

CENTER HALL 101: MON + WED, 6-7:20 PM

HOW ARE SCIENTISTS, DOCTORS, AND CONSUMERS USING BIG DATA TO UNDERSTAND HUMAN HEALTH AND THE ENVIRONMENT? WHY ARE "OMICS" TECHNOLOGIES KEY FOR UNDERSTANDING BIOLOGY IN THE 21ST CENTURY, AND HOW DO THEY WORK? WHAT SKILLS AND STRATEGIES WILL BE NEEDED TO MAKE SENSE OF THE MILLIONS OF GENOMES BEING SEQUENCED? DURING THIS COURSE WE'LL COVER ANSWERS TO THESE QUESTIONS AND MORE.

INSTRUCTOR: DR. KATHERINE PETRIE

OFFICE HOURS: [kpetrie@ucsd.edu](mailto:kpetrie@ucsd.edu)  
M: 3-4 (in person) H: 3-4 (remote)  
see canvas for office hours sign-up link



IAS: David Ferranti Anika Florin

Leeann Palisoc Stephen Huang Jennifer Reeves

Navyaa Sinha Brandon Tsai Jon Tan

SEE CANVAS FOR...

IA contact info

IA discussion section assignments

IA office hours

WHAT WILL YOU  
BE DOING IN  
THIS CLASS?

**LECTURES:** WE'LL HAVE IN-PERSON MEETINGS ON MONDAY + WEDNESDAY. THESE WILL BE RECORDED, AND ATTENDANCE IS NOT REQUIRED.

**DISCUSSION SECTION:** MEETING OVER ZOOM, NOT RECORDED. IAS WILL GO OVER QUIZ RESULTS, AND MOST SECTIONS WILL INCLUDE A WORKSHEET ACTIVITY YOU WILL NEED TO TURN IN (SOMETIMES THERE WILL ALSO BE A READING YOU MUST DO AHEAD OF TIME). YOU ARE STRONGLY ENCOURAGED TO ATTEND THE SECTION YOU ARE OFFICIALLY ENROLLED IN (BUT EMAIL DR. PETRIE IF YOU HAVE SCHEDULING CONCERNS). IF YOU ARE UNABLE TO ATTEND, YOU ARE RESPONSIBLE FOR COMPLETING THE WORKSHEET ON YOUR OWN.

**WEEKLY ASSIGNMENTS:** THERE WILL BE WEEKLY TAKE-HOME QUIZZES, WEEKLY DISCUSSION FORUM PARTICIPATION, AND THE SECTION ACTIVITY WORKSHEET.

## COURSE STRUCTURE:

## MATERIALS NEEDED TO SUCCEED:

WHAT DO YOU NEED  
FOR THIS CLASS?

**INTERNET ACCESS:** ALL COURSE DOCUMENTS WILL BE POSTED ON CANVAS, SO YOU'LL NEED THE INTERNET TO GET THEM. IF YOU DO NOT HAVE ACCESS TO A COMPUTER, PLEASE CHECKOUT THE RESOURCES AT [HTTPS://VCSA.UCSD.EDU/NEWS/COVID-19/](https://vcsa.ucsd.edu/news/covid-19/).

**ZOOM ACCESS AND A MIC:** WE WILL HOST DISCUSSION SECTION MEETINGS OVER ZOOM. YOU ARE NOT REQUIRED TO SHARE VIDEO, BUT A MIC WILL ALLOW US TO TALK TO YOU, SO PLEASE MAKE SURE YOU HAVE A MIC (IF YOU DON'T, SEE THE NOTE ABOUT RESOURCES ABOVE).

**PACKBACK ACCESS CODE:** WE'LL BE USING THIS AI-MODERATED DISCUSSION FORUM TO DIVE DEEPER INTO THE TOPICS WE COVER IN CLASS. BY ENROLLING IN THIS CLASS, YOU ARE SET UP TO PURCHASE PACKBACK (~\$25), VIA INCLUSIVE ACCESS AT THE BOOKSTORE. IF YOU DROP THE COURSE, BE SURE TO OPT-OUT OF PACKBACK TO AVOID BEING CHARGED. SEE CANVAS FOR MORE INFO.

