BGGN 241 & BIMM 172 – Genome Science (4 units)
Winter 2023
Tuesday and Thursday, 8:00-9:20am
Mandeville Center B-150

Discussion sections:
A01   Peter Berube   Monday 8:00-8:50am   Center Hall 217A
A02   Peter Berube   Monday 9:00-9:50am   Center Hall 217A

Instructor: Prof. Steven Briggs (sbriggs@ucsd.edu)
Office location and hours: Natural Sciences Building 6115; Thursday 1:50-3:00pm, or by appointment if this is not convenient for you

Instructional Assistant: Peter Berube (pberube@ucsd.edu)

COURSE DESCRIPTION
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BGGN241/BIMM172 is designed to convey current knowledge regarding the acquisition and use of genome-wide information to understand biology. No subject is more central to the life sciences than genome biology. By reading the literature, participating in classroom discussions, and writing answers to quiz questions each student will learn how the genome is characterized and exploited using a combination of technologies from biology, chemistry, and computer science. The utility of genomics as an organizing principle for biology and to aid in practical advances will be explored.

Most of you are seniors or graduate students and you are or will be working in the biotechnology industry or graduate school within the next several months. Your abilities to verbally present scientific results in group meetings and to report your work in writing will be crucial to your success. Similarly, it will be necessary for you to analyze research publications that are relevant to your work. This course is designed to help you strengthen these skills.

Prior to class, students will study the article for the week. They will prepare notes so that, when called upon, they can present every element of the article to the class. The elements are: (1) WHY was the work done (what problem are they trying to solve; what question are they trying to answer?); (2) HOW was the work done (what was their research strategy, e.g., mapping natural genetic variation or inducing unnatural alleles; measuring traits, transcripts, proteins, or metabolites; how were their experiments ordered to produce an outcome?) and; (3) WHAT did they find (what were their conclusions and supporting evidence?).

Students will be divided into groups of 5-6 for each week, using the Zoom breakout room tool. When class proceeds to an element of the article, the groups will be given 10 minutes to prepare their presentation of the element. Group members decide how to divide responsibility for their presentation; everyone should have an equal role to play. They will briefly present within their group and give feedback so presenters can refine their presentation notes. Then the group chosen to present that element will be announced by the instructor. For example, for a figure from the Results, that group will explain the figure (how were the raw data collected; how were the data statistically analyzed; how were the data visualized) emphasizing what conclusions were drawn from the figure and whether the

conclusions were based on correlations or proof. The rest of the class can ask questions or offer insights during the presentations.

Article titles
The article titles below follow the week number in which they will be discussed. There are short Commentaries or Perspectives associated with many of the articles and these provide helpful information for understanding the articles. All these documents are in Canvas>Files>Articles.

1 Live-seq enables temporal transcriptomic recording of single cells Chen Nature 22
2 Genome organization controls transcriptional dynamics during development Batutu Science 22
3 Loss of epigenetic information as a cause of mammalian aging Yang Cell 23
4 Functional regulatory variants implicate distinct transcriptional networks in dementia Cooper Science 22
5 The metastatic spread of breast cancer accelerates during sleep Diamantopoulou Nature 22
6 CCNE1 amplification is synthetic lethal with PKMYT1 kinase inhibition Gallo Nature 22
7 A non-canonical tricarboxylic acid cycle underlies cellular identity Arnold Nature 22
8 An exercise-inducible metabolite that suppresses feeding and obesity Li Nature 22
9 Bacterial sensing via neuronal Nod2 regulates appetite and body temperature Gabanyi Science 22
10 Effect of the intratumoral microbiota on spatial and cellular heterogeneity in cancer Nino Nature 22

Learning objectives
–<u>Skills</u>: ability to read a contemporary research article in genome science and understand the strategy and conclusions; and determine whether the conclusions are based on correlative evidence that infers causality or direct evidence that proves causality
–<u>Knowledge</u>: be familiar with contemporary models of 2D and 3D genome structure, omic profiling and multi-modal analysis, forward and reverse genome-wide genetic studies with natural variation and CRISPR, synthetic lethals in cancer therapy, protein interaction maps and imaging, molecular interactions between the microbiome and hosts

COURSE REQUIREMENTS
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Integrity

I will give and I expect in return an honest, fair, responsible, respectful, trustworthy, and courageous effort on all academic work and collaboration.

Please read UC San Diego's Policy on Integrity of Scholarship. Then, take the integrity pledge!

Grades
Following class on Thursdays, a quiz on Canvas will be open for 24 hours. Each of the ten quizzes is worth 9 points.
There will be a final exam, worth 10 points.

Make-up

A make-up report is acceptable to replace one quiz for any reason, worth 9 points. The make-up report will be due on Friday, 9:30am, one week after the quiz that it replaces. The report should be in Word or PDF format and comprise at least 2000 words. The topic will be a recent article on genomics, assigned by the instructor in response to a request from the student. *The student must request the makeup the same Friday that the quiz was due, or sooner, to provide time for the assignment and to get the report written*. The report should cover the same elements that we cover in class discussions as described above, encompassing the Why, How, and What of the article.

Extra credit
–Students will earn 0.5 points extra credit for each class they attend

Grading Scale

A = 90-100   B = 80-89   C = 70-79   D = 60-69   F = 59-below