

GALBRAITH HALL 242: TUE + THUR, 9:30-10:50 AM

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

H: 1-2:30 (in person or via zoom)

see canvas for office hours sign-up link



IAS: Anne Berry Ugbad Farah Wendy Yan

Nkechinyere Iroanusi Yushi Li Leonardo Gonzalez

Cassandra Lopez Nicole Mendoza Daniel Reyes

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 IN PERSON, NOT RECORDED. IAS WILL GO OVER QUIZ RESULTS, AND IAS WILL HELP GUIDE YOU THROUGH A WEEKLY WORKSHEET OR READING DISCUSSION; ATTENDANCE IS OPTIONAL (THOUGH YOU'LL BE RESPONSIBLE FOR COMPLETING THE WORKSHEET ON YOUR OWN IF YOU CAN'T ATTEND). YOU CAN ATTEND A DIFFERENT SECTION IF YOU HAVE, BUT ALL EMAILS + GRADE QUESTIONS MUST BE DIRECTED TO THE IA YOU ARE OFFICIALLY ENROLLED WITH.

ASSIGNMENTS: THERE WILL BE DAILY CLICKER QUESTIONS, 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/).

AN ICLICKER: THERE IS NO REQUIRED TEXTBOOK FOR THIS COURSE, BUT YOU ARE REQUIRED TO BRING AN ICLICKER TO LECTURE AND REGISTER IT ON CANVAS.

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 (~\$28.50), 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 OF CLASS.

ASSESSMENTS AND BASIS FOR FINAL GRADE:

ASSESSMENT	% OF GRADE
WEEKLY PACKBACK	10 %
WEEKLY QUIZZES	35 %
SECTION ACTIVITIES (WORKSHEETS)	5 %
DAILY CLICKERS	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 SCORE BASED ON ITS DEPTH, CREDIBILITY, AND PRESENTATION. HIGH SCORES ARE AN OPPORTUNITY TO EARN EXTRA CREDIT. YOUR LOWEST PACKBACK WILL BE DROPPED.

WEEKLY QUIZZES (35% OF GRADE) - DUE FRIDAYS AT 5:00 PM

THESE QUIZZES TEST YOUR ABILITY TO APPLY WHAT YOU'VE LEARNED EACH WEEK. THEY WILL BE OPEN NOTE, BUT ONCE YOU START YOU WILL ONLY HAVE 30 MINUTES TO FINISH, SO YOU WILL NOT HAVE ENOUGH TIME TO LOOK UP EVERYTHING. 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 (5% OF GRADE) - DUE FRIDAYS AT 6:00 PM

DURING MOST DISCUSSION SECTIONS, THERE WILL BE A WORKSHEET BASED ON AN ACTIVITY OR READING. YOU CAN DO THIS ON YOUR OWN, BUT YOUR PEERS + THE IA WILL HELP YOU IN SECTION.

CLICKERS (10% OF GRADE) - EACH LECTURE

THERE WILL BE MANY CLICKER QUESTIONS DURING CLASS. EACH DAY IS WORTH 2 POINTS, WHICH MEANS YOU NEED TO GET 2 CLICKER QUESTIONS CORRECT EACH DAY FOR FULL CREDIT. YOUR LOWEST 2 CLICKERS WILL BE DROPPED.

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. (SEE CANVAS FOR A MAKEUP CLICKER ASSIGNMENT IF YOU CAN'T MAKE IT).

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. 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 AND LOWEST 2 CLICKERS 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:

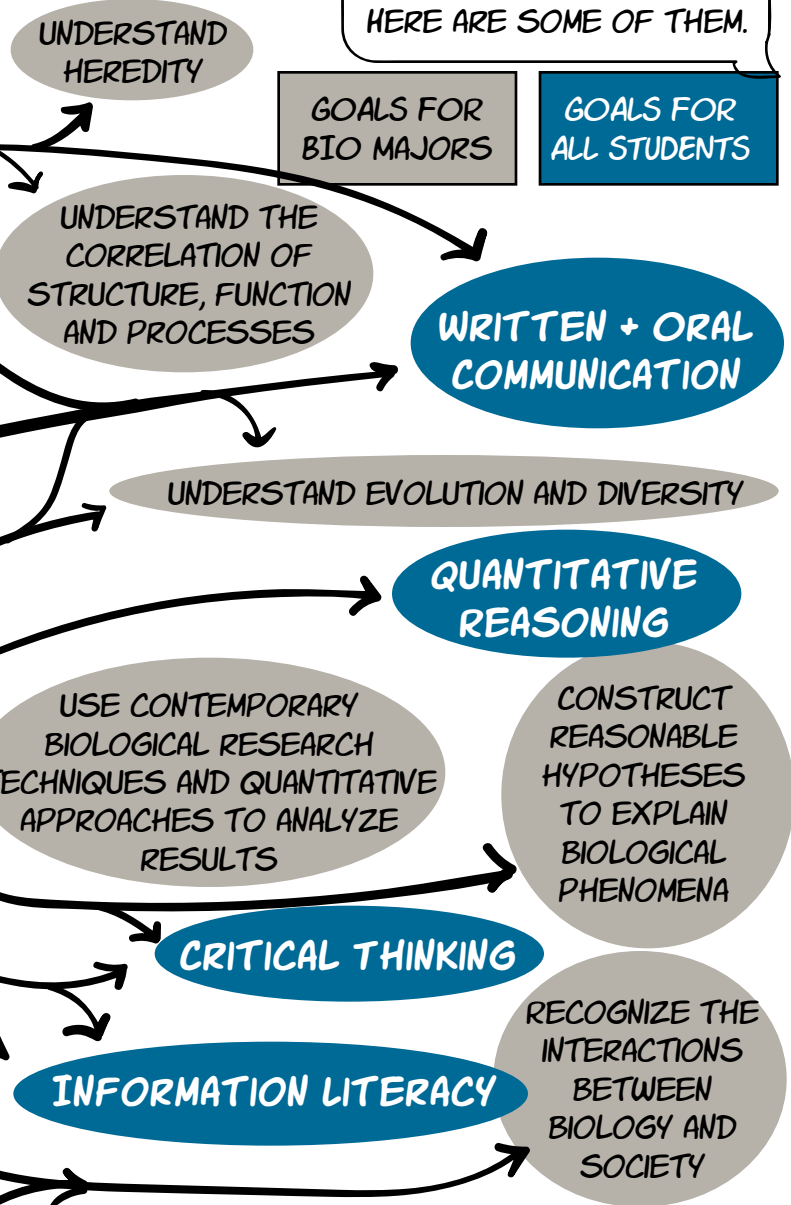
AN INCLUSIVE ENVIRONMENT IS ONE WHERE EVERYONE HAS AN EQUAL OPPORTUNITY TO SUCCEED. ACADEMIC DISHONESTY (INCLUDING, BUT NOT LIMITED TO: CHEATING + PLAGIARIZING) FRACTURES THE PLAYING FIELD BY GIVING SOME STUDENTS AN UNFAIR ADVANTAGE. ASSIGNMENTS WILL BE MONITORED VIA TURN-IT-IN, AND STUDENTS SUSPECTED OF ACADEMIC DISHONESTY WILL BE REPORTED TO 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
11. RECOGNIZE THE LEGACY OF SCIENTIFIC RACISM AND IT'S RELATIONSHIP TO MODERN GENOMICS