**A MASK!** IF YOU ATTEND IN-PERSON, YOU MUST WEAR A MASK FOR THE DURATION.

## ASSESSMENTS AND BASIS FOR FINAL GRADE:

ASSESSMENT	% OF GRADE
WEEKLY PACKBACK	10 %
WEEKLY QUIZZES	40 %
SECTION ACTIVITIES (WORKSHEETS)	10 %
MIDTERM EXAM	15 %
FINAL EXAM	25 %

NO BELL CURVE: YOU WON'T BE COMPETING AGAINST EACH OTHER!

### GRADING SCALE

97-100	A+	(4.0)
93-97	A	(4.0)
90-93	A-	(3.7)
87-90	B+	(3.3)
83-87	B	(3.0)
80-83	B-	(2.7)
77-80	C+	(2.3)
73-77	C	(2.0)
70-73	C-	(1.7)
60-70	D	(1.0)
<60	F	(0)

FOR ASSIGNMENT DETAILS, STAY TUNED TO CANVAS!

## KEY ASSESSMENTS IN BRIEF:

### WEEKLY PACKBACK (10% OF GRADE) - DUE FRIDAYS AT 6:00 PM

THIS AI-MODERATED DISCUSSION FORUM WILL HELP YOU MAKE CONNECTIONS BETWEEN WHAT WE LEARN IN CLASS AND THE REAL WORLD. EVERY WEEK, YOU ARE REQUIRED TO: MAKE 2 POSTS, AT LEAST 1 OF WHICH MUST BE A RESPONSE. TO EARN CREDIT, YOUR POSTS MUST MEET CERTAIN GUIDELINES. PACKBACK WILL ASSIGN A CURIOSITY SCORE TO EACH POST BASED ON ITS DEPTH, CREDIBILITY, AND PRESENTATION. CONSISTENTLY HIGH CURIOSITY SCORES ARE AN OPPORTUNITY TO EARN EXTRA CREDIT. YOUR LOWEST PACKBACK WILL BE DROPPED.

### WEEKLY QUIZZES (40% OF GRADE) - DUE FRIDAYS AT 5:00 PM

THESE QUIZZES ARE DESIGNED TO TEST YOUR ABILITY TO APPLY WHAT YOU'VE LEARNED IN THE PREVIOUS WEEK. THEY WILL BE OPEN NOTE, HOWEVER, ONCE YOU START THE QUIZ YOU WILL ONLY HAVE 1 HOUR TO COMPLETE IT, SO YOU WILL NOT HAVE ENOUGH TIME TO LOOK UP EVERYTHING. YOU ARE ENCOURAGED TO PREPARE A 'CHEAT SHEET' (SMALL 1 PAGE SUMMARY OF IMPORTANT INFORMATION) BEFORE STARTING EACH QUIZ. YOU ARE NOT ALLOWED TO WORK WITH OTHERS OR ASK FOR HELP DURING THE QUIZ. TO DISCOURAGE COLLABORATION, QUESTIONS WILL BE PULLED FROM A BANK AND THEY WILL BE RANDOMIZED IN ORDER. YOUR LOWEST QUIZ WILL BE DROPPED.

### SECTION ACTIVITIES (10% OF GRADE) - DUE WEDNESDAYS AT 6:00 PM

DURING MOST DISCUSSION SECTIONS, THERE WILL BE AN ACTIVITY THAT YOU WILL WORK ON IN SMALL GROUPS. YOU WILL COMPLETE A WORKSHEET FOR EACH ACTIVITY, WHICH IS DUE ON WEDNESDAY BEFORE THE NEXT CLASS (THOUGH YOU SHOULD HAVE TIME TO FINISH IT IN SECTION). YOU CAN DO THIS ON YOUR OWN, BUT IT WILL BE EASIER IF YOU JOIN SECTION AND WORK WITH YOUR PEERS + THE IA.

