CONSTRUCTION I (SE)

SEPT 4 2023

FOUNDATION
frames and foundations transfer loads from where they are to the ground.
Layers of rock and soil have different bearing capacity. ground characteristics, water capacity, etc.

foundation type depends on building loads, loadbearing capacity of subsoil, and type of surrounding buildings.

FOOTINGS:
pad/column footing + Trench or continuous footings + raft or slab footing

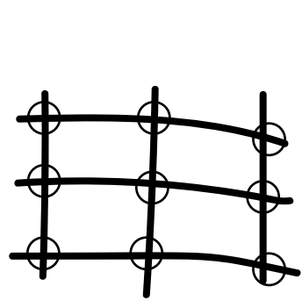
strip foundations or footings: a continuous strip of support to support a linear structure such as a wall.

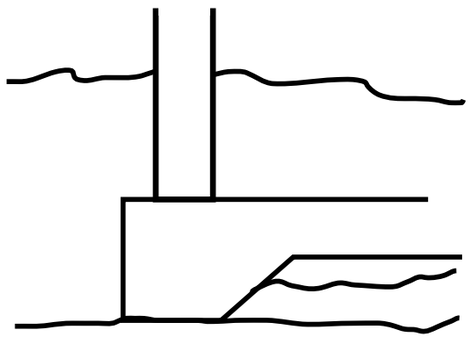
Tenches and concrete and formwork, like the
videos in arch class or what i have seen studio 804 do.

TWO: Shallow and deep foundations

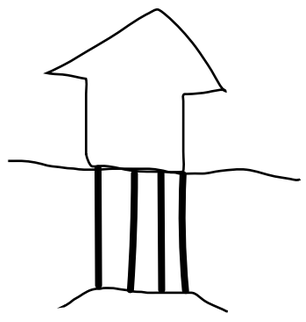
KEY WORDS:

STRUCTURE,
STRENGTH,
STABILITY,
SUBSTRUCTURE,
SUPERSTRUCTURE,
FORCE,
LOAD,
SHALLOW FOUNDATION,
DEEP FOUNDATION,
GROUNDWATER CONTROL,
WATERPROOFING / DAMP PROOFING
THERMAL INSULATION

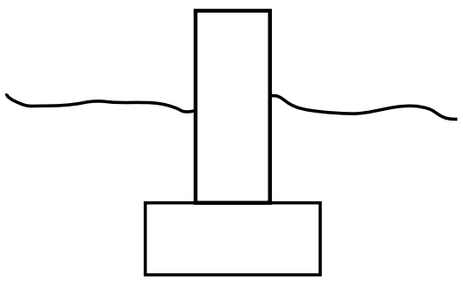




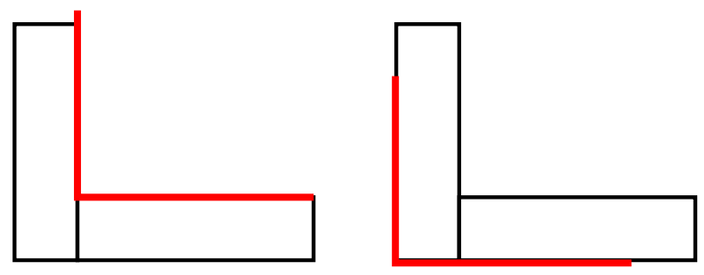
Rafts are slabs that cover a wide area, often where gorund conditions are poor. runs whole length of building. pockets of sand and gravel on the interior. has reinforcing rebar/wire mesh.
may still have pad foundations on the edges.



Pile walls (anchored diaphragm walls) securing deep anchored walls. go deep enough to meet a proper load-bearing stratum.



pad foundations: rect or circ to support localized loads, like columns



Internal and external waterproofing/tanking
waterproofing film , or paintng rubber/tar..

0.8 m (Czech standard)

Frost Depth
freezing of soil can causing heaving of foundations
Defense: build base of foundation below frost depth and frost protection for foundation.

VERTICAL STRUCTURES:
Low, Med, High Rise, and skyscarper.

a SUPERSTRUCTURE is a vertical extension of something else. A building perhaps built on top on top of another building.

Roofs include roof structure, roof coverings, drainage, rooflights

Superstructure excludes, the substructure, finishes,fittings, equipment and services.

finistration: windows

MEP: intnl. abbrv. for Mechanical, Electrical, and Plumping.

structures, even humans, need three points of contact with the ground.

SYSTEMS:

POST AND BEAM/LINTEL**:** anything with a beam running across two pillars. Think a lot of columns

MASONRY WALLS: made of brick or cement blocks held together by mortar. in tall and modern buildings, beams must be built below masonry walls, specifically to hold their weight.

FRAME: think tudor houses for timber frames.

core is the strongesr part of a building in concrete frame buildings. you can put lifts in there.

Shear walls add strength and support. walls that stretch from roof to foundation.

Dead loads (Stuff that cant move) Live loads (furniture) and environmental loads (wind and rain) and Dynamic modes (machines that move and have repetitive movements)

Ring Beam: horizontal superstruture. Can either be lintels of precast concrete or on continuous reinforced structure.
Light Partition Walls: light and quick to construct. they do not need to rest on pre-planned beams, placed anywhere. also called drywall partitions and gypsum boards. frame-then-fiilling construction.

FLOOR STRUCTURE: what drives the choice for floor system materials? Floors make the building stronger NON-VERTICALLY. It is good to think about different uses for the floor in the future.
Wooden floors have Main and secondary beams. the main carries the load of the walls and the secondary carries the load of the ceiling decking or whatever is there.

Ceramic/concrete floors have long perforations to reduce weight and increase thermal insulation with air gaps. air tubes.

Composite floors: formwork, probably steel or aluminum, holding concrete with rebar or WWM in it.

Access floor: sometimes called false or raised floor. Has removable panels on top of the structural floor to access wires underneath it. Some more structural access floors allow liquids to drain from car wheels in car parks.

Ceiling is just what u see. Literally. The structure of what is above u is still called the roof or floor.

ROOF: Pitched roofs and flat roofs, of course.
Gambriel roofs are different than Mansard roofs bc Gambriels dont go on the two opposite sides.
Ridge: topmost horiz line. Hip are diagonals leading away. Centerline of ridge is verge.
Slopes: a roof angle lower than 30 is Low slope. normal is 30-45 degrees. steep slope is above 45. a Flat roofs are low-ptich roofs that do not exceed 10 degrees slope.
TRUSSES: trangular system to support pitched roofs. Eiffel tower is a truss structure.
Space frames are metal truss structures used to hold up large ceilings. Seen in airports

KEY WORDS:
superstructure, post and lintel, column, bearing wall, beam, slab, ring beam, masonry, joist, composite floor, access floor, pitched roof, truss, flat roof, roof drainage.

WINDOWS
Sash windows and Casement windows are the two main types of windows. Sash windows (which open up and down) are mostly only ever used in the USA.

French window/doors pivot on a vertical hinge to have two doors open in or out. Classic.
Horizontal and Vertical pivoting windows are just rotating panes that are very dangerous. Opening patterns look like cylinders. They present the risk of accidentally pushing yourself out of it.
Casement windows are combo of still and moving windows.
Fixed windows are non-operable windows. Clerestory windows are often fixed. Fixed windows create sick (bad) buildings, which have no fresh air flow.
Clerestory windows are preferable for letting daylight in without being seen, and getting good light spread. Artists and bedrooms like them I think she said.

Window cross-section details goes glass, airspace, spacer (down), dessicant(down), seal(bottom), and another slice of glass.
aluminum windows have every complex frames with lots of air gaps for insulation purposes.

DOORS
Battened and ledged doors. battens are vertical boards with connected via horizontal and/or diagonal supports (ledges)
Frames and Paneled doors (standard)
hollow core doors have a cellular cores and are lightweight. Only interior doors. they are insulated well.
Louvered Doors have no glazing, allow for ventilation. Used in southern areas.
Wire Gauged Doors allow for visibility, ventilation, and security. Looks like a jail.
Revolving doors are nice for a constant flow of visitors.
Sliding doors run on runners and guide rails. The door may have one or more shutters. sensor controlled.
Swinging door use double action springs. Like grandpa's place! Good for places where doors cant be opened manually but still want to hide what is taking place beyond them. places like restaurants and hospitals.
collapsible and rolling steel doors commonly used for industrial settings. strong and safe. like the one used to close off the LHS Library at night.

