

Excavation

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- Before discussing excavation, let's back up a bit
 - Basically, archaeology is anthropology extended into the past
 - Except that cultural anthropologists study living people
 - While archaeologists use mostly material remains to get at the same kinds of questions
 - To be more specific, archaeologists basically try to do three things
 - 1. Reconstruct how people lived at some moment in the past
 - creating "snapshots" of the past; like ethnographies (or documentaries) of societies
 - essentially, we want to know how things worked at some single time.
 - often called a **synchronic** view – looking in detail at a single moment or period in time
 - 2. Put a series of these "snapshots" in order, creating a historical description of how things changed over time
 - this is essentially the same as history, but not based on written records
 - hence sometimes called "**prehistory**"
 - or "**culture history**"
 - often called a **diachronic** view – looking at change over time
 - 3. then *explain* these changes over time; try to figure out *why* things changed as they did
 - usually by dreaming up hypotheses and testing them
 - This is the tricky part (not that the rest is easy!)
- The past is gone. What evidence is available to help us reconstruct it?
 - Answer: All the garbage and debris that people have left behind that hasn't been destroyed.
 - people throw away garbage and leave stuff behind. It piles up. Just think of a dump, an empty lot, or an abandoned barn.
 - This is the **archaeological record**: The material remains of human activities
 - This junk is often - but not always - buried
 - archaeologists like buried junk because burial protects things
 - stuff that does not get buried, but instead lays around on the surface of the ground, tends to weather, decay, and disappear
 - sometimes people bury things intentionally
 - burials of the dead
 - putting trash in a pit
 - putting food in a storage pit and then failing to retrieve all of it
 - hiding valuables in a hole and failing to retrieve them
 - burying offerings to the earth or other supernatural forces
 - digging trenches into the ground and building foundations in them
 - Leveling an abandoned building and then building a new structure on top of the debris
 - sometimes buildings and other structures bury themselves
 - as an abandoned adobe house weathers in the rain, the walls melt and the mud covers the floor, the bases of the walls, and any trash that was still laying around
 - as abandoned stone walls collapse, the rubble of the upper parts does the same

- sometimes nature buries stuff
 - floods deposit silt over anything laying on the ground
 - dirt washes or slides downhill and covers things laying around at the foot of the hill
 - wind may pile up sand and dirt in some places
 - plants, earthworms, and rodents actually create soil and move it bit by bit, gradually covering things and moving them downwards below the surface
- But a lot of garbage does *not* get buried.
 - in many places, no soil forms and/or none is deposited by wind or water
 - in some places, wind or water may *remove* soil, leaving any artifacts or buildings exposed on the surface, where they may weather away
 - so what we find by excavating is a strange subset of all the original material remains
 - just the things that happen to have been buried and preserved
- So what do archaeologists find?
 - First, we usually *don't* find fragile or organic things that decay:
 - cloth, wood, leather, basketry, paper, most things made from plants or animals
 - But some artifact types are just durable, and are preserved in most environments
 - stone architecture, or other massive constructions
 - stone tools
 - pieces of pottery vessels used for cooking, storage, and serving
 - sometimes bone
 - patterns of different colors and textures of soils caused by digging and filling in pits or trenches, piling up dirt for defensive barriers or burial mounds, etc.
 - Some unusual environments preserve more evidence
 - Extremely dry environments (Egypt, Peruvian coast) preserve things by preventing bacteria, mold, etc. from growing.
 - Certain wet environments that permanently exclude air (underwater sites, bogs) also prevent decay
 - Frozen sites (Siberia, Alaska, the “Ice man” in Alps near the border of Austria and Italy) preserve organic materials well
 - Sometimes we just get lucky with odd circumstances; for example:
 - basketry or textiles preserved as impressions on pottery
 - seeds, textiles, or other organic materials that get burned to just the right degree (carbonized) and are preserved as charcoal “fossils” of the original object
- Ok, so some stuff remains. What can this garbage tell us about the past?
 - We have a problem here: there is a huge gap between
 - what we want to know, and
 - the evidence available from which to figure it out
 - We want to know about grand questions, like “what led to civilization?”
 - but most of the evidence we have is mundane garbage that is not obviously related to those big questions
 - and not even all of that – only whatever happens to be preserved
- Weaknesses of the archaeological record
 - Many of the most interesting aspects of culture are not material in the first place

