**Introduction to Urban Science**

**Assignment 7: Cities in History and Early Human Societies**

**Either**

**Qualitative Exercise: Short Essay (or in bullet point form) <500 words.**

Consider the resources linked below. Describe **five critical innovations** or technologies (including social) associated with the advent of the first cities.  The rational is that these innovations appeared together with cities and were not present before. For example, some art forms were present before and after.

Try to make choices that cover different aspects of life, including infrastructure (construction, irrigation), bureaucracy (property records, law), economics (wages, transactions), politics, the humanities (narrative, human experience), or mathematics (e.g. time measurement). Each choice can describe more than one of these functions.

For each of your choices:

* Suggest objects supporting your claims. You can include references from the ISAC exhibit or photos/links from online resources. [~150 words].
* Describe the object in light of the type of function it performs. [~150 words]
* Describe how modern technologies perform analogous functions in contemporary cities. [~100 words]
* Pick one object-function: In what sense are modern technologies/institutions allowing the scope of our present societies to be larger?  For example, compare --via quantitative estimates-- the differences in cost, speed, and reach of electronic records to clay tablets, or the nature of wages in Uruk to Chicago today. [~100 words]

**Suggested Resources:**

**If you are at the University of Chicago:** Visit the Institute for the Study of Ancient Cultures (ISAC) exhibit on the [first cities of Mesopotamia](https://oi.uchicago.edu/museum-exhibits/mesopotamian-gallery) (on campus).  Use catalogue references for objects and any photos from the ISAC exhibit.

Or use references from another exhibit available to you, or online, such as:

Met Collections: <https://www.metmuseum.org/art/collection/search?department=3&showOnly=highlights>

British Museum: <https://www.britishmuseum.org/collection/galleries/mesopotamia>

Yale Peabody: <https://collections.peabody.yale.edu/bc/ybc-ams/>

Staatliche Museum (Berlin): https://recherche.smb.museum/?language=de&limit=15&sort=relevance&controls=none&collectionKey=VAM\*

[Britannica (history of technology- focus on "urban revolution").](https://www.britannica.com/technology/history-of-technology/The-Urban-Revolution-c-3000-500-bce)

[Wikipedia (Uruk Period).](https://en.wikipedia.org/wiki/Uruk_period#Society_and_culture)

[Mesopotamia-Inventions (Thecollector.com).](https://www.thecollector.com/mesopotamian-inventions/) This is an informal online list, but not a bad starting point.

**Or**

**Quantitative Exercise: What do Hunter-Gatherers do after dark?**

Recall our approach in class (IUS Section 7.3) to finding the scaling of area with population of amorphous settlements by equating results from social interactions, with area   to mobility costs,

In < 500 words:

1. Write the costs as the sum of two different terms, the first accounting for movement costs () and the second reflecting short distance "scalar stress", as , where  is an energy cost per unit time due to conflict, and  is the distance at which conflict becomes likely, e.g. a few yards or meters.
2. Write the equation for in terms of of the length, , as a polynomial in . What is the meaning of the parameter ? When does   go to zero in terms of the distance of interaction, or the negative energy cost of conflict?
3. Take the limit of large and small compared to  and explain what scaling relations for area,   you obtain in each of these two different regimes (what's the value of in each regime?). Briefly comment why. You can use this code (link Cubic\_roots.py) to include a numerical solution or write your own.
4. If the length scale for "repulsion",  , where  is the kinship distance, which decreases with group size, and  accounting for family size of about 4, how does the camp exponent change (in the regime of small )?
5. How may a society take , so that  always and densification becomes possible?

For answering this question (qualitatively!) you may want to consider reading the two recent papers (linked below, one from anthropology and another from archeology) that suggest how the bonds of kinship are extended to larger groups, including possibly the first cities (150 words).

Link Wiessner\_Embers\_of\_Society.pdf Ur 2014 CAJ Households and the Emergence of Cities.pdf