STEP TERMS
Step, Tread, Riser, Nosing
STep: composed of tread *and* riser
Tread: part of stair that is stepped on
Riser: the board or space between one tread and the next
Nosing: in the board that juts out at the end of a tread.
Stairs have pitches that go from nosing to nosing. The angle of the stairs.
2 RISERS + 1 TREAD MUST EQUAL 63-65 cm.
Every stair must be the same.
A flight is an uninterrupted series of steps. Floating steps have nothing underneath, and ofte
no risers either.
Stringer: structural member that supports the treads and risers.
Railings can be at multiple different heights for diff height people.

FACADES
Exteriors of buildings, not always the front. Facades make buildings pretty! General Term.

CURTAIN WALL
Independent frame assembly, only supports itself, does not brace the building structure. weather barrier, light transmittance. Bauhaus may have the first curtain wall in the 20th century. Also think of National Technical Library CTU.

(NATURAL) MATERIALS
requirements:
physial, mech, thermal, acoustic, chem, aesthetic, etc.
soil, esp clay is very good at keeping temperatures at a constant levels.
timber usually refers to unprocessed wood, while lumber is milled.
WOOD SPECIES are covered in this slide. Hardwoods, softwoods, and special wood. should be able to name all woods. get studying!
Hardwoods: ash, beech, birch, cherry, elm, maple, oak, poplar, walnut
soft: cedar fir, TBC

TYPES OF WOOD MEMBERS
Laminated veneer lumber (LVL) is what van used a lot.
PSL (parallel stand lumber)
Oriented stand lumber too.
Cross Laminated Lumber:
can replace concrete or steel sometimes. has possibly the lowest carbon contant of any commericially available material. Teacher really likes CLT. prefabricated material. Can be easily assembled due to pre-fabrication.
"GLULAM" , or glue-laminated lumber, can withstand a burnout fire. maintains its load bearing capacity through a burnout fire. Nobody has used Glulam in the Czech republic bc they dont like ot.
Downsides: wood can rot and be affectedb by insects.
Marcus worked on this project with cross-laminated lumber and says they had to cover the CLT with a lot of fireproofing plaster and then more wood.

carbonized-wood. prevents against too much water and fire damage.
Wood Decay fungus exists though.

Bamboo doesn't last long as a structural material if it is exposed to the weather.

Rock
Granite, limestone, sandstone, slate, basalt, quarzite. Slate is flat and can be cut easily for shinges or floors.
crystal systems
Geology/soil brief overview:
O (organic material), A (topsoil), E (leached zone), B (subsoil), C (parent material), R (bedrock)
Sometimes soil must be consolidated if it is not strong enough to be built on. Leaning tower of Pisa.
Coursed masonry is flat, uncoarsed is unfinished stone. dry stacked or mortar set.
Adobe is great except when faced with water/flooding.
Ashlar is perfectectly worked stone that does not require any binding. Pyramids, gothic castles, and maccu pichu. Special type of surface at corner is Rustication?
new show at the prague castle opened this week.
Bricks:
solid brick, hollow, perforated, face brick, and partition tile. hollow bricks have horizontal holes, and perforated have vertical holes. the presentation has links to vaulted brick laying videos.

concrete blocks can be easily made with recycled material.
useful link in presentation.
reinforced masonry uses steel ties and rebar to increase resistance to tensile and shear forces.
jack on jack is straight stacked. basket weave and half basket weave.
grout is used to embed rebar and seal tiles.
Vitrified clay is used for sewers. not sure why.
plaster has been used for a long time and provides a continuous surface without joints, can

AREAS OF CONSTRUCTION
Primary Structure: SHELL of building, load-bearing structure
Secondary Structure: transfers the load of the facade to the foundation
Infill Elements: Glazing, Panels, etc.

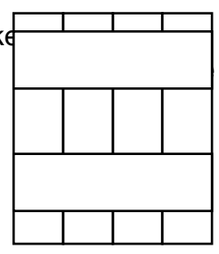
BASIC BUILDING TECHNICAL REQUIREMENTS
- Thermal insulation and climate protection
- Noise protection/containment
- Daylight
- Protection against falling = horizontal loading
- Restriction of fire spreading
- Ventilation
- Aesthetics and design
- Effective maintenance and servicing

INSULATION:
Thermal, Acoustic, Fire, Impact
Thermal: need to insulate more than the building, but pipes and ventilation ducting too.
Acoustic insulation, think of opera halls, that one German opera hall.
One needs to insulate impact insulation, like jumping on a floor from other spaces
Fire Insulation: insulated beams, floors, pipes.

What is glazing??

REMEMBER: presentation on building materials: present some modern materials that other may not know about at the beginning of lecture, two Czech girls are going next week.

Facade is everything, general term for a surface
Curtain wall is a type of structure (not a load bearing element) and carries itself attached to the building.



Shell is the envelope, a part of facade, just building exterior.
The shell and core in which the shell is the load-bearing system, so that the core multi-use and flexible. A popular American thing.

Angle of repose is very important in basement excavations. Depends on type of soil. retaining walls hold back the thrust of soil. gravity, anchored, etc.
Perimeter trenches are used for small buildings, a narrow moat basically.
shoring is used to support the walls or structure while construction is done. used in the street construction on the way to school. in the trench. Facade shoring exists too.
WATERPROOFING: Cast-in Situ. Tanking (membranes), and drains.
CONSTRUCTION DEWATERING (look into this a little)
SOIL STABILIZATION: maintains or improves stability of poor soil.
Jet grouting, vibration, removal and replacement, etc.
Solider pile and lagging: pre-drilled beams with beams slotted inbetween

properties of metals:
ductile, deforming under stress. metals get patinas and can be pre-treated.
Corrosion is very dangerous. Ferrous/non-ferrous metals, anodising, chrome plating, LEARN ABOUT THIS
can also read up on steel in the presentation.
Glass
toughened or tempered glas breaks into small pieces and not shards. car windshields.

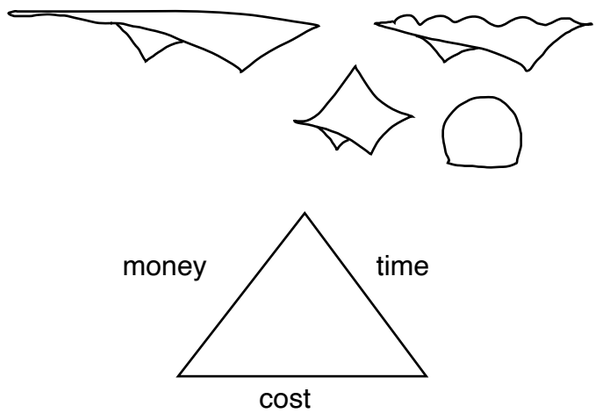
LITOMYSL
An old city in NE Bohemia. architect used glass that was non-reflective to blend in and match historical preservation codes... put glass in the roof and it blent in.

Concrete is Aggregate and Cement mixed together. Cement is the binder. Portland cement concrete is the most typical. concrete by itself has low tensile strength, so rebar is used. vibrator is used to eliminate any air bubbles. plain concrete is without rebars. HPC has additives that improve the qualities of stength, used for highways and bridges. self-leveling concrete is used for floors. shotcrete (Gunite) is concrete shot onto the walls, exposed aggregate finish. Beton Brut is brutal concrete...

pre-tensioning and post-tensioning. steel is stretched before concrete is placed for pre-t

plasterboard: gypsum has small water crystals which helps keep fire temprature down.
tensile arch is used for shading and stadium covers. synthetic fabrics.
Hypar, barrel vault, conic, and inflatable.

dangerous material: abestos, lead. PCB, synthetic mineral fibres. if not removable, must be sealed and inspected regularly.



modern products: Solar glass blocks,

FOUNDATIONS MUST:
Accept and divert loads
Withstand tensional and shearing forces generated by the foundations tendency to bend
Avoid using unreliable or weak ground
accomodate ground movement
withstand erosive elements within the soil.
minerals in water in the soil.
be deep enough to withstand climactic changes.
provide a level base for the floors.
Site investigation: geological survey, trial pits/boreholes, backfill, bearing capacity, made ground, settlement.
Setting out: establish the baseline of the whole building. clearly mark it.
Datum: point of refrence relating to the finished floor level. foundations are commonly built up to that point.
a benchmark is a permanently affixed point that ill establish a point above sea level, and a network of them is important for setting a datum level.
SUBGRADE: native soil, normally compacted
SUBBASE: layer of gravel on top of the subgrade
BASE: layer of material on top of subbase directly under slab.