- we want to know about politics, religion, social structure, myths, etc.
- but these are not material things that can be preserved
- except in very indirect ways that we hope to figure out
- Of the aspects of culture that *are* material, only a biased subset enters the archaeological record
 - certain kinds of things are consumed, like food
 - others are recycled, like metals and glass
 - others end up being burned for fuel, like parts of old buildings
 - The ways that things get into the ground are highly selective
 - Most things that get into the ground are worthless garbage
 - things that have any value generally won't be left laying around until they get buried
 - for example, the archaeological record under-represents gold jewelry - it contains fewer gold rings than did the material culture that it was drawn from
 - usually, only things that are worthless or not movable will be left for us to find
 - We find things that were intentionally buried
 - Caches of valuables that were never recovered
 - Burials of the dead
 - Offerings to the earth, spirits, gods, etc.
 - These sometimes contain whole or valuable items
 - but are a very biased sample of the things that were actually in use
 - only very specific kinds of things are likely to be buried in these ways
 - for example, an analysis of modern US burials would find that men usually wore nice suits and that nobody owned a TV, since they are never included in burials.
 - We occasionally find things that were buried suddenly by catastrophes like volcanic eruptions or mudflows
 - these are probably the only cases in which the archaeological record at least started off relatively complete
 - but these cases are very rare
- Of the incomplete and biased selection of objects that enter the archaeological record, only an even more biased subset actually survives to be found
 - Many things just decay away: wood, plant material, cloth, leather, often even bone
 - So items that happen to be made of perishable materials are underrepresented
 - Even if the objects do get buried, they are often disturbed later, by people digging holes for house foundations or other purposes, or by plowing the site for farming
 - So evidence in places where people continued to live or work -- which are usually the best and most important places -- is underrepresented
- Of the incomplete and biased selection of things that are preserved, we only find a tiny fraction
 - the vast majority of the archaeological record is still underground
 - collecting and analyzing archaeological material is slow and expensive, so even known sites have only had a very small portion excavated
- Result: the known archaeological record is an incomplete, distorted reflection of the past
 - some parts of the picture will be reasonably easy to reconstruct

- example: food garbage should reflect what people ate
- but other aspects of culture may be harder to figure out from bits of garbage
 - like religious beliefs
 - political organization
 - social structure, etc.
- we hope that we can be clever enough to figure out how people lived and what they did from these remains
 - but there is no guarantee that we can
 - or that we can necessarily get it right.
- But this incomplete, biased record does have some good points
 - first, it exists. It *is* evidence of the past
 - it *can* tell us some things about the past
 - which would be completely lost to us otherwise
 - so it is far better than nothing
 - second, most of it is free of the biases of historical records
 - history tends to focus on the interests of people who could write (or pay others to write), so it emphasizes kings, wars, politics, religion, the wealthy classes
 - but archaeological evidence is often more balanced in its coverage of kings and commoners, priests and potters alike
 - historical sources are often unintentionally or intentionally slanted, propagandistic, from a particular point of view
 - houses and garbage don't lie (at least not intentionally)
 - example: the difference between what people in Tucson told pollsters about their alcohol consumption and what William Rathje's University of Arizona Garbage Project determined by actually counting the bottles and cans in their trash
- OK, so say we have
 - found an interesting site through some form of site survey
 - we have mapped whatever is visible on the surface, like walls or just the shape of the surface
 - we have probably made and analyzed systematic surface collections
 - something Kelly & Thomas do not say much about
 - but these may show us where certain kinds of activities happened on the site, or when different parts were occupied
 - we may have done some remote sensing
 - depending on the kind of site and what we think might be there
- But we probably still have questions about what happened at the site
- So we decide to dig.
- Two general approaches to excavation: **vertical** and **horizontal**
 - not sharp categories; they grade from one extreme to the other
 - **vertical** excavations
 - typically focus on looking at a deep stack of strata
 - seek to get an idea of change over time by looking at how the collections of artifacts differ from the bottom to the top of a deep pit