### EXAMS (40% OF GRADE)

EXAMS WILL BE OPEN NOTE AND ONLINE, BUT THEY WILL BE SYNCHRONOUS (MIDTERM WILL OCCUR DURING REGULARLY SCHEDULED CLASS TIME, FINAL WILL OCCUR DURING OUR SCHEDULED FINAL EXAM TIME). BE SURE TO PREPARE AHEAD OF TIME - YOU WON'T HAVE ENOUGH TIME TO LOOK EVERYTHING UP!

**LOGISTICS AND FAQs:****PARTICIPATION:**

BECAUSE OF COVID, WE DO NOT WANT YOU TO FEEL PRESSURED TO ATTEND IN-PERSON IN ORDER TO EARN A GOOD GRADE. THERE ARE NO ASPECTS OF YOUR GRADE THAT DEPEND ON YOUR IN-PERSON PRESENCE. PLEASE PRIORITIZE THE HEALTH OF YOURSELF AND OTHERS: IF YOU HAVE ANY SYMPTOMS, TESTED POSITIVE, HAVE BEEN EXPOSED, OR HAVE BEEN ADVISED TO QUARANTINE, PLEASE STAY HOME! WHEN IN DOUBT - DON'T COME OUT!

THERE ARE A FEW THINGS THAT REQUIRE SYNCHRONOUS PARTICIPATION. SECTIONS WILL BE HELD ON ZOOM; THERE ARE SECTION ACTIVITIES OR DISCUSSION WORKSHEETS THAT WILL BE EASIER IF YOU JOIN AND ARE WORKING TOGETHER WITH OTHER STUDENTS DURING SECTION. EXAMS WILL BE ONLINE + OPEN NOTE (TAKEN REMOTELY), BUT THEY WILL ONLY BE AVAILABLE DURING FIXED TIMES. (CLASS OR THE SCHEDULED FINAL TIME).

**WHAT IF I DON'T TURN SOMETHING IN ON TIME?**

GENERALLY, NO LATE WORK WILL BE ACCEPTED. HOWEVER, YOUR LOWEST QUIZ, AND YOUR LOWEST PACKBACK WEEK ARE DROPPED

THESE DROPS ARE DESIGNED TO TAKE CARE OF UNEXPECTED SITUATIONS/TECH ISSUES, BUT PLEASE REACH OUT TO ME IF YOU HAVE ANY EXTENUATING OR SPECIAL CIRCUMSTANCES

IF HEALTH OR FAMILY EMERGENCIES RESULT IN YOU MISSING A SUBSTANTIAL AMOUNT OF COURSEWORK, YOU MAY BE ELIGIBLE FOR AN "INCOMPLETE". PER UCSD POLICY, YOU MUST BE IN GOOD STANDING BEFORE WORK IS MISSED TO BE ELIGIBLE.

**WHAT IF I HAVE QUESTIONS ABOUT GRADES?**

FOR QUESTIONS ABOUT WHY POINTS WERE TAKEN OFF, PLEASE CONTACT YOUR OFFICIAL IA.

IF YOU THINK A GRADE MAY HAVE BEEN ASSIGNED IN ERROR OR IF YOU HAVE ANY CONCERNS, PLEASE CONTACT DR. PETRIE WITHIN 7 DAYS OF GETTING YOUR SCORE BACK.

**INCLUSIVITY:**

EVERYONE WILL COME TO THIS COURSE WITH DIFFERENT BACKGROUNDS, KNOWLEDGE, AND PERSPECTIVES. WE WANT TO CREATE A CLASSROOM CULTURE THAT RESPECTS AND REVELS IN THIS HUMAN DIVERSITY. IF YOU HAVE ANY CONCERNS RELATED TO INCLUSIVITY OR FEEL YOUR IDENTITIES (RACE, GENDER, SEXUALITY, RELIGION, ABILITY, ETC) ARE NOT BEING HONORED, PLEASE LET US KNOW! ACCOMMODATIONS CAN BE MADE FOR STUDENTS WITH A LETTER FROM THE OSD. FOR MORE INFORMATION ON CAMPUS + COMMUNITY RESOURCES, CHECK CANVAS.

