Archaeologists often find it useful to estimate the amount of labor that it would have taken to build an ancient monument (such as a mound or a pyramid). The amount of labor required to build a monument can be used as a measure of the power of the person(s) who organized the construction; the ability to mobilize large numbers of people to work for extended periods of time suggests that whoever was in charge of the construction had a considerable amount of influence or power.

Because we live in a society in which large-scale construction is done with heavy equipment, we are not aware of the effort that is required to create large structures using only human labor. In this exercise, we want you to estimate the labor that would have been required to build a mound of earth the size of a building on the UNC campus. Hopefully, after estimating the labor involved in building a monument the size of a familiar building, you will have a better appreciation for the amount of labor that was required to build less-familiar ancient monuments.

The building you are to use is Lenoir Hall, which is right next to Davis Library. Your assignment is to estimate the amount of labor that would be required to build a mound of earth the size of Lenoir Hall. To do this, follow these steps:

1. Measure the horizontal dimensions of Lenoir Hall by counting your paces as you walk beside it. For the average person, a slightly exaggerated stride will be equal to about 1 yard. You might want to measure the average length of your pace with a measuring tape before you pace off the building.

2. Next, estimate the height of the building. One way to do this is to stand away from the building and to hold a pencil in front of you at arm’s length. Adjust the length of the pencil above your hand so that this length corresponds to the height of some reference point on (or next to) the building that you can easily measure with a tape or ruler (such as a doorway or a friend standing against the wall). Then move your arm upward, keeping it outstretched, counting how many “pencil lengths” it takes to get to the top of the building. Multiply the number of “pencil lengths” by the measured height of your reference point, and you’ll have your rough estimate of the building’s height.

3. Calculate the volume of the building. The formula for computing the volume \( V \) of a rectangular solid is \( V = L \times W \times H \), where \( L \) is the horizontal length, \( W \) is the horizontal width, and \( H \) is the height. If your measurements in the formula are expressed in yards, then this calculation will give you the volume of the building in cubic yards (yd\(^3\)).

4. The conical pyramid at the Olmec site of La Venta has been estimated to contain about 4,000,000 m\(^3\) of fill. Given that 1 m\(^3\) equals 1.3 yd\(^3\), this estimate translates to about 5,200,000 yd\(^3\). How many times larger or smaller is Lenoir Hall than the pyramid at La Venta?

5. Now that you have a volume estimate for the building, calculate the labor required to build a mound of earth of this size. Archaeologists measure labor in terms of person hours (PH), which is a unit equal to the labor of one person working for one hour. There are two steps involved in constructing an earth mound: procuring the earth (digging it out of the ground) and moving the earth to the place where you want to build. Here are the labor estimates for each step:
* It takes 1.5 PH to procure 1 yd³ of earth.
* It takes 0.65 PH to move 1 yd³ of earth 100 feet.

Assuming that the earth has to be moved 1000 feet (a little less than a fifth of a mile), use these constants to calculate the number of person hours required to build a mound of earth the size of Lenoir Hall.

6. Finally, calculate how many days or years it would take for 100 people working 8 hours a day to build such a mound.

Answers must be typed; be sure to show your calculations.

When you have completed your calculations, revisit Lenoir Hall and take a moment to appreciate its size. Make a mental note of the labor involved in building a mound of this size; we will use this mound as a scale to help you appreciate the immense size of some of the prehistoric monuments we discuss in class.

Due in class on Tuesday 3/1; late assignments will not be accepted (see syllabus for policy).

[This exercise is adapted from one developed by Keith Kintigh at Arizona State University]