- this is a **diachronic** approach
 - looking at change over time
- vertical excavations tend to be fairly small areas, since with finite time and budget, you can't do a deep excavation over a large area
- unfortunately, small areas give you a very limited view of what was happening at any given time
 - imagine that SSU was flattened by an earthquake, then buried by sand and silt from a flood
 - don't enjoy the thought too much!
 - little is visible on the surface
 - now imagine that a future archaeologist digs a 1 meter square test pit at the SSU site
 - it might go down through the lawn on the main quad
 - or it might hit a cement walkway
 - it might hit the rubble of Stevenson hall
 - it might hit the rubble and contents of a dorm
 - each would give the archaeologist a radically different idea of what SSU was like
 - so the archaeologist digs a lot of these pits, distributed around the site according to some sampling strategy: systematic, random, etc.
 - but still, each is just a tiny patch
 - it would be hard to know if you were digging in the center of a huge quad, or planter next to a building, or a memorial grove, etc.
- why would this matter for a diachronic approach that just wants to see how artifacts changed over time?
 - say we excavate in a cave, and one layer has a greater concentration of stone flakes
 - does that mean that stone flaking was more prevalent at that time?
 - or does it mean that stone flaking was done in different areas of the cave at different times, and the small vertical excavation pit just happened to hit a stoneworking area at this level, but missed them in others?
- That means that one has to be cautious about interpreting deep excavations
- People doing vertical excavations often look for deep garbage dumps, rather than residential areas or other places that were used for activities
 - The residential areas are more likely to have different artifacts concentrated in different places
 - While dumps are more likely to have a general representation of stuff in use at a given time, spread around fairly uniformly
 - So a small, deep excavation in a dump will probably give a more representative sample of the **material culture** in use at different times
 - deposits of garbage in general (deep or not, concentrated or not) are called **middens**, and the artifact-rich soil in them is **midden**.
- **horizontal** excavations, also called **horizontal exposures** or **areal exposures**
 - typically focus on opening up a large area that was the surface at some particular time
 - the idea is to see the spatial distribution of artifacts at a particular moment
 - the layout of buildings
 - what kinds of debris are found inside vs. outside

- in cooking areas vs. sleeping areas vs. public areas where guests might be served food vs. areas where pottery was made, etc.
- this is a **synchronic** approach
 - looking at how things worked at one moment in time
- often emphasizing **activity areas**
 - these are places where some particular behavior occurred once or repeatedly, leaving identifiable evidence
 - for example, an area where a lot of stone chips are found might be considered a stone tool manufacturing area
 - the trick is to distinguish activity areas from areas where garbage was piled, or stuff got kicked by people walking through, or dogs dragged it, or random patterns...
- detailed study of the horizontal distribution of artifacts can say a lot about
 - what people did
 - how many people were involved
 - what kinds of people (high or low status, etc.) did the tasks
 - how organized the activity was
 - how specialized the people were, and lots of other things
- horizontal exposures are usually not very deep, since time and budget would not allow going deep over a large area
- also often not very deep because going down further would require removing a large area of interesting, important remains
 - while poking small, deep vertical excavations into a site only destroys a small patch of the evidence for any given period.
- Excavations often start with small **test pits**
 - Small areas (typically 1 meter square or 1.5 m square)
 - Give an idea of what is to be found in an area
 - Fast and cheap enough that one can dig a number of them in different parts of the site in order to get an idea of what is below the surface
 - The places to test may be picked according to any of the sampling schemes we have looked at for survey and surface collection
 - Judgment sampling, systematic sampling, random, stratified random...
- Sometimes excavations start with **trenches** (or **test trenches**, the same but typically smaller)
 - Trenches are just long, narrow areas
 - Usually expected to be deep, but not always
 - The long sides provide a larger view of the stratigraphy, while the narrowness minimizes the amount of excavation necessary to get that view
 - Sometimes also used as a way to get a view of how the artifacts vary along some axis
 - Like from the center of a building, to the wall, to the outside, to across the street
 - Doing this as a trench rather than a row of test pits allows us to see the stratigraphic relationships between all the units, rather than having to guess at them
- Often these initial excavations provide a lot of answers about what happened at the site