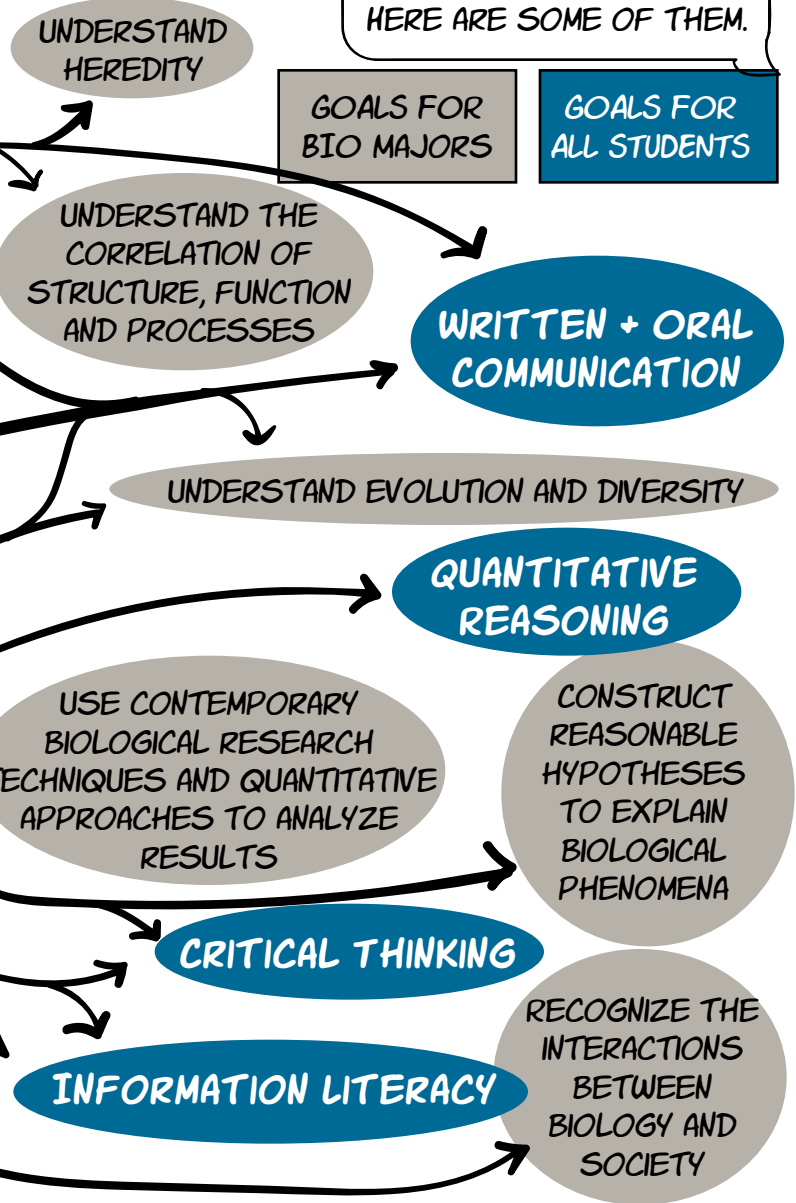
**ACADEMIC INTEGRITY:**

AN INCLUSIVE ENVIRONMENT IS ONE WHERE EVERYONE HAS AN EQUAL OPPORTUNITY TO SUCCEED. ACADEMIC DISHONESTY (INCLUDING, BUT NOT LIMITED TO: CHEATING + PLAGIARIZING) FRACTURES THE PLAYING FIELD BY GIVING SOME STUDENTS AN UNFAIR ADVANTAGE. ASSIGNMENTS WILL BE MONITORED VIA TURN-IT-IN, AND STUDENTS SUSPECTED OF ACADEMIC DISHONESTY WILL BE REPORTED THE ACADEMIC INTEGRITY OFFICE AND MAY RECEIVE A FAILING GRADE

## WHAT THIS COURSE WILL ENABLE YOU TO DO:

DID YOU KNOW UCSD HAS CORE SKILLS FOR ALL STUDENTS TO MASTER? HERE ARE SOME OF THEM.