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 REOCRDING, 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 INSTRUCTOR).

LETTERS OF RECOMMENDATION

DUE TO THE EXTREMELY HIGH VOLUME OF REQUESTS I RECEIVE, 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!****T - 3/29 INTRODUCTION TO GENOMES AND COURSE****H - 3/31 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****T - 4/5 NEXT-GEN GENOME SEQUENCING 1 (ILLUMINA)****H - 4/7 NEXT-GEN GENOME SEQUENCING 2 (ASSEMBLY)****F - 4/8 QUIZ, PACKBACK, SECTION WORKSHEET DUE****WEEK 3. EXTANT GENOME DIVERSITY (SPECIES)****SECTION: ANNOTATION ACTIVITY****T - 4/12 MEASURING DIFFERENCES + BUILDING TREES****H - 4/14 COMPARATIVE GENOMICS****F - 4/15- QUIZ, PACKBACK, SECTION WORKSHEET 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****T - 4/19 HUMAN DIVERSITY: RACE, RACISM + GENOMICS****H - 4/21 GWAS + SCIENTIFIC BIAS****F - 4/22 QUIZ, PACKBACK, SECTION WORKSHEET DUE****WEEK 5. EXTANT GENOME DIVERSITY (POPULATIONS)****SECTION: GWAS ACTIVITY****T - 4/26 ANCESTRY V. RACE: HISTORIC LEGACY + FUTURE
DIRECTIONS****H - 4/28 POPULATION DIVERSITY AND CONSERVATION****F - 4/29 QUIZ, PACKBACK, SECTION WORKSHEET 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

T - 5/3 METAGENOMES IN THE ENVIRONMENT AND HEALTH

H - 5/5 MIDTERM EXAM 9:30-11 AM

F - 5/6 PACKBACK DUE (NO QUIZ OR WORKSHEET)



WEEK 7. GENOME DYNAMICS OVER SHORT + MEDIUM TIME SCALES

SECTION: PAPER DISCUSSION 3

T - 5/10 PLASTIC RESPONSES AND RNA-SEQ 1

H - 5/12 PLASTIC RESPONSES AND RNA-SEQ 2

F - 5/13 QUIZ, PACKBACK, SECTION WORKSHEET DUE

GENOME
DIVERSITY
IN TIME

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

WEEK 8. GENOME DYNAMICS OVER MEDIUM + LONG TIME SCALES

SECTION: PAPER DISCUSSION 4

T - 5/17 DEVELOPMENT AND REGULATORY CASCADES

H - 5/19 STEM-CELLS, DIFFERENTIATION

F - 5/20 QUIZ, PACKBACK, SECTION WORKSHEET DUE

WEEK 9. GENOME DYNAMICS OVER LONG TIME SCALES

SECTION: PAPER DISCUSSION 5

T - 5/24 MECH. OF GENOME EVOLUTION - DE NOVO GENES

H - 5/26 EVO-DEVO + ALLELE-SPECIFIC EXPRESSION

F - 5/27 QUIZ, PACKBACK, SECTION WORKSHEET DUE

LONG-TERM DYNAMICS:
CHANGES IN THE
GENOTYPE ITSELF

WEEK 10. GENOME DYNAMICS WITHIN A SINGLE LIFETIME

SECTION: NO SECTION THIS WEEK (UCSD HOLIDAY)

T - 5/31 KEY MOMENTS IN GENOME HISTORY

H - 6/2 EVOLUTION OF CANCER

F - 6/3 PACKBACK DUE (NO QUIZ OR WORKSHEET)



**FINAL EXAM:
TUESDAY
6/7 8-11 AM**

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