- But often one still wants to know more, so larger areas are opened up in places that the test excavations suggest are promising
 - Often expanding a test pit, or excavating areas off the long side of a trench
 - This way, you have the stratigraphy that is already exposed to guide the new excavation
- So how will you dig?
 - By shovel if you don't care about detailed proveniences, exact coordinates
 - As with undifferentiated layers like flood deposits that may have a few artifacts randomly scattered through them
 - by large or small pick if the soil is too hard and you need to get through a lot of it
 - By trowel if you want to go slower, get a better sense of subtle changes in the stratigraphy, not move things (too much) out of their original position
 - By large or small paintbrush or whisk broom if the soil is loose
 - Often good for removing soil from around rocks, etc.
 - By dental pick, sometimes tweezers, sometimes by blowing through plastic tubing if you are trying to clean off a delicate feature like a burial
 - The dirt is transferred to dustpans or scoops, from those to buckets, from there mostly to be screened
 - Some soil may be saved for flotation or dry screening (more on that later)
 - Why are archaeologists always “cleaning things off”?
 - Because dirt is opaque
 - You can't see what is there until you remove even the thinnest layer of dirt covering it, or dust on it
- Constant tradeoff between
 - excavating carefully and slowly
 - getting complete, high-quality data from a small, well-excavated area
 - and excavating rapidly but with less control
 - getting more data, but at the risk of some mixing, poorer control of where artifacts come from, some damaged artifacts, etc.
 - also exposes more area, gives better idea of context relative to walls, activity areas, etc.
 - also more likely to find unusual or important artifacts or features
 - if you excavate one very careful test pit in a church, you may never see the altar
 - but a more rapid excavation of the entire left half of the church would probably encounter the altar, greatly changing your view of the building
 - excavating too slowly may mean that you don't get enough data to answer your questions, or you get data with such poor context that you misinterpret it
 - so there is reason not to do the absolute best job possible
 - but excavating too carelessly may mean that you can't accurately separate strata or tell where things came from
 - if you shoveled out the church, you might find the altar but not be able to tell which artifacts were near it
- excavation is destructive
 - once removed, that material can never be excavated again

- excavation destroys the record as it studies it
- so we have to record as much information as possible during excavation
 - or it will be impossible for us or anyone later to analyze the artifacts
- most important thing to record: **provenience** of every artifact (or bag of artifacts)
 - **provenience**: an artifact's location relative to everything else
 - example provenience: PI=002-05
 - in this particular project, means the site is Pillistay, the excavation unit is 002, and the locus is 05
 - **excavation unit**: an area that is excavated, often a 1x1 meter square or a 150 x 150 cm square
 - **locus**: used in some projects, means a subdivision of the sediment in a unit, typically a stratum
 - has the virtue of being unspecific, so the same term can apply to a layer, the fill of a pit, a cluster of sherds, etc.
 - the format of the provenience system is usually different in every project
 - depends on the situation and the preferences of the director
 - but the idea is always the same: to identify the portion of dirt that the artifacts came from
 - in a way that allows artifacts to be connected to notes about strata, features, etc.
- many cataloging systems give each artifact or bag of related artifacts a **specimen number**
 - identifies a unique item
 - helps with tracking items in storage and analysis
 - might be written on in ink, a label in a bag, etc.
 - the specimen number is tied to a provenience, which applies to all the specimens from the same location
- In archaeology as in real estate, the three most important things about an artifact are location, location, and location
 - that is, provenience
 - provenience tells you which items were found together
 - in the same **context**
 - which ones were found in earlier strata, and which in later
 - if you can learn something about a given stratum (context), it should apply to all the items in that context
- example, in the New World, glazed pottery was unknown until European contact.
 - if we are working in a site in Peru and a stratum contains a glazed sherd, we know that everything in that stratum was deposited there after the Spanish conquest
 - as was everything in strata above
- example: we excavated at Pillistay in 2006
 - in 2008, I had an expert analyze the animal bone from the site
 - specimen 102031 was a bag with a few animal bones
 - one of them was a foot bone of a llama or alpaca
 - with a pathology that probably indicates overwork from carrying excessive cargo
 - it came from Pillistay, unit 2, locus 5

