In this course, we will finish studying oscillations and then examine the erratic but non-random behavior known as chaos. After that, we will develop the mathematical framework that will allow us to extend the methods we learned for determining the stability of equilibria in LS 30A to any number of variables. We will then use these methods to take a second look at how oscillations arise in dynamical systems. We will also see how the ideas we have developed are related to optimization.

About the Instructors:

- **Will Conley** is a mathematician who has been teaching LS 30 since 2013. He did his graduate work at UCLA. Although his research is in number theory, his true passion is teaching mathematics, and mathematical biology. Outside the classroom, he is also an animal lover, and enjoys the outdoors. He’s especially fond of rock climbing, hiking, and cycling. You can sometimes find him slacklining at Janss steps, though unfortunately not this quarter.

- **Artur Jaroszewicz** is a geneticist (or more precisely, a bioinformatician) who absolutely loves learning and teaching math. He did his undergraduate AND graduate work at UCLA, though his path hasn’t always been straight and narrow. Besides math, he loves motorcycles, music, board games, and rock climbing (only indoors so far!). Ask him about his math tattoo when you have 20-30 minutes to spare, and get his life story absolutely free!

- **Jane Shevtsov** is an ecologist who has been working on LS 30 since 2012, co-authoring the textbook and writing almost all the labs. She came to the US from Ukraine with her family at age 7 and is a Bruin herself, having attended UCLA for undergrad. She also enjoys science fiction, Brazilian jiu jitsu and indoor rock climbing (the latter two being on hold for now). Ask her about food webs, networks, or the time she failed the midterm in her first mathematical ecology class.

**Textbook:** *Modeling Life* by Alan Garfinkel, Jane Shevtsov and Yina Guo. This book will be made available to you on the course website.
How the Course will Work: Because of the COVID-19 pandemic, this course will take place entirely online. We have come up with the following course setup to help you learn while accommodating logistical and health issues. Given the very fluid nature of the current situation, we may make changes in the syllabus if the need arises.

Every week, you will get lecture videos along with some embedded or follow-up questions. These are meant to be your first exposure to the material. You will then have an opportunity to discuss questions and do problems with your instructor and classmates via Zoom. This will occur during the regularly scheduled lecture time (all times PDT); however, if life prevents you from participating in your enrolled section, you can take part in another one. There will also be weekly textbook-based homework assignments, which you will submit via Gradescope. As usual, we encourage you to seek help from instructors, TAs and classmates. To facilitate this, we will use Campuswire (https://campuswire.com/p/G31FDB5D5, class code 2636) for online discussion and chat, in addition to Zoom office hours held by instructors and TAs.

For labs, you will receive an assignment and one or two short intro videos. We will then hold real-time Zoom-based lab sections throughout the week. (You can have Zoom and CoCalc open side by side.) As before, we encourage you to attend your own section, but if you have difficulties doing so, we are happy to provide accommodations.

Grading: Grading will use a points-based system. There are two important things to know.

1. Grading is not competitive.
2. You don’t need to earn every available point to get a perfect score.

The point breakdown will be as follows:

<table>
<thead>
<tr>
<th></th>
<th>Scheme 1:</th>
<th>Scheme 2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities:</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>Homework:</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>Labs:</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>Midterms:</td>
<td>Two midterms, 15% each</td>
<td>Highest of the two, 20%</td>
</tr>
<tr>
<td>Final exam:</td>
<td>25%</td>
<td>35%</td>
</tr>
</tbody>
</table>

For several of the above grade categories, it will be possible to earn more points than will count for that category. For example, in the homework category, we are planning on 10 homework assignments, worth 2 percentage points each, for a total of 20 percentage
points. However, the whole category is only worth 15 percentage points. (This will be similar for the labs and the activities.) Any excess points that you earn for beyond these 15 percentage points will be halved and added to your final average.

So, for example, if you end up with 17 out of 15 in the homework category, you have exceeded the maximum for that category by 2 percentage points. We'll take 1 percentage point and add it to your final average. This way, you can miss points (or even miss entire homework/lab assignments), and make up for it with “bonus points” from other categories.

The “Activities” category will include points you can earn for participating in the weekly lecture and lab sessions (like clicker questions, but via Zoom). It will also include other opportunities to earn points throughout the quarter, such as challenge problems, completing interesting extra readings or videos, or other things.

Activities: The activities will be assigned each week to allow you to practice the skills you are learning from the videos and lectures. It will be graded on correctness, but you will have more than one chance to answer a question. This way, if you get it wrong, you can get immediate feedback as to which topics you need to review.

Homework: The purpose of homework is to give you an opportunity to practice course skills and think about concepts, thereby strengthening your understanding. It is a learning tool, not an evaluation tool. Therefore, homework will be graded on whether you appear to have made a serious effort. That said, it is to your definite advantage to work hard on the homework, as this will help you tremendously on exams. Late homework will be accepted but marked down 10% for each day it is late.

Labs: Labs will be held at your normally scheduled time through Zoom. If you are unable to attend your lab section, you may attend a different section, but please email both your TA and the TA of the section you would like to switch to.

Exams: Each exam will be held over a 24-hour period. Exam dates are subject to change due to COVID-19.

Collaboration and Cheating: You are encouraged to work with other students on homework and labs, but don't copy their work word for word. That's a waste of your time as you don't learn from copying. Also, please list your collaborators (not including
instructions). This is standard practice in science and you should start getting used to it now.

If you decide to cheat, the primary effect is that you will be a cheater. If caught, you will be reported to the Dean of Students for punishment. However, we'd much rather have you be too proud to cheat than too scared to cheat.

Disability Accommodations: If you need any accommodations for a documented disability, please email your instructor. For test-taking, note taking and other accommodations and resources, contact the Center for Accessible Education (formerly the Office for Students with Disabilities) in A255 Murphy Hall, phone number (310) 825-1501.