Alloy is a mix of two diff metals.

superstructure is the vertical extension.
in the prehistoric times, timber structures could be rebuilt every 2-3 years or so. people did not have permanent dwellings until people starting building stone houses en masse.
oldest wood structure found is 7,000 years old, in the czech republic.
Senso-Ji temple is dismountable, survived for 1500 years. survived earthquakes because of its central pillar.
shafts are the main vertical pole between the base and the capital. can be plain, fluted, or ornate.
ARCHTRAVE: is a lintel or beam that rests on the capitals of columns. the whole system is called entableture.
STEEL BEAMS are coated to resist fire. come in many different shapes
TIMBER is in some cases as strong as steel. Nowadays timber is connected to concrete via horseshoe column bases to prevent them from rotting.
Arch, stronger than a lintel. what is a corbel?can be called a curved lintel. it provides a structure which eliminatess tensile stresses in spanning an open space. arches allowed early masons to span wider spaces because of shortness of blocks required. effictively distributes compression downwards.
in poiinted arches, more force is exerted downwards than in the rounded romanesque semicricle arch, which exerts more horizontal pressure.
the size of arches is limited only by economy.
ashlar was used without mortar often. massive aquaducts in france without mortar.
there are videos about arches and their mechanics on the linked powerpoint.
vaults must be heavily buttressed along their entire length. sad cause it inhibits light and circulation.
the ideal line of pressure in an arch is slightly parabolic, so semi-circular arches can have the crown fall while sides buckle. Gothic arches better fit it, but if too tall the crown can rise while sides collapse inwards.
aircraft hangar in rapid city south dakota was an important development.
cross/groin vault are almost always square in plan and are only 90º intersections.
Rib vault provided a skeleton of arches or ribs. gaps were filled with masonry arches which could be raised as high as they wanted.
CAVETTO are sort of rectangular arch domes/basins.
in gothic buildings, the roof could be supported by the arches instead of only the walls, so walls could be thinner.
gothic arches are formed by two arches, segments of circles. the classic gothic arch is known as the quinto acc something. more arch geometry is in the power point.
BUTTRESS: a counterfort, or a projecting form from a wall that serves to reinforce it. acts against lateral forces.
FLYING BUTTRESSS. MAKES CHURCHES APPEAR LARGER.
CAST IRON WAS THE NEXT DEVELOPMENT in arches and building materials.

WALLLSSSSSS
Walls divide and enclose.
walls do not include doors and wondows and their frames or architraves.
Palisades were fort walls. made to protect posessions.
loghouses were next walls. timber frames become popular. half-timber houses.
cavity walls are two layers of masonry blockwork with an airgap between to provide thermal and water insulation.
Compartment wall forms a barrier against the spread of smoke and fire.
curtain walls are very common on large-multi-story buildings, and only carry their own and environmental loads.
dwarf walls are low walls. less than 1 meter tall.
green walls, and even letting plants gross across a facade increases thermal insulation and environment temprature.
internal load bearing walls. brick walls can simply be inserted into the exterior masonry wall, bonded in thousand of thoiusands of different ways.
A PARTY WALL is a shared, thick wall between buildings. sits on boundary line.
Rainscreen is an exterior wall detail that stands off from the main wall and allows ventilation. Thermal insulation too.

trombe walls use a combination of thermal mass and glazing to store solar radiation that that it can be used to heat buildings.
for brick laying:
Perpends MUST not vertically allign in any two successive layers.
ring beams improve structural stability of brick walls, other walls.
BUILDINGS MOVE.
Movement joints can be implemented between bricks. Looks like these long vertical strips .
earth, moisture, and temprature xauses the built environment to move.

horixontal loads can be resited with a lot of junctions in walls connecting to other walls.

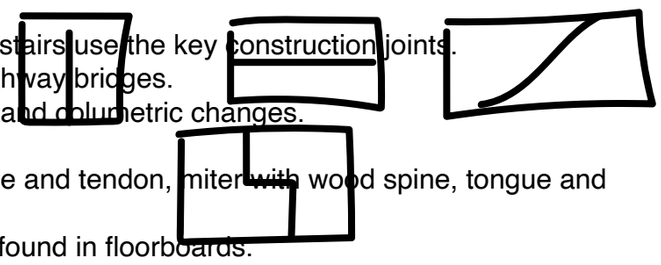
MORTAR
mortar in brickwork transfers the tensile, compressive, and shear stresses uniformly between adjacent bricks,
mortar can suffer from dampness penetration.
DPC (damp proof course) can be put between bricks to prevent moisture from being absorbed.
EFFLORESCENCE is the absorbtion of salts and other minerals from the soil into brick or concrete walls.
CAPILLARITY is the effect of the water seeping up the walls.
sacrificial layer of bricks or masonry in old world construction were used to slow down the results of capilarity and stuff.
U-Value is the maximum transmission of heat or energy through a material. the Minimum resistance is the R-value. measured in W/m^2K!!!!
acoustic performance and fire resistance of walls. Acoustics mostly relies on the mass of the material in the partition. transmissions can occur through the flanking connections of walls.

HORIZONTAL STRUCTURES

Gallileo discovered as the length of a beam increases its strength decreases,
hammer beams are these beams that sitck out from the side, short, because that is stronger, help build a roof that cover a long distance.
floor provides: structural support, resistance to the mousture, heat, and sound, and the look of it is important.
subfloor is the load bearing structure. or structure floor, it can also be called that. base for the finished floor.
types of floor:
flat slab, flat slab with drop panels, flat slad with column head, flat slab with drop panel AND column head.
screed is a sort of concrete layer, makes the floor perfect for finishing later.
BEAM and JOIST
joist usually are smaller elements. joists are often supported by beams. joists run between either wall or beam. ceiling beams tie the walls together and support the stuff above.
beams can be cantilevered or simply supported. or both!
primary beams run more often, and secondary beams run between those beams,

connections can be concrete, or panel/joijned. or prefabricated even. you want to make sure theres some anchorage.
ribbed floor are one object, this runnning attached beams.
suspended timber floors are floorboards lain on suspended timber beams, with airtight seal between beams and floorboards.

JOINTS
can be very simple. utilize friction and weight. well duh.
metal plates are often incorporated where timber alone would not be strong enouhg for a given load. concrete structures need joints because large areas cannot be cast in one shot. concrete exhibits volumetric changes, and structures may have independant elements with different supports (diff stuff), and control the location of cracks.
types of concrete joints:
construtiopm, isolation,
TWO SLIDES TO READ AT HOME
types of contruction joints
vert, incllined, horiz, and key construction joint. stairs use the key construction joints.



expansion joints are the teeth at the ends of highway bridges.
joints between concrete slabs allow for thermal and volumetric changes.
wood joints!!!
doweled butt, dado, rabbet, lap, dovetail, Mortise and tendon, miter with wood spine, tongue and groove,
dado is just half-lap joint. tongue and groove is found in floorboards.
Mortise and tendon is a rectangular socket insert.
birdsmouth join is used for roof construction, cross lap joint can be used for beams, and splice joint joins two boards end to end.
glue laminated timber has high fire resistance, unique dimensions, flexibility, and other resistance forms.
Glulam bamboo is possible,
section of structural slab floor is in the SLIDES.
composite floors have bars and ceramic elements that interlock, and then concrete is on top of that.
the ceramic elements can be hollow blocks, or other ceramic shapes.
form decking is a permanent formwork for a reinforced concrete slab. not removed formwork.
acoustic decking contains glass fiber to absorb sound.
cellular decking , where corrugated is attached to flat metal sheet, allowing for passage of cables.
precast floor systems require cranes and being leveled. cuz they so heavy.
flat grid/waffle system is lighter than some other alternatives, used on large surfaces. can be prefab or cast in situ.
FLOORS NEED to accomodate services. covering the services costs money and is often not necessary. floors also need to be adaptable for all these services. with all the pipes and ahrd surfaces there must be acoustic solutions.
access floors dont only need to be completely accessible it could just be a section or lane.
sprung floor, very modern. You can find them in gyms/athletic halls. for joint support.
separating floor is to prevent sound transmission.
underfloor heating system evenly heats the whole floor.
a dropped ceiling is in offcie buildings and schools, conceals wiring and ductwork. the space between the structural and the tiles is called plenum. good to know that. also have acoustic properties.
slide about design challenges to READ IN THE SLIDE. !!!!
keywords at the end of the presentation.

