Particle dynamics class, SMS 618, Emmanuel Boss
Wavetank lab.

Today you will observe sediment behavior under gravity waves as well as formation of ripples in a wave tank.

Matrial:
1m long wave tank with sandy sediment on bottom overlaid by water (depth h).
Motor attached to a paddle to force waves with different frequencies.
Tea leaves and potassium permanganate for motion observation.
Trays with sediment grains of various sizes.

Tasks:
Figure out the frequency (or period) of natural modes of the tank (fits an integer amount of wavelengths). Using the following information:
Surface elevation: $\eta=A\sin\{2\pi(x/\lambda+t/T+\text{const.})\}$, λ-wavelength.
For shallow water waves ($\lambda>20A$), Phase speed=group speed: $c=\lambda/T=(gh)^{1/2}$, T-period.
{a little more accurate would be: $c=\lambda/T=[g\lambda/2\pi\cdot\tanh(2\pi h/\lambda)]^{1/2}$)}.
Find the voltage that force that standing mode (note the paddle position modifies the actual dimension of the tank).

Using tea leaves and/or potassium permanganate observe the circulation in the tank.

Ripples are forming on the bottom. Where do they form first? What is their wavelength? What do you think is controlling the ripples wavelength? What is the maximal steepness of the ripples (beyond which they don't get any steeper)?

Once you had enough of looking at ripples and the particles motion, add grains of different sizes into the tank and observe how they do/don't modify the flow, bed forms etc'. Emerge a structure (e.g. pier) in the sediment. How does it modify the bed forms?