**April 4th:** What is sequencing? Discussion of how sequencers work, how sequencing libraries are generated, and what form data takes.

**Paper assignment**: Xue and Bloom correspondence, and reply, on bottleneck calculation in influenza A virus

**April 11th:** A grain of salt. Artifacts and considerations (broadly) in sequencing analysis. Mapping reads and choice of reference.

**Paper assignment**: Ballouz et al. Opinion piece on human reference sequence

**April 18:** Transposon screens. Discussions of pathway analyses and interpretations.

**Paper assignment**: Opijnen et al. Tn-seq paper

**April 25:** A technical introduction to CRISPR, CRISPRi, and CRISPRa.

**Paper assignment**: Sanson et al. Optimized dCas9 screening libraries.

**May 2:** RNAseq and single cell RNAseq. Sequencing considerations for both.

**Paper assignment:** Macosko et al. Drop-Seq paper.

**May 9:** Perturb-seq. Considerations of lentiviral vectors.

**Paper assignment**: Datlinger et al. Crop-Seq paper.

**May 16:** High throughput mutagenesis (deep-mutational scanning). Methods and analysis. Prime-Edit.

**Paper assignment**: Clausen et al. Parkinsons DMS paper.

**May 30:** Analysis of diversity within  microbial populations. Copy-number-variation analysis.

**Paper assignment:** Elde et al. Poxvirus accordion paper

**May 23:** Epistasis and other combinatorial analyses. Examples and challenges.

**Paper assignment:** None as final lecture is remote!

**June 6th: (remote, recorded)** Genetic tools as applied to human populations.

# BIMM 194/BGGN 283
# Course syllabus

Spring 2024- Live Lectures: Thursdays 9:00am-10:20am York 3010

As this will be a discussion-heavy class I am not supporting a hybrid format. That being said, if you are not feeling well you can miss a class, just give me a heads-up. One of our classes will also be remote (noted on schedule). If you need to miss more than one class please contact me and I will do my best to accommodate. If you need special accommodations, please see the section on OSD accommodations below. I am happy to work with folks, but also want to make sure I provide the best possible educational experience for those taking my class.

**Instructor**: Alistair Russell, Ph.D.          **Email**: a5russell@ucsd.edu
**Pronouns :** He/him/his
For all correspondence, please include BIMM 194/BGGN 283 and your full name

**Office**: Tata 4105

**Office Hours**: By appointment

**Course Description:** In the modern era, sequencing and computational analysis has allowed for the simultaneous measurement of thousands of perturbations to cellular, or microbial, systems. Classical genetic approaches, with one gene and one phenotype, can now be expanded dramatically to understand how entire genomes encode complex behaviors. This class will cover the foundations of sequencing, caveats in data analysis, and new techniques in high-throughput genetics as applied to cellular or microbial systems. Students should have a solid foundation in molecular biology and ideally genetics before taking this class. Students will read and discuss primary literature as a means of understanding the state-of-the-art applications of these methods.

**Course Website/Canvas:** All materials for this course will be found on Canvas (https://coursefinder.ucsd.edu), and should automatically appear on your Canvas account as soon as you register for the class.

**Prerequisites:** BIMM 100. Podcast is available (https://podcast.ucsd.edu)

**Preparation and expectations**: A working knowledge of molecular biology is absolutely required for this class.

**Textbook**: There is not a required textbook for the course.

**Final Grade:** Your final grade will be determined by attendance and active participation in class discussions. For attendance, you may miss one class, but please contact me concerning the absence so I may note it. Otherwise, for every unexcused absence after the first your grade drops a full letter.  In all classes where you are assigned a paper I will have a set of notecards with student's preferred names. I will ask question prompts you will be provided alongside each paper. I expect you to be able to provide a reasonable answer that shows an effort to engage with the literature. Your answer does not need to be "correct", but if called upon, and it is clear you have not made an honest effort to read the assigned literature, you will not receive participation credit for that class. If you grade is in jeopardy due to lack of participation I will reach out and contact you; with such a qualitative metric I want to make sure I am being transparent.  All students can miss one class with no excuses before it impacts their grade, but please reach out to me so I can record your absence. If I do not reach out to you you are meeting all expectations and can expect full marks in my class.

**Examinations:** No exams

**Scientific articles**: We will read a number of scientific papers over the course of our class. Each set of assigned papers (1-2) will be posted to blackboard immediately after class with an accompanying "questions for consideration", which will be questions that I will use to guide our discussion during class.

**Statement on Office for Students with Disabilities (OSD):** To receive accommodation, students must present or email their "Authorization for Accommodation" (AFA) form provided by the Office for Students with Disabilities (OSD) to the instructor. I am happy to work with you on any accommodations you require to succeed in this class.

**Statement on Academic Integrity:** Integrity of scholarship is essential for an academic community. The University expects that both faculty and students will honor this principle and in so doing protect the validity of University intellectual work. For students, this means that all academic work will be done by the individual to whom it is assigned, without unauthorized aid of any kind. The consequences of being caught cheating can be severe. Information can be found here: http://www.ucsd.edu/current-students/academics/academic-integrity/index.html Students are expected to do their own work, as outlined in the UCSD Policy on Integrity of Scholarship: http://senate.ucsd.edu/Operating-Procedures/Senate-Manual/Appendices/2 Academic misconduct will NOT be tolerated. Any student who engages in suspicious conduct will be confronted and subjected to the disciplinary process. Cheaters will receive a failing grade on the exam or assignment, and/or in the course. They may also be suspended from UCSD pursuant to University guidelines. All class material, such as syllabus, readings, homework, scientific articles, lecture slides, etc. are copyrighted and cannot be posted to websites and/or distributed without instructor's approval for any reason. Students that sell and/or distribute course materials not only violates the student code of conduct, but also violates UC's 2005

policy on the Use of Recordings of Course Presentations:
http://copyright.universityofcalifornia.edu/resources/ recorded-presentations.html .

**Academic misconduct includes but is not limited to:**
1. Cheating, such as using "crib notes", copying answers from another student during the exam, or forge assignments.
2. Plagiarism, such as using the writings or ideas of another person, either in whole or in part, without proper attribution to the author or the source. Copying anything from any source is plagiarism if the source is not clearly cited. Plagiarism is stealing someone else's ideas and presenting them as your own.
3. Collusion, such as engaging in unauthorized collaboration on exams or assignments, completing for another student any part or the whole of an exam or assignment, or procuring, providing or accepting materials that contain questions or answers to an exam or assignment to be given at a subsequent time.