
  • Ade5p
  • Cdc28p
Genotypes

• List mating type loci first (MATα vs. MATa)

• Haploid
  • List one copy of each gene
  • MATα act1-1 URA3 ADE2

• Diploid
  • Separate the 2 copies by a slash
  • MATα/MATα act1-1/ACT1 ura3Δ/URA3 ADE2/ADE2
Phenotypes

- Non-italic
- 3-letter
- Corresponds to gene symbol
- Upper case first letter
- Example:
  - Ade for Adenine biosynthesis
  - WT: Ade⁺
  - Mutant: Ade⁻
Resources

• https://www.yeastgenome.org/
  • The Saccharomyces Genome Database

• http://genome-www.stanford.edu/

• http://www.candidagenome.org/Nomenclature.shtml

• Images from:
  • Nature.com, utm.utoronto.ca, uowy.edu