

BGGN 241 & BIMM 172 – Genome Science
Winter 2022
Tuesday and Thursday, 12:30-1:50 pm
Peterson Hall 102

Discussion sections:

A01	DI	Joey Truong	Monday	3:00pm	3:50pm	Center Hall 220
A02	DI	Joey Truong	Monday	4:00pm	4:50pm	Center Hall 220

Instructor: Prof. Steven Briggs (sbriggs@ucsd.edu)
Office location and hours: continue zoom from class; Thursday 1:50-3:00pm

Instructional Assistant: Joey Truong (jbtruong@ucsd.edu)

Campus Safety Requirements and Expectations

Keeping our campus healthy takes all of us. You are expected to follow the [campus safety requirements](#) and pursue personal protection practices to protect yourself and the others around you. These include:

- **Participate in the university's daily screening process.**
Everyone must complete a [Daily Symptom Survey](#) to access a university-controlled facility.
- **Participate in the university's testing program.**
All students are required to participate in the [COVID-19 Testing program](#) as required by their vaccination status:
 - Unvaccinated students with approved exceptions must complete a COVID-19 test twice a week.
 - Students who are fully vaccinated must complete a COVID-19 test once a week, for the first four weeks of the quarter.
- **Wear a well-fitted face covering that covers your nose and mouth at all times.**
Everyone is required to [wear face coverings indoors](#) regardless of vaccination status. If you see someone not wearing a face covering or wearing it incorrectly, then kindly ask them to mask up.
- **Monitor the daily potential exposure report.**
Every day the university will update the potential exposure report with building and some classroom information and the dates of exposure. Download the [CA COVID Notify app](#) to your phone to receive an alert if you have been potentially exposed to COVID-19.
- **Assist in the contact tracing process.**
If you're contacted by a case investigator, it means you have been identified as [close contact](#), please respond promptly. You must assist with identifying other individuals who might have some degree of risk due to close contact with individuals who have been diagnosed with COVID-19.

- **Contact the instructional team if you are impacted by COVID-19**

Please note that due to the ongoing COVID-19 Pandemic, changes may be made in response to new developments and information.

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 analyses 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 entering 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 organized to help you strengthen these skills.

The format of the course is two classroom workshops and one discussion session weekly. Participation is encouraged and graded for all workshops. Workshops are guided explorations of the biological meanings in the research articles. Each workshop will begin with a 10-15 minute slide presentation by student volunteers who will explain the reason that the research was done (WHY) and the key methods that were used (HOW). At the end, presenters will offer their conclusions and perspectives on the article. The remaining period of the workshop will engage all students in analysis of the figures from the papers (WHAT). WHY-HOW-WHAT is the standard format for scientific presentations and articles. Preceding the discussion of each figure, students will confer with each other for 5 minutes in breakout rooms to refine their understanding and to prepare for their presentation if they are called upon. Then students will be called upon randomly to present figures from the article under consideration. Each figure will be shown on the screen and the designated students will describe what was measured, how it was measured, how the figure should be interpreted, what conclusions were drawn by the authors, and how the results fit into the narrative of the article. Preparation before class is essential for success!

Please make a point of participating in every class. I know that this can be hard for shy people or if English is your second language. Participation is a requirement for this course and it will be required in your professional life. The pre-reading by Hernandez illustrates the cost of shyness. Fully participating in group efforts helps the group and it helps you.

Presenters must submit their slides as a PPT or PDF file before the beginning of class as an email to Prof. Briggs.

Written analyses of the articles are due 24 hours after the end of class (i.e., Friday, 2:00pm). Please upload your analyses in the "Assignments" section of Canvas.

Discussion sessions are used to address questions about the articles and it is a good time to cover the supplemental material published with most articles, and to discuss the companion reviews that accompany some of the articles. Each article title is preceded by the week number and companion reviews are preceded by the week number and a letter.

Additional course information can be found on our class website on Canvas, including PDFs of the articles in Files.

COURSE REQUIREMENTS

Participation

Written analyses of articles (not companion reviews), class participation, and a final exam are required.

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!

BGGN241/BIMM172 Genome Science WI22 Syllabus

Pre-reading by Hernandez

Week 1 (Jan 4, 6) – Topic: DNA seq

Articles:

1 Performance assessment of DNA sequencing platforms in the ABRF Next-Generation Sequencing Study Foox Nat Biotechnol 21

1a Closing in on a complete human genome Eisenstein Nature 21

Written analysis must be uploaded to Canvas Jan 7, 2:00pm

Week 2 (Jan 11, 13) – Topic: Human evolution

Articles:

2 Reintroduction of the archaic variant of NOVA1 in cortical organoids alters neurodevelopment Trujillo Science 21

2a Reintroduction of the archaic variant Commentary Science 21

2b Reintroduction of the archaic variant Response to Commentary

2c Reintroduction of the archaic variant Commentary Nature 21

Written analysis must be uploaded to Canvas Jan 14, 2:00pm

Week 3 (Jan 18, 20) – Topic: Single-cell omics 1

Articles:

