Today: Hunting Dinosaurs

Two methods for finding dinosaur fossils
- Prospecting - walking around looking at the ground
- Quarrying - opening a big pit and breaking open rocks

1. Both methods involve finding a place to look:
   Criteria include:
   - Geologic strata of the right age-- (use geologic principles like those you learned about: original horizontality, lateral continuity, superposition as well as the dating methods - radioactive decay etc.)
   - Usually little ground cover (trees, plants) or some commercial enterprise has cleared area
   - Nobody else has looked there!

2. Tools for finding a place to look:
   Geologic Maps and Satellite images/aerial photographs
   Geologic maps show mapped distribution of strata of different ages
   Satellite images/Aerial photographs
   - Can recognize strata by color/spectral signature in areas that have not been mapped
   - Very important in most areas dinosaur hunters want to look - which are places that are no one has looked before

3. Finding a place to look: geologic strata of the right age
   - Mesozoic rocks (strata) if we are looking for non-avian dinosaurs
   - Most non-avian dinosaurs are known from Cretaceous age strata so we would go there for the highest probability of finding a non-avian dinosaur
   - We would go to the Triassic for the biggest challenge - most new insights into early dinosaur evolution but a lower probability of finding a dinosaur - maybe lower abundance.
   - We have great Triassic in Texas.

3.5 Other factors effecting where we look for a dinosaur
   - The kind of environment where the dinosaur lived and died - in a desert or tropical forest
   - The environment in that region now. Climate - how fast dinosaur bones are coming to the surface (via rain or wind)
   - Whether or not the area is now heavily forested - how many rocks exposed to look at
   - These factors are largely unpredictable… so practically speaking they aren’t considered much…

4. Other tools for finding a place to look:
   - Previous papers by other geologists/paleontologists
• Locals - reports of bones, eggs etc.
• Researching the most isolated areas to visit

5. Finding a place to look: Usually little ground cover (trees, plants)
• why dinosaur hunters usually work in deserts: can see more of the surface- where the bones are exposed by rain and wind
• for quarrying methods sometimes use explosives to blow off soil and other rock covering fossil bearing strata
• for quarrying methods also go to places commercial enterprises have opened large quarries- phosphorus, brick quarries.

6. A Dinosaur Expedition involves
• International agreements/or local U.S. permits
• Staging: trucks, supplies, team
• In the field…

7. We’ll look at two examples:
• in Mongolia, prospecting
• In China, quarrying
First example: Why Mongolia?
Roy Chapman Andrews at Flaming cliffs

8. Use GPS- Global Positioning System-
• know coordinates for where you are in poorly known areas
• Take a reading on the fossil itself for very accurate location data--
• can go back to same area, where new finds may likely be made.

9. Camp life sand storms:
field expeditions are generally from 2 weeks to several months

10. Prospecting, first step in finding a dinosaur=
• Walking around (many miles) looking at the ground for spots of white, black, blue or red depending on the color of the bone.
• Sometimes this involves crawling on the ground looking for very small things like tiny mammals or avian dinosaurs.
What a fossil find would first look like….
Bones on surface are the most poorly preserved we want the ones in the rock

11. Prospecting- next step
• Minimally expose bones visible on surface using pocket knife or dental tools (or rock hammer if the dinosaur is large). Lightly brush off dirt.
• Evaluate if specimen seems worth collecting (potentially new species or especially
complete specimen of an already described species).
• -- that is, we look for what synapomorphies/autapomorphies can be seen.
• If we are going to collect it … we apply glue…

12. Collecting a dinosaur fossil
• After prospecting and evaluating find (deciding to collect it), further clean off bones on surface, add more special glue
• Cleaning away some rock to see if we can see a synapomorphy identifying the fossil as an important find- maybe new species or part of a poorly known group
• Dig a moat around fossil using pickax, shovels, rock hammer, knives- sometimes a cobra hammer or rock saws
• Cover top of fossil with toilet paper such that the plaster you will use doesn’t stick to the exposed bone.
• Cover in splattered plaster, plaster-soaked burlap strips and more plaster. Then let dry.
• Tunnel under block so that dino is on a pedestal of rock and capped with plaster. Pry loose.
• Flip block over and cover other side in plaster.
• Prying loose a jacket (plaster covered fossil+rock matrix)
• Trimming excess rock
  -lightening the jacket so that it is easier to transport
• Transportation + Cataloging
• Preparation of fossil in lab
  plaster jackets with fossil embedded in rock are carefully opened in a lab with a saw and the rock is slowly removed with dental tools and compressed air “scribes”

13. Second of the two methods for finding dinosaur fossils
   Quarrying Example: Gansu Province, in northwest China
   What a quarry looks like: where the first feathered non-bird dinosaur was found – Liaoning Province-- Range of animals known from the feathered dinosaur strata extends to Gansu-
15. Break open slabs that represent ancient lake deposits laid down in fine layers to find insects, plants, and maybe a dinosaur
• Quarry for fossil birds and other dinosaurs in Gansu- formerly horizontal beds are turned vertically by processes related to uplifting of Himalayan+ Mountains
• Dinosaurs are not found in isolation - are discovering the remains of whole ancient community - living near by those ancient lakes
• We wrap the slabs in toilet paper and tape, lake sediments are hard- well cemented and smaller so plaster is usually unnecessary
• Other aspects of international science - learning about new cultures!