SPRUNG floor for school gym.
the space between the dropped ceiling and floor is PLEENUM

WINDOWS
glass used to be glazed together with lead
the first made glass surfaced at 3500 BC in eastern Mesopotamia and Egypt
Window Tax: property tax based on number of windows in a house. Designed to impose tax relative to income, but repealed. Some people woud brick up windows and later glaze them.
Casement and Sash windows differences. Casement windows now usually open to the inside, but have opened outwards too.
Learn all the component names to windows. Jam, sill, transom, miullion.
Sash were divided into smaller panes of glass which made it cheaper.
french windows open in, casement windows open out.
Hopper windows are the top little propped open windows that open to a certain angle.
“hanging” is where the hinges are in a window.
laminated glass is used for railings or balcony where the glass pane must be very long.
dessicant is to dehumidify things
dessicant, in double glazed windows, is placed with the seal around the edges of the windows.
the dual-action windows are called tilt and turn windows.
roof windows are defined as in the roof plane, but reachable. Skylights are in the roof but are unreachable.
Cupola, roof lantern(a) (WHAT IS THE DIFF)
bay windows, or bow window, is a muti-paned window to create a protrusion from the wall.
SICK BUILDINGS and Laguna disease
transom window
windows above doors, can be either operable or fixed for ventilation.

FIXING, when installing. fixed with long screws into expanding plastic plugs in the brickwork. and then insulated of course.
old windoes used putty and very tiny nails.
TECHNICAL TERMS
- U-Value W/m^2K (thermal transmittance)
- air leakage
- solar Heat gain coefficient
- condensation resistance

Low-emissivity coasted planes reduce heat trransfer, and the positioning of windows impact efficiency. double or triple glazing can save a lot of bills.
more comfort home
Peace and quiet
less condensation and moisture
ENERGY EFFICEINT WINDOW MATERIALS:
GASS
GAPS TWEEN GLASS
PANE SPACES
FRAME MATERIALS (uPVC)

U-VALUES
the lower the value the better.
most windows these days shoot for 1.1 u-value. Watts per square meter.
a fire rated window is shatter resistant and will help to compartmentalize fire and smoke. must prevent fire and stuff through 20 minutes or other time period.
TRICKLE VENT
a TV is a very small opening in a window that allows small amount of ventillation. recreased dampness, and better than opening major openings. improved comfort through draft resistance.
WINDOW HARDWARE
ahndles, spacers, hinges, drapery hardware.
Louvres windows were used for ventillation without letting pests in.
Blinds and awning. a blind is also known as a shade.
CLERESTORY
clerestory windows, fixed. bring light into churches or cathedrals. prevent against unwanted eyes. “painters love them”
roller shutters/blinds
Mies Van Der Rohe uses giant moving panes of glass in Villa Tugendhat in 1930.

DOORS
We have single leaf and double leaf, louvered, moulded (MDF) or paneleds, slidjng, pocket.
TYPES OF MECHANISM LEARN THESE TERMS
hinged, folding, swing door, revolving doors
A SLIDE WITH TECHNICAL TERMS OF DOORS, GO READ IT.
Swing direction.
swings are determined while standing on the outside or less secure side of the door. There is an explanation of it in the presentation go read!! she gets ramped up about this.
Fire doors: panic bars are the horizonta bars that are on the inside only. Fire doors must be tested and certified to resist fire for a certain about of time. sometimes doors have internal strips that expand in heat and prevent penetration.
glass doors have some regulation to make them safe.
Hatch doors open from roof to attic. Trap door is just on floor. sometime frog or rat one-way doors?
Porte Cochere is a large awning that a coach or car can pass under.
Air curtains make people entering from cold, immediately warm. THey just use a lot of energy.
ACOUSTICS OF DOORS.
insulate gaps, fin type smoke seals are better than brush seals. Sometimes acoustic doors are expensive, something about double paneling a door.
next week we will talk about staircases!!! Woop Woop.

transoms are heavy dity horizontal dividers in windowpanes and mullions and muntins are vertical

STAIRSSSS
Main staircases are generally prefabricated, and muhc nicer than service stairs.
stairWELL is just the whole space a stairwell is in.
floating stairs hace no landing, and modern requirements say stairs should have maximum 16-18 stairs in a flight.

2 risers + 1 tread = 63-65 cm. THIS WILL BE IN THE TEST

String, Stringer, Stringer board is the thing that holds all the treads.
Running (?) is related to carpet.
headroom of 2 m at least on all landings
- winders are steps that seem to cover landings. this is when we dont have a lot of space to go up a lot.
- balustrade is system of railings and balusters to prevent falling.
- NEWEL is a large vertical beam that supports the stairs on the sides. Inside corners.
- stairs angle should be between 28-36º
- ladders and ramps on other ends of the angle spectrum
- eliptical stairs are ike u shaped..

NOISE AND VIBRATIONS IN STAIRS
- solutions: impact sound insulation

RAMPS
- no more than 1 to 12 ratio. most comfortable is 1:9

LIFTS
- 1852 first safety elevator
- terms relating to lifts are on slides
- multiple elevators in a row is called a bank.
- standard elevators are cable-borne. aNYTHING IN GREY LETTERS DOES NOT MATTER TOO MUCH
- more modern is roomless elevator, and saves space.
- roomless elevators used MRL machines.
- hydraulic elevators can be smelly, but useful in small areas.
- lift shaft dimensions are in the slides.
- vehicle elevators
- slide on elevator air conditioning if wanted
- flat escalators are called travelators!
- whats a winder?
- video at end in link,.
- NEXT WEEK IS ROOFS
-

ROOFS
- basic requirement of roofs is to keep the weather out
- carry self-weight of roof and also resist climate loads.
- roofs can account for 25% of the heat loss that occurs in buildings/homes
- also prevent the spread of fire.
- working of copper roofs is synonymous with gothic architecture.
- ridge board runs along thw ridge, with rafters going down from that and battens holding the rafters together on top.
- Purlins hold on to rafters from the bottom.
- rafters have birdsmouth joints to accomodaye wall beam shapes, ceiliing joists, and wall plates.
- a gable is a trianguar section of the exterior wall.
- side gabled in when the door is on the side, and front gabled is when the door is on one of the walls where the gable is.
- cross gabled is when it has a joint.
- hipped is when there is no gable, but more like a diagonal gable. can be pyramidal, or cross-hipped.
- hip and valley. Hip runs away from the roof ridge.
- saltbox is when a gabled roof goes farther down on one side.
- you know what a mansard roof looks like.
- shed roof are planar. Flat roofs are angles below 15º.
- trusses are tranguar composoitons that make all exterior forces sort of act ony at the nodes, or intersections of truss members, which centralizes or eliminates loads.
- wall plates are typically timber placed on top of the wall for rafters to run to the ridge beam from. Couple roof is the simplest and most common, when the rafters just lean against each other.
- the rafters are sorta tied together by the ceiling joist, and thats when the roof becomes “coupled”. The ceiling joist ties them together.
- the most common type of truss is the kingpost truss, with a central beam, but the queen post truss makes a square in the middle that is nice for crawlspaces and attics.
- wind loads are based off of 90mph
- mission tiles are the ones by the studio. Can be imbrex (top, convex side up) or tegula (bottom, concave side up).
- pantiles have s-shaped crosssections.
- oi canning is the slight waves on sheet metal roofs.
-
- FLAT ROOFS
- the first one in the central european area is that one by church.
- minimum fall is 1:40 of flat roofs.
- common flat roofs coverings include sheet materials, bituminous felt, sheet metals, or asphault.

