

# GCB 534-401 2020C Experimental Genome Sci: Experimental Genome Science

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Welcome to GCB534, Experimental Genome Science! The course meets every Monday/Wednesday 10:15-11:45AM in BRB room 251, with the first class meeting **WEDNESDAY SEPTEMBER 8.**

You should join the course Slack group ([gcb534\\_2021.slack.com](https://gcb534_2021.slack.com)) prior to the first class - we will use this as a place to ask/answer questions about the course, papers etc. You can use this link to join:

[https://join.slack.com/t/gcb5342021/shared\\_invite/zt-v8vjfrnl-i4JAlakpXYBhHICYtFzogg](https://join.slack.com/t/gcb5342021/shared_invite/zt-v8vjfrnl-i4JAlakpXYBhHICYtFzogg)

The course is organized into two segments both topically and in the focus of in-class activities. The first section of the course focuses on genomics methodology, and in class activities and discussion are based on reviewing and presenting the primary literature. The second section of the course is focused on applications of genomics, with a strong focus on the genomics of human genetics. In this section, we will also focus on developing new questions and approaches from a foundation of existing work, and you will ultimately prepare a short grant proposal using the NIH application format. At the end of the class we will break the class into two "study sections" where you will review each other's proposals.

In most weeks we will have a lecture on Monday and use Wednesday to discuss papers and assignments. We expect that you will have read each paper carefully before the Wednesday classes so we can discuss in detail, and to facilitate this you will be asked to submit questions through the course Slack in advance of each paper discussion session. These discussions will take different forms, depending on the paper and the professional skills being developed.

There will also be 2 exams and a final project. In addition, you will do two short (~8 minute) presentations to the class based on papers you select yourself. Your final grade will be a combination of your classroom participation (1/4) and your exams (1/4), your grades on presentations and assignments (1/4) and the final project (1/4).

We teach this class because we enjoy thinking about the latest advances across the field of Genomics and we hope to share this enthusiasm with you during the course. Welcome!

Sincerely,

Casey Brown and John Murray

A tentative schedule is available at this link:

<https://docs.google.com/spreadsheets/d/1Th1iTEhkAGd4TmIK8w1Eymf1BHbdxiOoVHNNCaWoJV4/edit?usp=sharing>

### **Key assignments and dates:**

**9/17 : Paper selection due *no later than this date*. Papers must be approved by the faculty.** You will likely work with the material in this paper throughout the semester as you develop their independent proposal, so choose a paper that is in an area that is significant and of interest to you. You will select a paper that uses experimental genomics techniques; note that a purely computational paper is not appropriate. You will prepare both a 1 page written review of the paper as well as a short (~5 minutes with 2 minutes for questions) “journal club” presentation with slides, focusing on providing background and highlighting ONE major result from the paper.

### **10/4 and 10/6: Journal Club presentations**

PowerPoint or .pdf presentations due the day before you will present (announced the week before) via canvas.

### **10/8 (Friday): 1 page written review due**

**10/13: Come to class with an outline of “Next steps” ideas to workshop during class. This outline is not turned in but for your benefit in preparing for the in-class discussion.**

### **10/18: Exam 1 (based on material through 10/11)**

**11/1 and 11/3: Specific Aims presentations (presentations powerpoint or .pdf due the day before via canvas)**

*You will come up with 2-3 independent but related questions raised by EITHER the paper you selected for the first presentations OR, less ideally, a new paper. This project must be distinct from your own planned thesis or rotation project(s).*

### **11/12: Aims Page due**

You will further refine your ideas from the Next Steps presentation feedback to present a formal Specific Aims page in the NIH format.

### **11/22: Exam 2 (based on all lectures since the first exam)**

## 12/1: Final Proposal due

You will write a proposal in an abbreviated NIH format (1 page Specific Aims PLUS 1 page Significance and Innovation PLUS 2 pages Approach = 4 pages total not including references).

