2016 Che3460 – Assignment #2: Journal Figure
Due on Feb. 20th at 1pm
Upload here: http://159.203.103.114/ (look for box labelled "Journal Figure")

For this assignment, you are asked to make a journal-style figure describing part of your chosen scientific grant proposal. Unlike the textbook figure, a journal figure must be composed of panels labeled (a) (b) (c) (d) etc., and space is much more tightly constrained. Also, a journal figure has very specific dimensions and printing resolution requirements. Typically, a journal will require a color figure to have a printing resolution of 600 dpi. For this assignment, you are required to create an image with a printing resolution of 300 dpi. In addition to including schematics/diagrams, you are also given data that needs to be visualized somehow, either by a simple plot or a more creative approach. Try to make everything as clear and easy to understand as possible. You will also need to provide a figure caption that addresses each part of the figure, which is limited to a maximum of 150 words.

Proposal #1:
CO_2 and N_2 adsorption experiments were done on 4 different MOFs, and you need to depict clearly each of their crystal structures (as well as their unit cell boundaries), as well as the CO_2 adsorption data for each MOF. You also need to depict the CO_2/N_2 selectivity for each MOF, as that is an important criteria to judge carbon capture materials. There is also computational screening data (CO_2 adsorption vs. volumetric surface area vs. void fraction) for over 100,000 hypothetical MOF structures, which you need to plot and show. Everything must be included in one double-column figure with dimensions 7" by 5.5". See course website for MOF structures and data.

Proposal #2:
Draw a series of 3 nm nanoparticles (NPs) with different Pd/Au compositions, going from 100% Au to 100% Pd in 20% increments. We also need to show a diagram of the TCE-to-ethane NP-catalyzed chemical reaction. We have experimental data of TCE conversion for different catalyst compositions that needs to be plotted. From tedious TEM counting, the synthesized NPs have been counted for the 80/20 Au/Pd and the 60/40% Au batch – plot the population count as a function of size and composition. Everything must be included in one double-column figure with dimensions 7" by 5.5". See course website for data.

Proposal #3:
Draw diagram of a DNA-mine, with different numbers of locks (from 1 to 8, the mines with 8 locks may need to be bigger, we don't know yet… this is *proposed* research!). We have preliminary experimental activation data for DNA mines with just one lock (which open in the presence of platelet-derived growth factor (PDGF), but not other biomolecules). We also have some limited experimental data for activation of a series of DNA mines with up to 4 locks, which respond to PDGF, Neuropeptide Y (NPY), leptin (1AX8), and insulin-like growth factor (ILGF). Include in the figure, somewhere, a depiction of each of these four proteins. Everything must be included in one double-column figure with dimensions 7" by 5.5". See course website for protein structures and activation data.

Proposal #4:
Include a diagram of the prototype device. Plot mass response data from the adsorption of CH_4 on a single sensor. Also plot the data from a simulated 100 sensor array responding to both (a) CH_4 at 1 bar, and (b) ambient air. For the sensor array, show how it responds when it switches from being in air to being exposed to pure CH_4 (and try to take the error into account). For the purpose of detecting CH_4, which sensors provide a signal that is above the noise? In the figure, identify those sensors whose signal is below the noise and in the caption explain that our screening process would filter them out, so that we can try different ones instead. Everything must be included in one double-column figure with dimensions 7" by 5.5". See course website for data.