- LEARNING OUTCOMES AKA LO'S**  
BY THE END OF THE COURSE YOU'LL BE ABLE TO:
1. EXPLAIN HOW PHENOTYPE = GENOTYPE + ENVIRONMENT + EXPRESSION
  2. COMPARE AND CONTRAST EXTANT GENOMES AND CONNECT TO PHENOTYPIC DIFFERENCES
  3. SUMMARIZE WAYS GENOMES CHANGE AT THE MOLECULAR LEVEL AND DISCUSS HOW EVOLUTION TAKES ADVANTAGE OF THOSE CHANGES
  4. RECOGNIZE DIFFERENT LEVELS OF GENOME DIVERSITY: FROM WITHIN INDIVIDUALS TO WITHIN COMMUNITIES
  5. RELATE SCALE OF GENOMES AND GENOMIC DATA TO FAMILIAR SCALES
  6. SUMMARIZE OMICS TECHNOLOGIES: HOW THEY WORK AND WHAT QUESTIONS CAN THEY ANSWER
  7. INTERPRET OMICS DATA TO DRAW CONCLUSIONS
  8. EVALUATE MAINSTREAM MEDIA REPORTS OF OMICS DATA
  9. RECOGNIZE UNKNOWNNS IN GENOMICS
  10. VALUE THE POWER OF GENOMICS RESEARCH TO ANSWER BROADLY RELEVANT QUESTIONS



**WHERE TO GET HELP IF YOU HAVE QUESTIONS?**  
PLEASE BE SURE TO WATCH EACH LECTURE, EITHER IN-PERSON OR OVER POIDCAST. IF YOU WATCH THE REOCRDRING, OR IF YOU DIDN'T GET A CHANCE TO HAVE YOUR QUESTIONS ANSWERED IN CLASS, YOU CAN ASK YOUR IA DURING THEIR OFFICE HOURS, OR YOU CAN EMAIL YOUR IA (IF YOU STILL HAVE QUESTIONS OR CONCERNS AFTER EMAILING YOUR IA, YOU CAN EMAIL THE INSTRUTOR).

**LETTERS OF RECOMMENDATION**  
DUE TO THE EXTREMELY HIGH VOLUME OF REQUESTS I RECEVE, I AM ONLY ABLE TO WRITE LETTERS FOR STUDENTS WHO HAVE EARNED A'S IN TWO CLASSES WITH ME, WHO HAVE TAKEN A LAB CLASS WITH ME, OR WHO I HAVE WORKED WITH OUTSIDE OF ENROLLMENT AS A STUDENT IN THIS CLASS.

**WEEK 1. HOW DO WE SEQUENCE GENOMES?****NO SECTION WEEK 1!****M - 9/27 INTRODUCTION TO GENOMES AND COURSE****W - 9/29 OLD-SCHOOL GENOME SEQUENCING****F - 10/1 QUIZ + PACKBACK DUE**

INTRODUCTION

+

KEY GENOMIC  
METHODS**WEEK 2. HOW DO WE SEQUENCE GENOMES (PART 2)?**

SECTION: PAPER DISCUSSION 1

**M - 10/4 NEXT-GEN GENOME SEQUENCING 1 (ILLUMINA)****W - 10/6 NEXT-GEN GENOME SEQUENCING 2 (ASSEMBLY)****F - 10/8 QUIZ + PACKBACK DUE****WEEK 3. EXTANT GENOME DIVERSITY (SPECIES)**