THREE MAIN CATEGORIES
Warm, Inverted, something else.
- 30 year roof replacability schedule.
- main concern is durability.
- must consider water vapor and thermal insulation together
- also consider wind performance.
- very strong and heavy dampers are buit to resist sway in skyscrapers.

Buildiing construction can be generalized into these categories:
RIGID CONSTRUCTION, with ring beams perhaps,
FLEXIBLE CONSTRUCTION, with plywood or metal sheeets
what is positive internal pressure?A litte bit of pressure helps the movement of air inside.
singe ply roofing is asingle alyer of asphalt ply with a thickness of 45-90 mm.
rubber roofing uses adhesive and keeps seams watertight. one of the oldest single-ply roofing member on the market! Does not have much longevity, and must be replaced 7-10 years.
causes ponds.
roof materials must be uv resistant!

tar was also used, but tar roofs crack.
asphalt shingles are made in sheets of 6 or so.
what does gravel do? Gravel provides shade to the tar, reflecting the light, and preventing the harmful uv rays from penetrating the tar.
COLD ROOF
- the primary thermal insulation is directly above the ceiling. below the structural deck. more accessible insulation.

WARM ROOF
- insulation is nex tto the roof. above the structural deck.
-

INVERTED ROOF
Ballast, rigid insulation, waterproofing/vapor, concrete, ceiling.

Flat roofs may be drained with two methods: idk.
those turning things on roofs are ventilators!!
roof needs expansion joints.every 60 meters or so of length.
metal roof panels use Welking. called flashing.
flashing often covers the expansion joints.
guttering and downpipes must be calculated depending on location!
must strain drains.
stack effect is the effect of air or water air rising throughout the house.

green roofs need to divert water from roots, and protect roots from structural members / intensive roofs need serious irrigation.
roof accessories: roof hatch, vent caps, light tunnels, roof gulleys.
De-icing cables

KEYWORDS WITH USEFUL SUMMARY ON LAST SLIDE

next week about facades.
and then furnishings/finishings\

100 questions, 100 minutes
multiple choice, only one is correct
the first round will be in person, 18th dec
second: online third: online.
many students dont pass the first round.

FACADES
- PLASTER
  - used since ancient times, egypt, babylon, crete,
  - easily colored
  - lime plaster is softer, used for the interior
  - cement plaster is harder, used for external environments.
  -
- CORNICE
  - means ledge in italian.
  - Baroque structures have very ornate Cornices.
- CUBIST STYLE
  - only at CZ
- ADOLF LOOS
  - Ornament and Crime:
    - loos developed his simplistic ornate geometry from a statement from louis sullican saying “we should abandon ornamentation”
- BAUHAUS
  - introduced the curtain wall
  - glass curtain wall doesnt carry any weight but itself!
- FACADES MUST HAVE:
  - thermal insulation
  - noise insulation
  - daylighting
  - no falling, horizontal loading
  - fire protection
  - ventillation
  - aesthetics
  - effective maintenance
- FACADE TYPES
  - CURTAIN WALL
    - stick built,
    - or unitized
      - large units, assembed and glazed in the factory.
    - post wall, like post and lintel but just post.
  - POST AND BEAM
    - like glass and aluminum beam
  - GLASS FIN FACADE
  - DOUBLE FACADE
    - adding an extra later of glazing for thermal or sound insulation
    - The Gherkin has it.
  - DOUBLE SKIN
    - add privacy
    - Rain Screen, which is a ventilated facade
      - drained and ventilated rainscreen
      - pressure equalized
  - EXHAUST AIR FACADE
  - INTEGRATED FACADE
    - has heating and cooling and daylighting integrated
    -
- LEarn about how they are supported
- big panels (whole walls) can be installed all together
- IMP (integrated metal panel)
- Must withstand wind load and movement.
- thermal expansion too
- Facades have Warm and COld facades too, just like roofs.
- AREAS OF CONSTRUCTION
  - primary structure
  - Secondary Structure
  - INfill elements (glazing)
- Shading design
  - in urban environments it may be necessaru to provide sun protection on all sides of the building
- WIND LOADING and SEISMIC LOADS
- FIRE PROTECTION
  - steel is not very strong after 600 C
  - timer burns at a constant rate, members can be overside to provide resistance
  - cocrete is good, but insulation needed around the rebar.

NanoCoating:

CZ Leads the global market

link to good website at the end. short keywords

INSULATION LECTURE
what is the difference between waterproofing and damp proofing?
waterproofing in structural engineering is keeping out groundwater that can cause pressure!
dampproofing is protection against humidity and water contained in the air: no pressure made

ENVIRONMENTAL FACTORS
- Air temp
- Radiant Temp
- Air Velocity
- Humidity

PERSONAL FACTORS
- Clothing insulation
- Metabolic heat

What is thermal comfort? what is optimal?
U-VALUE IS w/m^2K
EPC - Energy Performance certificate
A-G. Want like a 70 score.
types of insulation: structural and non-structural
Insulating concrete form (ICF)
- contains some bubblles or polystyrene

THERMAL BRIDGING
-two materials that are un-insulated and are directly or connected to each other that go outside, and are serious sources for temprature loss or condensation
it is hard to have supportive elements int he structure while maintaining insulation.
new developments such as “isoshock” i think are structural insulation members.
prime areas for concern:
- window/door jamb
- balcony slab

IGU’s, insulating glass units

Intumescent materials dont let fire through,
a very special type of insulation is Radon Gas.
- radon can enter house through soil, building material, or water. It can cause cancer.

ACOUSTIC INSULATION
- Textiles are very good at insulation for sound. UNderlays too.

PRIVACY Boards...?
Accoustic ceiling baffles
- they reduce reverbs
- two videos that are very interesting on ears
- KEYWORDS AT END

FINISHES
-used in the final part of construction. make the building nice.
wet applied
dry applied
base
primer
finishing mateirals
- lime, cement, and gypsum plaster.
- Materials like these have a binding component, like cemebnt, responsible for strength and moisture resistance
- and then they also have a structural element
- add ins effect finishing time and stuff
- pebble dashing is pebbles in plaster
- varnish is a hard coating on wood.

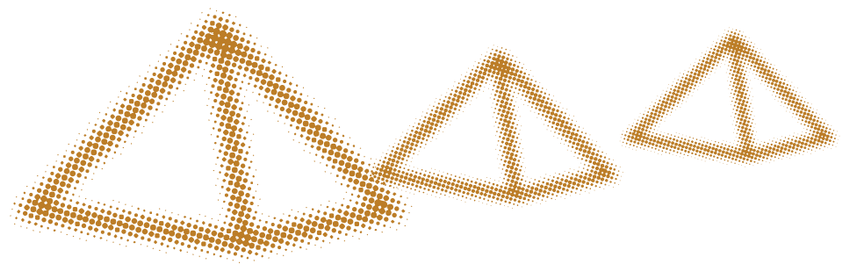
SCREED
- manually spread or self-leveling.
- the surface has to be well prepared.

TERRAZO
- with cut pieces of pebbles. its what the holywood stars are made of. stones in an emulsion.

ANTI-BACTERIAL
- terroxy resin systems for hospitals, schools, hotels reduce infection risk.

THERMOWOOD
- treated wood which improves wood to reduce moisture content, thermal conductivitu, stability, no decay, its pretty good.How much more cost?
- at the end of the presentation there is a list of 10 possibly industry changing materials.
- learn about skirting
- terrazzo is that pebbly flooring
- wood/floor joints
- veneer is a rich material applied on top of inferior material.

