BGGN 241 BIMM 172 - Genome Science - Briggs [WI24]

BGGN 241 & BIMM 172 – Genome Science (4 units)

Winter 2024

Tuesday and Thursday, 8:00-9:20am

Mandeville Center B-150

Discussion section:

A01 May Wu Thursday 1:00-1:50pm Zoom (https://canvas.ucsd.edu/courses/51864/external_tools/4101)

Instructor: Prof. Steven Briggs (sbriggs@ucsd.edu (mailto:sbriggs@ucsd.edu))

Office location and hours: Natural Sciences Building 6115; Wednesday 3:00-3:50pm, or by appointment if this is not convenient for you

Instructional Assistant: May Wu (yuw130@ucsd.edu (mailto:yuw130@ucsd.edu))

COURSE DESCRIPTION

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 and you will be working in the biotechnology industry or graduate school within the next several months. Your ability 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 essential aspects of the article to the class. For example: (1) WHY was the work done (what problem were they trying to solve; what question were they trying to answer?); (2) HOW was the work done (what was their research strategy; 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 small groups. When discussion proceeds to a figure or table from the article, the groups will be given 3 minutes to confer. Then someone will be chosen randomly to 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 inferences or proof. The rest of the class can ask questions or offer insights during the discussion.

The article titles below follow the week number in which they will be discussed. There are short companion articles (e.g., Commentaries or Perspectives) associated with many of the articles and these provide helpful information for understanding the articles. Quizzes may address information in the companion articles. All the articles are in Canvas>Files>Articles. Every article was published within the 12 months preceding the first day of class.

Evolution

1 Genomic evidence for West Antarctic Ice Sheet collapse during the Last Interglacial Lau Science 23

2 Regulatory dissection of the severe COVID-19 risk locus introgressed by Neanderthals Jagoda eLife 23

Development

3 OBOX regulates mouse zygotic genome activation and early development Ji Nature 23

- 4 MSL2 ensures biallelic gene expression in mammals Sun Nature 23
- 5 Single-cell DNA methylome and 3D multi-omic atlas of the adult mouse brain Liu Nature 23

Aging

6 cGAS-STING drives ageing-related inflammation and neurodegeneration Gulen Nature 23

Disease

7 Oncogenic CDK13 mutations impede nuclear RNA surveillance Insco Science 23

8 Ablation of CaMKIId oxidation by CRISPR-Cas9 base editing as a therapy for cardiac disease Lebek Science 23

Microbiome

9 *Microbiota-derived 3-IAA influences chemotherapy efficacy in pancreatic cancer* Tintelnot Nature 23 10 *Dietary tryptophan metabolite released by intratumoral Lactobacillus reuteri facilitates immune checkpoint inhibitor treatment* Bender Cell 23

LEARNING OBJECTIVES

-Skills: ability to read a contemporary research article in genome science and understand the strategy and conclusions; determine whether the conclusions are based on correlative evidence that infers causality or direct evidence that proves causality; ability to explain to an audience how a figure was produced and what it means; ability to answer in writing questions that probe the methods and conclusions of an article.

-Knowledge: familiarity with methods and topics of contemporary genome science such as 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

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

Grades are based on assessments of two types of performance: ability to understand and verbally explain elements of an article; ability to understand and explain key aspects of an article in writing such as which result provided the conclusive evidence establishing causality. These two types of performance will be evaluated based on in-class participation and on quizzes.

Participation will be managed by pulling names randomly out of an ice bucket. When your name is called you have an opportunity to earn points. Class participation will be graded according to the completeness and accuracy of your explanations. Each class period a student can earn up to 2 points for participation. Declining to participate or providing a completely wrong explanation is worth zero points. Names will remain out of the ice bucket until every name has been pulled.

A quiz on Canvas will be open for 24 hours following class on Thursdays. Each of the ten quizzes is worth 5 points.

There will be a final, comprehensive exam, worth 10 points. When doing a quiz or the exam, you can access any resources that you think will be useful.

A make-up report is acceptable to replace one quiz for any reason, worth 5 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.