- coded as PI=002-05
- we could go back to the field notes, unit plans, and photographs to see exactly where this bone came from
 - below a prepared clay floor PI=002-04
 - above an earlier prepared clay floor PI-002-09
- so this animal was overworked well before the site was abandoned, probably not long before the second floor was put in
- So, why do archaeologists do all this stuff in neat, rectangular holes with vertical sides?
 - In order to simplify record-keeping about where things are found
 - Much easier to draw plans of what is found at each level and see how they overlay each other if the area has clearly defined boundaries that remain the same from layer to layer as you go down
 - Much easier to fit the unit drawings onto the general site plan if they are based on the same coordinate system
 - Also, many artifacts are not individually mapped, but are scooped up with dirt while excavating, and are then found while screening the dirt
 - If the excavation is proceeding in separate squares, this stuff from the screen is known to come from a given square area
 - Later, you can look at general patterns of distribution of artifacts across the site by density per square
 - Stratigraphy is easier to understand if you see it in a vertical cut, rather than a sloping or curved one
 - In a vertical cut, what you see of each layer is directly below what you see of the one above it
 - In a sloping cut, the bottom is closer to you than the top. What you see of a lower layer is actually not below what you see of a higher layer. This can seriously mess up the understanding of the stratigraphy
- In any excavation, the point is to keep track of where each artifact or lot of artifacts came from in 3 dimensions
 - Typically based on an arbitrary site **datum**, that is, a point from which all the coordinates are measured
 - Sometimes this is a stake cemented into the ground
 - Or a naturally identifiable fixed point, like the highest tip of a big boulder
 - often there are also secondary datums, or local datums
 - these are points located closer to a particular unit, to make measurements easier
 - they are measured in relative to the site datum so that measurements relative to the local datum can be converted to the site-wide system later
 - most archaeologists work in metric because the units and arithmetic are easier to do in the field, causing fewer errors
 - As each level is exposed, you draw a plan showing the horizontal arrangement of artifacts, features like pits and trenches, etc.
 - **Plan** views: looking down; what you see while you are excavating
 - **feature**: a localized stratigraphic unit: pit, hearth, wall, etc.

- Often done with measuring tapes and plumb bobs
- The unit will typically have strings marking its boundaries
- These provide unchanging reference lines to measure the horizontal positions of features to be drawn on the unit plan, which usually is on graph paper to facilitate transferring the measurements to the drawing
- the unit plan will usually have elevations (depths) indicated at numerous spots, to help tie the plan view in with the profile drawings of the stratigraphy
- During the excavation, you take notes about what is being found, the soil, the relationships between different strata, interpretations (was this feature a hearth or a cluster of rocks, etc.)
 - Usually done on standardized forms
 - sediments often described using **Munsell color charts**, grain size charts, etc.
 - This information is essential for interpreting the processes of deposition and the collected artifacts and unit plans later
- During the excavation, you or a designated crew member takes lots of photos
 - Very important, often can make up for omissions in notes and drawings
 - Often needed to convince others that you really found what you say you found
 - Taking field photos is a real skill; harder than you might think
 - Digital photography has largely replaced film
 - Video is also becoming more common, but as a supplement to still photos
- When the unit is finished, or sometimes before, you draw the profiles, that is, the strata visible in the sidewalls of the unit
 - **Profile** views: looking at the sidewalls of the excavation; what you see when some strata have been removed
- If the excavation is a large area, often you leave **baulks**, or strips of unexcavated soil that run across the unit, or between two adjacent units
 - These allow you to see how the strata run across the middle of the area, while only covering up a small portion of the area
 - Murphey's law of baulks: the baulk always covers up a key part of the area, like a wall, doorway, half a burial, etc.
 - another approach is to excavate alternating rows of squares, like just the black squares on a checkerboard
 - this leaves long profiles that are visible alternately from one side and the other
 - but leaves more of the whole area covered up
 - sometimes baulks are left only temporarily, then excavated after the profiles have been drawn
- in excavation, we generally try to take the strata out in the reverse order than they were laid down
 - otherwise, they may run under others that have not been removed yet, becoming impossible to dig
 - so simply digging successfully requires figuring out the stratigraphy as you go – a constant 3D puzzle to be working on
- **natural levels, or stratigraphic levels**
 - are units of excavated soil that correspond to strata of soil

