Illinois' glacial landscapes, deposits, and history; its societal relevance.

[7-week Class for Osher Lifelong Learning Institute (OLLI) at the University of Illinois; Sept. 3 – Oct. 22, 2020]

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Course Description:

This class will highlight Illinois' glacial history, including the landscapes and sediments left behind by cyclical glacial advances of the past million years. The causes of glaciations will be discussed along with how glacier-related deposits and ancient interglacial soils are recognized. Geographic variations of landscapes and sediments can be explained though understanding of geologic processes and history. What can ice age fossil records (large mammals to snails to microscopic pollen) reveal about paleoclimates and paleoenvironments ? The role of Illinois' glacial history in current societal issues (Mahomet aquifer, wind farms, agriculture, climate change) and ecosystems (plant-soil relations) will also be emphasized.

Course Outline:

1.) **Overview of Illinois' glacial history (Sept. 3rd)**
   a. Overview of class
   b. Glacial maps of Northern Hemisphere, North America, northern USA for context
   c. Quaternary map of Illinois
   d. Champaign County high resolution LiDAR map
   e. Chronology of glaciations --- time scales
      i. Wisconsin Episode glaciation
      ii. Illinois Episode glaciation
      iii. pre-Illinois Episode glaciation
      iv. interglaciations
   f. Bedrock surface topography and drift thickness maps of Illinois
   g. Discussion: how did bedrock surface, preglacial ridges, and Great Lakes basins affect glacial advances ?

2.) **Causes of glaciations; early recognition (Sept. 10th)**
   a. orbital variations --- precession; obliquity; eccentricity
   b. first recognition of glacial deposits in Alps
   c. marine oxygen isotope records

d. Midwest records

e. current ideas on glacial cycles

f. Discussion: why did we have glaciations in Illinois ? will there be future ice ages ?

3.) Glacial and interglacial deposits in Illinois (Sept. 24th) **THERE IS NO CLASS ON SEPT. 17TH**

a. till

b. loess

c. outwash

d. dune sand

e. lake sediment

f. nonglacial alluvium

g. paleosols --- paleodrainage, paleoclimate, age, etc.

h. stratigraphy – naming geologic units and 3D framework

i. Discussion: geographic and subsurface distribution of glacial deposits in Illinois

4.) Modern glaciers [analogs] (Oct. 1st)

a. Alpine

b. Greenland

c. Antarctica

d. supraglacial and englacial processes

e. subglacial processes

f. contrast of modern and Pleistocene glaciers

g. ice directional indicators

i. striations and till fabric

ii. stoss-lee features...roche moutonees

h. ice streams ---

i. global warming and glaciers

j. Discussion: how can we use modern glacier processes to help understand Pleistocene records ?

5.) Glacial landforms in Illinois (Oct. 8th)

a. moraines ---- regional pattern and locally in C-U

b. lake plains ---- proglacial, slackwater

c. terraces

d. floodplains

e. kames and eskers

f. drumlins

g. Lake Michigan's ancestral shorelines

h. unglaciated landscapes

i. Discussion: maps of Illinois --- geographic distributions of landforms statewide

6.) Ice-age fossil records / paleoclimate (Illinois); age dating (Oct. 15th)

a. large mammals --- mammoths, mastodons, sloths
b. invertebrate fossils ---- gastropods, bivalves, ostracodes
c. plant macrofossils --- wood, leaves
d. microfossils --- pollen
e. radiocarbon (^{14}C) dating
f. optically stimulated luminescence (OSL) dating
g. amino acid dating
h. comparing climate records
i. Discussion: which glaciation was the most severe or coldest in Illinois ? do we have enough data ?

7.) Societal Issues related to glacial sediments (resources / hazards) (Oct. 22nd)

a. Brief review of class
b. groundwater / aquifers
    i. resources --- geologic control on aquifer materials
    ii. potential contamination
c. sand and gravel resources
d. wind farms (moraines)
e. earthquake hazards – effect of substrate
f. soil erosion
g. agriculture --- land use
h. future climate change
i. Champaign County issues
j. Final Discussion and open time for questions on topics of global, regional or local interest
k. Discussion: how do legacy effects of glaciation still affect the Midwest today ?