

# SIO87: Physics of Surfing

Scripps Institution of Oceanography,  
University of California, San Diego, CA

**Instructors:** Falk Feddersen and Matthias Morzfeld

**Class time:** Tuesdays 4pm-5pm.

**Location:** Munk lecture room (IGPP) or Pier/Center for Coastal Studies

## Outline of class meetings

- **Meeting 1: 2-April.** Introductions and “Waves across the Pacific” (**dry**).

*Meeting point:* Munk.

We will do a round of introductions, explain the class mechanics, explain how to get access to Matlab and then watch the movie “Waves across the Pacific” (1967).

- **Meeting 2: 9-April.** Measuring bathymetry along the pier – data collection I/II (**dry**).

*Meeting point:* Pier.

We walk along the pier and stop at regular intervals to measure the distance from the top of the pier to the bottom of the ocean. In that way, we can obtain a depth-profile along the pier. We expect that the sandy bottom shifts around with the seasons and for that reason we repeat this experiment at the end of the quarter to detect if the sandy bottom has shifted or not. If we find students (or instructors) who can handle a surfboard, we can take similar measurements using one of Falk’s special surfboards that can also measure bathymetry.

- **Meeting 3: 16-April.** Measuring bathymetry along the pier – data processing (**dry**).

*Meeting point:* Munk.

We will put the data we collected into Matlab and then plot it, also in Matlab. In this meeting, we will also explain how to use Matlab via UCSD on your computer, tablet or phone.

- **Meeting 4: 23-April.** Measuring wave period – data collection, processing and interpretation (**dry**).

*Meeting point:* Munk.

We measure the wave period from the class room, then we collect and digitize all the data and then we will analyze it and compare it to Surfline’s wave period forecast. We will also discuss some of the basic physics that we will observe in action during the rest of the experiments.

- **Meeting 5: 30-April.** Visit to the Marko Wolfinger Surfboard Shaping Studio with tour, demo, and lecture from instructor David Migdal:

Visit [this website](#) for more information.

- **Meeting 6: 7-May.** Measuring paddling speed and wave speed – data collections (**wet/dry**).

*Meeting point:* Pier.

Group 1: Paddling speed. We will use your phones (in water proof bags) to measure your paddling speed. We will use a variety of boards to see if we can detect differences in the paddling speed of the boards.

Group 2: Wave speed. Get into the white water and hop on a wave. With a GPS sensor, you will record your speed as the wave pushes you towards the beach.

Group 3: Wave speed dry. Measure wave speed by measuring the time it takes for a crest to propagate between two pier pilings and the known spacing between pier pilings.

- **Meeting 7: 14-May.** Measuring paddling speed and wave speed – data analysis and interpretation (**dry**). *Meeting point:* Munk.

Group 1: Paddling speed. We will use Matlab to figure out the paddling speed and determine the fastest board and paddler.

Group 2: Wave speed. We will see if the physics work and if we can see a square root decrease of your speed (which is equal to the wave speed) as you get closer to shore.

Group 3: Wave speed dry. Measure wave speed by measuring the time it takes for a crest to propagate between two pier pilings and the known spacing between pier pilings.

- **Meeting 8: 21-May.**

*Meeting point:* Munk. Preparing presentations (**dry**).

Build four groups of five students per group. Each group picks one experiment to document and to present the results. We use this class time to prepare the presentations.

- **Meeting 9: 28-May.** Measuring bathymetry along the pier – data collection I/II (**dry**).  
*Meeting point:* Pier.

Repeat of class 2.

- **Meeting 10: 4-June.** Presentations and pizza party. (**dry**)  
*Meeting point:* Munk.