ART HISTORY 1



SEPT 7 2023 Taught by Hana

- Written exam, 1 hour 20 mins.
- lots of excursions in the future of this class
- class relies on identification skills

ANCIENT EGYPT

INTRODUCTION
- Regular floods is what helped egyptians flourish. two crops a year.
- villages and towns built on the escarpment where the floods could not come
- somehow the effects of the floods are reflected in the art and architecture... to be expanded on later. duality. life and death. dark and light.
- the nile has moved pretty far eat over 5000 years...
- the inundation of the nile is when the nile would be flooded; from july to november
- inundations were measured, and that data was used to calculate probable food production
- kemet/ Black land: farming and cultivated land.
- Desheret/Red land: rocky and inhospitable land.
- Nile is a highway for communication as well. North and South settlements.
- cleaning the canals was very important.

LECTURE TWO

- read one of the top three books. come and ask qustions about it.
- do noy reuse the posted materials anywhere, loaned in confidentiality!!
- always mention your sources in essays. very particular on plagarism. theres an essay on plagarism to read.
- book on studying art histry. sections on navigating art history exams, Chapter 4-5 are the good things to read. written 4 beginners.
- UPPER AND LOWER
- upper egypt is what is downstream on the nile, so southern.
- Upper egypt is associated with louts flower, and Lower Egypt is associated with Papyrus plant.
- LAND OF EGYPT
- extraordinary mineral wealth, semiprecious stone, gold, alabaster, basalt, and ither traditional building stone. Stones like Lapis Lazuli was traded all the way from afghanistan across the fertile crescent.
- the idea of having eternal life was mirrored is the constructoin being done in stone. Lime and Sandstone were the main rocks used.
- Local limestone quarries were the source of limestone for the pyramids. Aswan quarries (pink red) Diorite (white, mostly black)
- Economic redistribution was very big there. the pharoah owned the stone, and distributed it out.
- Whern the Pharoah wanted to build something, he chartered an expedition
- stone had important symbolic value, based on its color. Granite, with its red color, was related early on with religion. Red related to sun god. White (alabaster) was clean and pure and heaven like. They would paint stars yellow on blue backgrounds for night scenes. yellow emulated gold.
- statues were very personal for burial areas.
- Egyptian art, and architecture, is FUNCTIONAL. not just aesthetics.
- Hierarchy of materials, transportation of mateirals, knowing these things make the art pieces take on more meaning. ‘
- wood: not very high quality. They used Palm trunks , prehistoically traded for cedar for big construction projects, some sycamore(?)
-

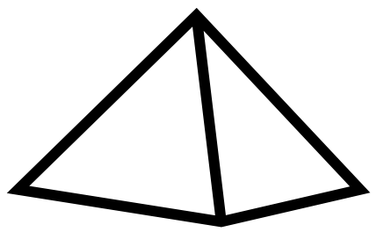
LECTURE THREE!!

- art was delegated to specific artists.
- Quarry works used wooden Mallets and Chisels.
- covered quarries
- dry wood was saturated to peel blocks off the ground...
- bricks were made with chopped straw
- tombs had real offerings, painted offerings, family offerings, and then also lastly a painting of production of a specific item. thats the key to eternal life! Offerings!
- first tourists come in around 1840.
- napoleon goes to egypt to find a way to india
- which brings the interest to egypt
- a few info books were published and spread to americas and europe, which spurs more egyptomania.
- Light and shadows effect in Architecture and Art
- the sun is very strong, making the contrast and duality stronger. Hana is very intent on teaching that there are so many forms of duality in Ancient Egypt.

Reliefs:
- there are raised and sunk reliefs. raised were often painted. sunk were used for exteriors due to light and shadow and didnt need paint.
- Egyptian art is functional. Aesthetics come second.
- most art was produced as Funerary art.
- the art tells complex social stories, and things hard sculptor and artist names on the walls.
- art tools were simple, especially sculpting tools. They had balls of diorite, copper and bronze chisels.
- nefertiti
- Egyptian statues are geometric and stable. different than hellenistic sculpture with its twistingness.

LECTURE FOUR...

- Predynastic period started in 5500, but we will start earlier because there were architectural structures before that.
- early dynastic period and the old kingdom ran from 3000 BC to 2000 BC
- middle kingdom ran from 1994 BC to 1543 BC
- new kingdom from 1540-1300 BC (when egypt ruled a large area) (locality was in central egypt, thebes/luxor.
- Alexander the Great has relation to Ptolemaic period and Ptolemy. (300-30) BC
- roman era (turn of the ages-300) and then Byzantine egypt
- Narmer Palette shows moment of unification of lower and upper egypt. Accomplished by King Narmer. King Narmer striking an enemy.
- Kings had five named, but the king of upper and lower egypt was given to Narmer.
- King Khafra. Built the second pyramid? sits powerfully. The king as a god. ideal royal image of the old kingdom. on his seat are depictions of the lotus flower and the papyrus plant knotted together. r
- red crown is the crown of lower egypt.
- osiris and black dirt and resurrection are related. Osiris was a dynastic (big leagues) god during the middle kingdom.
- something about soil being put in a tomb with grain in it and the grain began to grow. Osiris was the king of the underworld.
- white crown the tall crown of upper egypt.
- double colored crown to represent rule over a united egypt.
- regalia included a fake beard, a sacred protecting cobra attached to the crown, called Uraeus.
- ADMINISTRATORS were at all “levels” and a valuable position, those who had it had good lives. Scribe types.
- the introduction of HIEROGLYPHS was one of the most important developments in Egypt. a close connection between the depictive hieroglyphs and their subject manner (royals, the dead, etc) was apparent.
- each hieroglyph has a phonetic value. Simplified hieroglyphs were Hieratic signs made for day-to-day records.



LECTURE FOUR...CONT

- RELIGION: multiplicity of gods. each had different ways of manifestation.
- ankh means life
- christians thought they werent pagans.
- primeval hill that appears was a super ctructure and the start of the world. the egyptian rulers are buried under that hill, so therefore from the start of the world
- ART
- READ ONE OF THE ARTICLES SOMEWHERE (on art)
- egyptian columns had their own orders like greeks, but they were more inspired by nature and location.
- \when they died, egpytians hoped not to go to paradise but to live a life similar to the one they just had. that is why egyptian art that accompanied them to the grave carried their life with them. pre-ritual Washing bowls, furniture, bread and water,
- mummification was suggested a s a way for the spiritual aspects of somebody to be preserved after death
- most of the surviving egyptian art we see was never meant for public viewing.
- Therefore, the art was *ESSENTIALLY* functional. never meant to be public.
- artists were separated into groups depending on what type of matieral they worked with. wood sculptors with furniture makers, stone sculptors with stone masons and architects.
- workshops were in the nearest vicinity of the construction sites, same as quarries.
- staatues were made in pieces and covered in Stucco for details
- PRINCIPLES OF EGYPTIAN ART
- Aspectivity: no rendering of perspective. drawing what they know instead of how something is seen.
- other principles include symmetry, 2 dimensionality, false transparency, hierarchical perspective.
- canon of proportion was placing a grid of equal squares over the human figure therefore being able to reproduce it in the same way with the same styles. it contributed to making egyptian art much more recognizable.
- figures were often organized very symmetrical and repetitive manner.organized into rows and maximum space used.
-

LECTURE FIVE.

- ASPECTIVITY!!!
- HTP hieroglyphic symbol on the altar before a false door to a tomb.
- door symbolizes granite, pink granite.
- architectural element on the fake grave doors wa sthe cornice, which was
- fake door symbolized abundance in as many ways as possible
- \above the door was an “offering scene”
- the OFFERING CHAPEL is the essential part of the tomb. it is where the family and the priests can come and make offerings on the altar. must be pure!