3 Scalable, multimodal profiling of chromatin accessibility, gene expression and protein levels in single cells Mimitou Nat Biotechnol 21

Written analysis must be uploaded to Canvas Jan 21, 2:00pm

Week 4 (Jan 25, 27) – Topic: Single-cell omics 2

Articles:

4 Profiling the genetic determinants of chromatin accessibility with scalable single-cell CRISPR screens Nat Biotechnol 21

Written analysis must be uploaded to Canvas Jan 28, 2:00pm

Week 5 (Feb 1, 3) – Topic: Spatial omics

Articles:

5 Embryo-scale, single-cell spatial transcriptomics Srivatsan Science 21

Written analysis must be uploaded to Canvas Feb 4, 2:00pm

Week 6 (Feb 8, 10) – Topic: Epigenomics and cancer

Articles:

6 A gene–environment-induced epigenetic program initiates tumorigenesis Alonso-Curbelo Nature 21

Written analysis must be uploaded to Canvas Feb 11, 2:00pm

Week 7 (Feb 15, 17) – Topic: Interactomes and cancer 1

Articles:

7 Environmental robustness of the global yeast genetic interaction network Costanzo Science 21

Written analysis must be uploaded to Canvas Feb 18, 2:00pm

Week 8 (Feb 22, 24) – Topic: Interactomes and cancer 2

Articles:

8 Targeting the nucleotide salvage factor DNPH1 sensitizes BRCA-deficient cells to PARP inhibitors Fugger Science 21

8a Targeting the nucleotide salvage factor Commentary

Written analysis must be uploaded to Canvas Feb 25, 2:00pm

Week 9 (Mar 1, 3) – Topic: Microbiomes and cancer 1

Articles:

9 Enterococcus peptidoglycan remodeling promotes checkpoint inhibitor cancer immunotherapy Griffin Science 21

9a How microbiota improve immunotherapy Ansaldo Science 21

9b The microbiome and human cancer Review Sepich-Poore Science 21

Written analysis must be uploaded to Canvas Mar 4, 2:00pm

Week 10 (Mar 8, 10) – Topic: Microbiomes and cancer 2

Articles:

10 Fecal microbiota transplant overcomes resistance to anti-PD-1 therapy in melanoma patients Davar Science 21

10a Modulating gut microbiota to treat cancer Perspective Woelk Science 21

Written analysis must be uploaded to Canvas Mar 11, 2:00pm

Finals (Mar 12-19)

Grades

Written analyses (10) = 45 points (4.5 points per analysis). 0 = poor understanding; 1 = good understanding; 2 = excellent understanding. Written analyses should be 300-500 words. Students can help each other to understand the articles. All text must be original with no copying from each other or from other sources. Written analyses should include a statement of purpose (WHY were the investigators doing the research?); a brief description of the experimental approach (HOW was the research done; describe each goal and strategy); and a summary of their findings (WHAT did they learn? Describe the key data and the conclusions). Each result should be identified as either correlative or causal. If it's causal, then did the investigators find something that was necessary, or sufficient, or both?

Class participation = 45 points. Two shared presentations plus opportunities every class period to present figures and contribute comments and questions.

Shared presentations = 10 points. Sign up on the Google sheet for the two Presentations you wish to make. On Tuesdays, Presenters will take 10-15 minutes for an Introduction to describe the WHY and HOW of the paper (goals and strategies) using slides from other articles or from Supplementary figures of the article. Then they will display the figures from the paper in order. It will often be best to display only one or a few panels from each figure at one time. After the discussion of WHAT for each figure (data and conclusions), the presenters will offer their comments, to complete or clarify matters. On Thursday, discussion of figures will continue. After the discussions are over, Presenters will provide a Summary of the findings of the article and offer their

comments on its strengths and weaknesses; they should use a few slides for this and may include Supplementary figures from the article. Emphasize correlation vs causality; necessary or sufficient?

Figure presentations/comments = 35 points. Prior to the discussion of each figure, students will confer in small groups (breakout rooms) for 5 minutes to finalize their preparation. Then the instructor will choose a student randomly to describe and interpret the next figure. We will only discuss the figures in the main body of the article. However, it is a good idea to look at Supplementary figures for clarifying descriptions and other helpful information; you can find that information on the journal website. All students should add to the discussion with questions and comments. Credit of up to 1.75 points per class will be given for accurate presentations/explanations of the figures. This part of the class is where many students fall behind in their grade because they are shy or have not prepared ahead of time. Don't be that student! Credit of up to 1.75 points doesn't sound like much yet it adds up. Get your 1.75 points every class!

Final exam = 10 points

There are no make-ups. Early submission of written analyses will be accepted.

Grading Scale

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