## 12/7: Reviews and scores due

## 12/8 + Final Exam period: STUDY SECTION

The class will be split into two "Study Sections" and each half of the class will read the proposals from the other half, scoring them on Significance, Innovation, Approach and Overall Impact using the NIH scoring system. In "Study Section", we will discuss the proposals and each member will score each proposal to generate a final ranking, as would happen for a real NIH proposal.

Week	Lecturer(s)	Notes	Homework	Lecture date	Lecture Topic	Paper Discussion	2021 paper	PMID or link
1	John Murray	NO CLASS 9/1 or 9/6		9/8 (Wed)	Sequencing methodology and genome sequencing	N/A	n/a	N/A
2	John Murray		Paper selections due 9/17 (Friday)	9/13 (Mon)	Transcriptomes and single cell methods	9/15 (Wed)	Mitnenzweig et al: "A single-embryo, single-cell time-resolved model for mouse gastrulation"	33932341
3	Hao Wu + Casey Brown			9/20 (Mon)	DNA methylation and chromatin	9/22 (Wed)	Reddington et al: Lineage-Resolved Enhancer and Promoter Usage during a Time Course of Embryogenesis"	33171098
4	Eric Joyce			9/27 (Mon)	Nuclear organization	9/29 (Wed)	Shah et al: "Dynamics and Spatial Genomics of the Nascent Transcriptome by Intron seqFISH"	29887381
5	n/a		Review presentations due (8AM morning of presentation). Written review due Friday 10/8	10/4 (Mon) and 10/6 (Wed)	PAPER REVIEW PRESENTATIONS	N/A	N/A	N/A
6	Ben Garcia (recorded)		Watch lecture and read paper (Monday 10/11). Bring ideas for research questions to class (Wednesday 10/13)	10/11 (Mon)	Proteomics	10/13 (Wed)	Jiang et al: "A Quantitative Proteome Map of the Human Body" (Monday)	32916130
7	Casey Brown	Exam Monday, (virtual) Human genomics 1 (genetics) lecture Wednesday	For Wednesday- watch optional "principles of genetics" recorded lecture: <a href="https://www.dropbox.com/s/2y3rcdianab5hdr/Genomic%20Inheritance.mp4?dl=0">https://www.dropbox.com/s/2y3rcdianab5hdr/Genomic%20Inheritance.mp4?dl=0</a>	10/18 (Mon)	EXAM 1	10/20 (Wed)	N/A	N/A
8	Ophir Shalem			10/25 (Mon)	CRISPR/Screening	N/A	Gasparini et al: "A Genome-wide Framework for Mapping Gene Regulation via Cellular Genetic Screens"	(Tentative) 30612741
9	n/a			11/1 (Mon)	AIMS PRESENTATIONS	11/3 (Wed)	N/A	N/A
10	Casey Brown + Shweta Ramdas		Specific Aims page due (Friday 11/12)	11/8 (Mon)	Human genomics 2 (large scale projects, eQTL)	11/10 (Wed)	The GTEx Consortium: "The GTEx Consortium atlas of genetic regulatory effects across human tissues"	32913098
11	Casey Brown			11/15 (Mon)	Human genomics 3 (mechanism)	11/17 (Wed)	Sort1 functional dissection + MPRA saturation mutagenesis	(Tentative) 20686566 and 31395865
12	n/a	NO CLASS 11/24		11/22 (Mon)	EXAM 2	N/A		
13	Sarah Tishkoff		Final proposal due (12/1). Note reading for Monday NOT Wednesday	11/29 (Mon)	Genomics, ethics and race	12/1 (Wed)	(Monday) DiscovEHR paper	(Tentative - Monday) 28008009
14	Elizabeth Grice		Reviews due (12/7)	12/6 (Mon)	Microbiome and metagenomics	12/8 (Wed)	N/A	N/A
15	n/a			12/16 9-11 (Finals period)	Study Section II (if needed)	N/A		