SECTION: ANNOTATION ACTIVITY

**M - 10/11 MEASURING DIFFERENCES + BUILDING TREES****W - 10/13 COMPARATIVE GENOMICS****F - 10/15- QUIZ + PACKBACK DUE**GENOME  
DIVERSITY  
IN SPACEGENOME DIVERSITY  
AMONG THINGS THAT  
ARE ALIVE IN THE  
BIOSPHERE TODAY.**WEEK 4. EXTANT GENOME DIVERSITY (POPULATIONS)**

SECTION: PAPER DISCUSSION 2

**M - 10/18 DIVERSITY WITHIN A POPULATION, RESEQUENCING****W - 10/20 EFFECT OF DIFFERENCES IN A POPULATION 1****F - 10/22 QUIZ + PACKBACK DUE****WEEK 5. EXTANT GENOME DIVERSITY (POPULATIONS)**

SECTION: GWAS ACTIVITY

**M - 10/25 EFFECT OF DIFFERENCES IN A POPULATION 2****W - 10/27 POPULATION DIVERSITY AND CONSERVATION****F - 10/29 QUIZ + PACKBACK DUE**QUIZZES ARE DUE FRIDAYS AT 5PM, AND PACKBACKS  
ARE DUE FRIDAYS AT 6 PM. BUT QUIZZES OPEN AT 5PM  
ON THURSDAY, AND YOU CAN DO PACKBACK ANYTIME  
DURING THE WEEK! START EARLY!

**WEEK 6. EXTANT GENOME DIVERSITY (COMMUNITIES)**

SECTION: REVIEW

M - 11/1 METAGENOMES IN THE ENVIRONMENT AND HEALTH

W - 11/3 MIDTERM EXAM 6-7:20 PM

F - 11/5 PACKBACK DUE (NO QUIZ THIS WEEK)



**WEEK 7. GENOME DYNAMICS OVER SHORT + MEDIUM TIME SCALES**

SECTION: PAPER DISCUSSION 3

M - 11/8 PLASTIC RESPONSES AND RNA-SEQ 1

W - 11/10 PLASTIC RESPONSES AND RNA-SEQ 2

F - 11/12 QUIZ + PACKBACK DUE

GENOME  
DIVERSITY  
IN TIME

SHORT-TERM DYNAMICS:  
CHANGES IN THE  
"EXPRESSED"  
GENOME

**WEEK 8. GENOME DYNAMICS OVER MEDIUM + LONG TIME SCALES**

SECTION: HEAT MAP ACTIVITY

M - 11/15 DEVELOPMENT AND REGULATORY CASCADES

W - 11/17 STEM-CELLS, DIFFERENTIATION

F - 11/19 QUIZ + PACKBACK DUE

**WEEK 9. GENOME DYNAMICS OVER LONG TIME SCALES**

SECTION: PAPER DISCUSSION 4

M - 11/22 MECH. OF GENOME EVOLUTION - DE NOVO GENES

W - 11/24 EVO-DEVO + ALLELE-SPECIFIC EXPRESSION

F - 11/26 NO QUIZ! NO PACKBACK! (UCSD HOLIDAY)

LONG-TERM DYNAMICS:  
CHANGES IN THE  
GENOTYPE ITSELF

**WEEK 10. GENOME DYNAMICS WITHIN A SINGLE LIFETIME**

SECTION: REVIEW

M - 11/29 KEY MOMENTS IN GENOME HISTORY

W - 12/1 EVOLUTION OF CANCER

F - 12/3 PACKBACK DUE (NO QUIZ THIS WEEK)



FINAL + MIDTERM WILL BE ONLINE + OPEN  
NOTE (TAKEN REMOTELY) BUT THEY WILL  
ONLY BE AVAILABLE DURING THE SCHEDULED  
TIME (MUST TAKE SYNCHRONOUSLY)

**FINAL EXAM:  
MONDAY  
12/6 7-10 PM**