**Lesson 9 Exercises**

1. Find the supplement for the Reich et al. (2012) study “Reconstructing Native American Population History” and read Supplementary Note 6. With one sentence per section (i – v), write the main point of each section.
2. Take Figure S6.1 from Reich et al. (2012), which we looked at in class. Read the text carefully and write in one paragraph how this figure shows different patterns of relatedness to Asians among Native Americans.
3. Using the ancient groups in Haak et al. (2015) and what you’ve learned from D and f3-statistics, construct ‘leftpop’ sets of three sets with the following conditions and justify why you think this is true.
   1. Gives you three different streams of ancestry in qpWave
   2. Gives you two different streams of ancestry in qpWave
   3. Gives you one stream of ancestry in qpWave
4. Using #2, actually calculate qpWave for (a), (b), and (c), and show that you find a minimum of three, two, or one stream of ancestry, respectively.
5. Read the documentation for qpDstat on the Reich Lab github page. What is the command to add to the PAR file to calculate f4 instead of D?
6. **BONUS, ADVANCED:** Calculate f4(Corded\_Ware\_LN, X; Out, Out), where Out are the outgroups we used in lecture (from p. 94, SI 9, Haak et al. 2015), and X are the other ancient groups published in the Haak paper. Plot (using Excel, R, or Python) each pair of X on a coordinate plane, much like in Figure S6.1, where one f4 is on the x-axis and the other is on the y-axis. Can you categorize how many streams of ancestry there are? What are the different trends observed in the figures – can you name the patterns and which sets are associated with which patterns?