ARCHITECTURE
- the royal tombs of the old and middle kingsom were in pyramid complexes. onllt the new kingdom pharaohs chose cliff-face desert locations, usually in dried river beds, in what is now know as the valley of the kings.
- pyramifs had these paths to riverbed temples for offerings
- tombs at the river complexes were prefabricated, they were for brothers and sisters
- djoser step pyramid was symbolic of a stairway to heaven. at saqqara. beuilt by Imhotep.
- the forst true pyramid was built by Snofru, in the 4th dynasty.
- the Great Pyramids at Giza where erected by king Khufu, son of Snofru.
- Snofru made the mistakes that Khufu learned from. Allowed Khufu to make a LOT and prefebraicted stuff and everything.
- Mastaba were PRIVATE TOMBS. rectangular. had tombs in the substructure.
- shafts went to the roof to completely seal off the tombs. were prebuilt before burial, and after burial were filled in with rubble to prevent against tomb robbers.
- Egyptians were syncratic in their religion. combining new without letting go of the old.
- insides of temples contained the Naos, or a shirne to the divine image of a god
- state temples were temples to gods, there were not mortuary or funerary temples to the pharaohs.
- Hatshepsut maybe had an affair with an architect. just putting that here. eeeeeeeee
- egypt late PYLON temples were very modern, monolithic, even fascist architectures (temple of isis in Philae)
- ARCHITECTURAL CHRONOLOGY
- predynastic period 5000-3150. in 3150 the unification of lower and upper egypt. these early nile settles had decorated house decor inspired by nature.
- Calendar circle was maybe one of the earliest astronomical devices sued to measure the summer solstice.
-
-

LECTURE SIX?

- Remember, canon of proportion was to copy previous pieces of art. changes of proportion distinguish changes in period.
- Egyptian canon is dual perspective, featuring the most important parts
- the more you see the more you have.
- similar to cubism! Picasso studied egyptian and other african art
- false transparency to show the maximum amount of information
- sometimes the landscape was painted on the bodies of figurines. Opposite of false transparency. The setting was often important to the figure.
- men in egyptian art are shown with darker skin and in walking poses, so display activity, and women are standing and pale-skinned to show a domestic life.
- Hierarchical perspective was used to show the important figures in the scene. Normally double the size.
- from the beginning, egyptians understood very well the propagandistic uses of art.
- STATUES
- statues were a substitute or a physcial abode for a spirit after death; they were all identifiable..
- statues and reliefs were brought to life so that they could function
- altars were in the shape of a hieroglyph meaning abundance!!

LECTURE SEVEN0

- early egyptian shrines were stylized, and could be associated with different gods. Originally made from light plant material.
- shrines are similar to the biblical traveling temple that had the ark of the covenant.
- some burial tombs in the grounf had a big burial room and a separate room for afterlife gifts.
- People back then were very good at orientation.
- Hierakopolis was where the Narmer Palette was found, and was a bumping pre-dynastic
- Libyan Tribute Palette, protodynastic period, 3000 BC. Carved from tough Basalt. Not present in the Nile valley. Showed fortified nubian cities and waht gifts they had.
- EARLY DYNASTIC PERIOD, THE ESTABLISHMENT OF A UNITED STATE UNDER ONE RULER, HIEROGLYPHICS, ROYAL ICONOGRAPHY ESTABLISHED, PALETTES AND MACEHEADS ARE DEVELOPED INTO THE ROYAL VOTIVE OBJECTS.
- ABYDOS: royal necropolis of early dynastic period. in lower egypt. moved north from Hierakonpolis.
- first ever tomb of the QUeen: Primevial hill.
- boats for funeral precessions were also buried with the body.
- imhotep was the first architect ever to be known by his name
-

LECTURE egght0

- palettes were made of basalt, and sued to ground malachite.
- early figurettes in the early dynastic period. funerary statues. beard MEANS GOD. very abstract bodies.
- potterywas mostly produced for funerary equipment with meticulous detail, and were even sold abroad.
- vessels were the main medium to start egyptian painting.
- figurative motivs. dancing goddess. dancing goddesses made of stone, but idealistic women figures sometime were made of ivory, thus showing their worth.
- HUNTERS PALETTE - HUNters corrall desert animals and kill them. depicting the dange rof the desert.
- KING KHASEKHEMUSED evil entities to help him.
- OLDDDDD KINGDOm ART
- peak pyramid building time. first monumental stone building too.
- mastabas were non royal tombs. started to get decorated. with everyday scenes.
- first known standing life-sized statues in the world
- inside of the tomb symbolized the palace
- rhe tomb had the equipment of the palace.
- the top floor of the tomb could have the primeval hill and benches with palace facade.
- mud bricks and sandstone
- granite sometimes.
- 11-13th dynasties, was age of classical egyptian language.
-

LECTURE NINE

- formulative time in the old kingdom ages. cards put into hands that would be dealt for the next long times.
- pyramids were built above the nile valley, which definitely made them more visable and impressive.
- painted stucco and painted white. wall that symbolzed the first temple palace was named white walls.
- there was a lot of gilded tips. sun god ra glowing white.
- egyptian word for pyramid was MR (mer). pyramids were always in oyramid complexes mostly. and very functional.
- two type of pyramid complexes: East-West and North-South. changed during dynasties. changes of religious belief, which god is the most important god.
- THE COOLEST CASE STUDY: Djoser step pyramid complex in Saqqhara. it is so important because it is the first monumental stone structure. petrified stuff in the building material?
- 11 gates. only one of them is the real entrance. why?
- what went on in the stuperstrucutre of the complex was recorded in facade below pyramid.
- pavillion of the south was int he shape of a typical southern egyptian temple, while pavllion of the north was typical of the north.
- western massifs are weird. Djoser, out of piety, included crazy long structures into his own complex, which have underground chanmbers with hundreds of stone vessels of many beautiful different types. funerary equipment.
- the pyramid was made bigger over time, so Djoser's tunnel is off-center.
- the labrynth was not repeated under the pyramid in later dynasties.
- there is a book in IS about pyramids if I am interested.
- engaged columns, separated columns in DJOSERS. dont fully understand limestone yet?
- modeled columns after plants
- the shiny statues that scared workers were in a mastaba part of a certain complex... dunno which one.
- Bent pyramid was built on top of very moist soil and clay, tafla, making the pyramid crack. it was built bent though.
- snofru moved north and built the red pyramid, the third pyramid, during his life.
- the red pyramid had the first stone arches. Corbel vaulted ceiling.
- pyramid cladding was almost white. preserved near the bottom of red pyramid pyramid?
- Djoser kinda just failed a lot until the red pyramid.
-
-

LECTURE TEN

- buildking blocks were from lical quarries, but cladding was from afar.
- farmers were hired during floods to be builders. there were bakeries unearthed by American Leonard.
- ramps for building pyramids can differ from straugh and thin, striaght and thick, and spiral ramps.
- there were earthquakes in egypt, but the pyramids were able to absorb the waves.
- a quicker way to build pyramids was to use mud bricks for the entire interior and then stone only for the cladding,
- Pyramids had foundations underground.
- entrance from the north.
- theres a weird undecorated chamber at the bottom of the KHUFU pyramid. Why?
- smart wooden structures were used to manuever stone blocks into the great gallery pof the khufu pyramud.
- pyuramids had offering temples at their bases.
- Pyramid complex of Khafra. the temple at the base becomes more complex and spaciallt divided! 5 chapels. more storerooms, and alsi as a payment for priests. temples became more decorated. over-sized statues.
- temples were the most complex in the 5th dynasty.
- the sheer amount of priests and other economuc problems regarding them caused the old kingdom to "collapse".
- thick temple walls.

LECTURE TEN.. CONT

- in the old kingdom pharaohs were idealized in sculpture.
- ABUSIR: there was a big lake that got bigger after floods. people started to build their own sun temples, connected with the pyramid complexes, RA was the most important god. every pyramid complex should have a sun temple, and abusir had two if not more.
- the pyramids in abusir once had cladding like all the others, but thier interior construction was strictly out of mud bricks. So when the cladding was stolen, they crumbled from the weather..
- 5th-6th pyramids were not massive like the pyramid complexes of earlier dynasty.
- astrological observations were done on the tops of the pyramids/temples.