- most modern excavations proceed by stratigraphic levels
- versus **arbitrary levels**
 - which are simply horizontal slices of the site at intervals, such as every 10 cm.
- unless the strata are pretty horizontal, arbitrary levels will mix artifacts from different strata and time periods
 - the lowest arbitrary levels will usually be generally older than the highest ones
 - but they will be mixed
 - any patterns over time will be blurred by mixing the lower material together, the middle material together, and the upper material together
- why would anyone ever use arbitrary levels?
 - sometimes you just can't see any strata to follow; arbitrary levels are better than no levels at all
 - sometimes you have to dig very fast or very large amounts; again, arbitrary levels are better than nothing if they allow you to get a gross idea of what is going on in the time allotted
 - sometimes we subdivide thick visible strata into narrower slices by arbitrary levels, because we can't see any divisions within it,
 - we may still suspect that the stratum accumulated over a long period of time
 - so the arbitrary subdivisions within it may let us see some change over time from the lower arbitrary levels to the upper ones; this control is better than none
- but most modern archaeologists feel obliged to explain why they use arbitrary levels, if they ever do
- When do you stop digging?
 - ideally, when natural soil with no artifacts (**sterile** soil) is encountered
 - sometimes this is obvious once you know the local soil and geology
 - sometimes this is hard to tell, so you continue a bit deeper after no more artifacts are found, just to be sure
 - often, you dig a small area down deeper yet, to make sure that you haven't just hit a natural deposit from a flood, a period of abandonment, etc., that is on top of earlier cultural material
 - sometimes when the season ends and you have not hit sterile yet
 - sometimes when you have learned what you need to know about that spot, even if the bottom has not been reached yet
- Screening
 - Dirt has to be screened, because the excavators would never make any progress if they had to pick out all the artifacts by hand
 - And they would miss a lot
 - 1/4 inch, 1/8 inch, window screen... depends on the items present and the questions the project is addressing
 - finer screening takes longer
 - and a lot of small artifacts are not very informative
 - tiny sherd fragments, tiny bits of unidentifiable shell and bone, etc.

- but some are, like rodent bones, seeds and other plant parts, fish scales, etc., so often only a sample of the soil is screened at a finer mesh
- we often measure and record the volume of sediment that was screened, using calibrated buckets
 - some strata are thin and small, others thick and broad
 - if we find 50 sherds in a stratum from one period, and 100 in a stratum from other, how can we compare them?
 - by using the volume of dirt to calculate the “density” of artifacts
 - compare, say, 5 sherds per liter with 2 sherds per liter
 - this is independent of how much soil from a given period we happened to excavate
- Finer-grained study of soil samples
 - Slow, expensive
 - So usually just a sample of the soil is more carefully processed
 - Like 8 liters from each stratum in each grid square
 - **Flotation**
 - gets the stuff that is too small to catch with screens in the field
 - particularly important if the soil won't go through field screens very well, for example if it is wet and clumpy, or chunky and cementlike
 - Separates even microscopic organic stuff that floats
 - seeds, plant parts, leaves, some small bones, threads or bits of textile, charcoal, etc.
 - this is the "light fraction"
 - Cleans the heavy part, too, for easier sorting later
 - the sample bucket has very fine screen in the bottom to allow powdery portion of soil to be washed away
 - this "heavy fraction" is dried, then usually screened through geological screens (precision screens in known, small mesh sizes) to aid in separating the tiny artifacts from the fine gravel
 - but this still comes down to carefully picking through the small stones to remove anything artificial
 - Allows systematic study of
 - tiny rodent bones and fishbones (both can tell you a lot about diet, storage, etc.)
 - tiny stone flakes that could indicate use or sharpening of stone tools
- Dry fine screening
 - In dry climates, wetting for flotation can damage organic materials
 - dry seeds may "explode" when wetted
 - And the soil is often loose, so it can pass through screens easily
 - So soil samples may be screened through a series of geological screens
 - Someone then has to go through the contents of each screen and pluck out the artifacts, bones, seeds, etc, and dump the little rocks
 - At the finer grades, this is done under magnification, even a microscope
 - Often the finer material is further subsampled, since there is just too much to separate
- Either way, someone has to then categorize all the tiny bits by material, species, etc.

- This kind of analysis is very slow, expensive, and usually requires an expert for each kind of material
- Again, archaeology is destructive
 - The excavated part of the site is gone when you are done
 - So you have an obligation to take good notes
 - To collect the artifacts systematically (screen, bag with good labels, etc.)
 - To see that the material is safely stored for the very long term (i.e. forever after!)
 - To see that the notes, photos, etc. are also safely stored and available for as long as the artifacts are, or longer--
 - To analyze, write up, and publish the findings, since now no one else can do so
-