A = 91-100 B = 81-90 C = 71-80 D = 61-79 F = 60-below

Course Summary:

Date	Details	Due
Thu Jan 11, 2024	BGGN 241 BIMM 172 - Genome Science - Briggs [WI24] - Discussion (https://canvas.ucsd.edu/calendar? event_id=991345&include_contexts=course_51864)	1pm to 1:50pm
Fri Jan 12, 2024	Quiz 1 (<u>https://canvas.ucsd.edu/courses/51864/assignments/752082)</u>	due by 5pm
Thu Jan 18, 2024	BGGN 241 BIMM 172 - Genome <u>Science - Briggs [WI24] -</u> <u>Discussion</u> (https://canvas.ucsd.edu/calendar? event_id=991346&include_contexts=course_51864)	1pm to 1:50pm
Sat Jan 20, 2024	Quiz 2 (https://canvas.ucsd.edu/courses/51864/assignments/754681)	due by 5pm
Thu Jan 25, 2024	BGGN 241 BIMM 172 - Genome <u>Science - Briggs [WI24] -</u> <u>Discussion</u> (https://canvas.ucsd.edu/calendar? event_id=991347&include_contexts=course_51864)	1pm to 1:50pm
Thu Feb 1, 2024	BGGN 241 BIMM 172 - Genome Science - Briggs [WI24] - Discussion (https://canvas.ucsd.edu/calendar? event_id=991348&include_contexts=course_51864)	1pm to 1:50pm
Thu Feb 8, 2024	■ BGGN 241 BIMM 172 - Genome Science - Briggs [WI24] -	1pm to 1:50pm

Date	Details	Due
	Discussion	
	(https://canvas.ucsd.edu/calendar?	
	event_id=991349&include_contexts=course_51864)	
	☐ BGGN 241 BIMM 172 - Genome	
	Science - Briggs [WI24] -	
Thu Feb 15, 2024	Discussion	1pm to 1:50pm
	<pre>(https://canvas.ucsd.edu/calendar?</pre>	
	event_id=991350&include_contexts=course_51864)	
	📾 BGGN 241 BIMM 172 - Genome	
	<u>Science - Briggs [WI24] -</u>	
Thu Feb 22, 2024	Discussion	1pm to 1:50pm
	(https://canvas.ucsd.edu/calendar?	
	event_id=991351&include_contexts=course_51864)	
Thu Feb 29, 2024	📾 BGGN 241 BIMM 172 - Genome	
	<u>Science - Briggs [WI24] -</u>	
	Discussion	1pm to 1:50pm
	(https://canvas.ucsd.edu/calendar?	
	event_id=991352&include_contexts=course_51864)	
	BGGN 241 BIMM 172 - Genome	
	<u> Science - Briggs [WI24] -</u>	
Thu Mar 7, 2024	<u>Discussion</u>	1pm to 1:50pm
	(https://canvas.ucsd.edu/calendar?	
	event_id=991353&include_contexts=course_51864)	
	BGGN 241 BIMM 172 - Genome	
	<u> Science - Briggs [WI24] -</u>	
Thu Mar 14, 2024	<u>Discussion</u>	1pm to 1:50pm
	(https://canvas.ucsd.edu/calendar?	
	event_id=991354&include_contexts=course_51864)	
Fri Mar 15, 2024	<u>W1-Thu-participation</u>	due by 11:50pm
	(https://canvas.ucsd.edu/courses/51864/assignments/753193)	due by 11.59pm
	₽ <u>W1-Tue-participation</u>	
	(https://canvas.ucsd.edu/courses/51864/assignments/753192)	aue by 11:59pm
	₽ W2-Thu-participation	
	(https://canvas.ucsd.edu/courses/51864/assignments/753195)	aue by 11:59pm
	<u>W2-Tue-participation</u>	due by 11:59pm

(https://canvas.ucsd.edu/courses/51864/assignments/753194)

<u>₩3-Tue-participation</u>

due by 11:59pm (https://canvas.ucsd.edu/courses/51864/assignments/755744)