LECTURE 'LEVEN

- Midde kingdom is classical egypt!
- traditonal daily action wood figures in tombs became very popuar at the end of the early kingdom. Its as if the 2D reliefs became 3D.
- a new artistic style, typical for its bold treatment of volumes and non balanced proportions.
- WHITE CHAPEL OF SENSURET I:
  - rectangular construction.
  - amount of goods to send (taxes) were in relief on the walls.
  - built interior with mud bricks, and shel was stone, which required these ties between blocks, ike wood ties.
- mud brick pyramids had interior stone skeletons
- pyramid passageways were very small
- palace facade: series of niches and extrusions. Refers to royalness. Lol.
- Pyramid complex of amenemhet III at hawara had a new temple complex, larger than the pyramid. a LABYRYNTH OF STRABO
  - they built the first real arched ceiklings.
  - had things that showed new crazy dresses for warrior, and new gods. the crocodile god.
- As the kingdom changed, the depictions of the pharaohs changed.
  - now they look old and maybe wiser. more mature. Senusret III
- MIDDLE KINGDOM FORTRESSES IN NUBIA
  - they needed the fortresses as related to the river.
  - They built them above some crucial places where their ships or boats could be distroyed.
  - had barracks, granaries, temples, and a palace facade wall.
  - fortresses were on escarpments above the river nile.
  - Semna and Kumna were across from each other.
- PYRAMID EPILOGUE
  - they stopped using the pyramids as a tomb during the ___
  - the pyramid slid down the social ranks.
  - Craftsmen who lived to mkae the valley of the kings could not leave because the valley of the kings was supposed to be very private.
  - workmans tombs were small pyramids.
  - these small pyramids were at Meroe, in Nubia/Sudan.
- HISTORY OF ARCHITURE. TEMPLES AND TOMB ARCHITECTURE. 1800-1100 BCE!
  - NEW KINGDOM (1500-1300)
    - numerous contact with other countries/greater freedom
    - royal burials were all in the valley of the kings,
    - tombs no longer had representations of every day life, replaced with fate of the dead in the next life.
    - initially was monotheistic under Akhenaten, but then back to polytheistic under Tutankhamun and Horemheb.
    - the TOMBS ARE ROCK CUT. They would not bury the family of the kings in the valley of the kings. But they had their own beautiful tombs rock cut in the cliffs above the temples.

LECTURE 'WELVE (ART)

-
- Midde kingdom is classical egypt!
- the steele (stela) of princess nefertiabet represents prefabricated tombs! everyone had the same tombstone.
- sometimes, under the feet of middle kingdom throne statues, the pharaohs have "bows" under their feet.
- HEADS
  - reserve heads, not whole statues. prefabricated.
  - placed in entrance to burial chamber
  - nose and ears were chisled away. Why?
  - there were just so many of these reserve heads.
  - BUST OF ANKHHAF
    - super geometrical, not royal, big bust. did not know why it existed.
    - this bust was showing the body going OUT of the burial tomb! Body moving between burial chamber and offering area.
  - wigs can be used to date. wi
  - the statues carved from hard stone, ike granite, could be painted, but only the important details.
- the thing that looks like a carrot is for the opening of the mouth
- copper statues began to be produced in the 6th dynasty. they were casted in multiple parts and then nailed together. they were also painted.
- Figures are becoming slim and poor creation. What is happening! they are all clumsy! this new "second style" is from the local artists
  - more and more couple statues. family statues.
  - appeared on royal statues first and then went to private statues by the end of the dynasty.
  - They also became naked statues?? 6th dynasty
- MIDDLE KINGDOM ARCHITECTURE DYNASTY 12
  - priests have shaved heads, polished stone
  - depicted workshop scenes, in wood.
  - more realistic pharaohs show the inner weight of being pharaohs, tough life.
  - Faience figurines of hippopotami were placed in middle kingdom tombs, they were connected to ideas of fertility and procreation.
- NEW KINGDOM
  - more contact with foreign places, better depiction of reality.
  - depth in painting, and not only profie views. showing momentum and people have induvidual features.
  - so much painting of heiroglyphs. carved and painted! wow!!!

DOTS SYMBOLIZE THE DESERET!!!

LECTURE IRRRRTEEEEN

- FINAL WRITTEN EXAM: TWO TRIELS: LAST WEEK B4 CHRISTMAS, FIRST ON MON THE 18TH, 15:30-17:00, STUDIO 1, SECOND ON THURS, THE 21ST, 14:00-15:30
- LAST LECTURE IS ON THE 7TH OR 8TH.
- VARIOUS TYPES OF QUESTIONS: OPEN QUESTIONS, DRAWING, IMAGE IDENTIFICATION (DATING, WHAT IS IT, WHY IS IT IMPORTANT). BLIND MAP!
- EXAMPLE: KNOW WHY THEY USED SANDSTONE VS. LIMESTONE.

- NEW KINGDOM!!! (1543-1292 BCE) Dynasty 18-20
- an empire built of stone
- reach to euphrates river to the east, south to sudan, west to libya. North to cyprus and crete.
- monotheistic reform by amenhoten 4 because the priests were too rich. God of Ra.
- Priests controlled the egyptian economy
- names were program for phaorohs lives.
- temples were pushed to the valley, and burials happened in the valley of kings and queens.
- private tombs became subterrainian tombs, buried in cliffs.
- thebes, wasset, luxor.
- state temples are temples to the gods supported by the pharaohs. the other temples were funerary temples for the pharaohs.
- funerary architecture:
  - many different shapes.
  - tombs in the VoK+Q
    - the first tombs,
    - pharaohs were named after smart and peacful gods. linguistic combo names.
    - interesting tomb shapes: bend tombs. two things:
    - technical reasons: the first tomb was redirected because of quality of material the builders met.
    - on the second tomb, they repeated the shape, even if the material was fine. repetition.
    - Became more and more complex, more regular geometry,
    - some included wells, chambers, pillared halls,
    - now tombs depict primarily religious themes, and incorporate the book of death, a guide to the netherworld.
    - less rich people had the book but in papyrus.
    - religious topics were becoming more crucial. THIS WAS BEFORE THE MONOTHEISTIC REFORM
    - hatshepsut went to central africa, and thutmoses went to syria and brought back scientific materials.
    - there was a shaft in the entrance to the tomb. it had religious purposes, but also protected against flooding!
    - antechamber had depictions of divinites and underground world.
    - the walls were rounded so the name could be carved into it and never be ending.
    - as with tombs, designs repeat what came earlier without question, minimal reform.
    - the path is following Ra in his nocturnal boat.
    - paint became more courful, bue was background cuz iT WAS expensive. Displayed primarily in private luxurious tombs.
    - skies were painted with stars to symbolize the heavens and Ra's boat.
    - Ra- sun Mes -born. Ramses.
    - Nut is the sky goddess, swallowing the sun. her whole body was painted in the ceiling
    - book of the dead, guide of the netherworld, goes around the sarcoughagus of the pharaoh! guiding.
    - this final tomb guy had reliefs carves in alabaster. mixes of royal temples in the tombs.
      - royal coutyards, winding pathways, was copied by private persons in tombs.
      -
    - repetition of certain royal features was just the general gist.
    - WORKERS HOMES
    - had public reception room, altar niche, wind catcher in the roof carefully oriented to the direction wind was blowing from.
    - these villages were built massively for workmen in nearby worksite valleys;
    - fiorst ever architectural plan was for the tomb of ramses the fourth.
    - workmans now know how to create vaults. in their own tombs. craftsman wanted to have everything in their tombs! They knew how to do everything, and so they swagged out their small tombs with the book of death,
    - ladys with sophisticated dresses and cones are from new kingdoms.

LECTURE FOUUURRRRTEEEEN

- NEW KINGDOM TEMPLES
- FUNERARY TEMPLES
- amon-ra was the main god at this time. there was a celebration in which the statue moved to luxor, temple of hatsheput, and then back to karnak. biggest celebration ever.
- hatsheput went to central africa.
- Her temple was a enclosed space. She was an innovator, and had a very good architect.
- terraces one above another, reminiscent of step pyramids.
- the temples that hatsheputs architect built had depth, and took time to see as you walked along the central axis.
- hatsheputs temple gets more complicated as the viewer ascends up the terraces.
- painted but gone now, high original illustrations: showing lightweight architecture of other areas, architecture,
- the temple is a combo of old and new, plays with the space, and very original temple design.
  \
- Pylon represents the sky. something to do with gates to temples.
- new kingdom temples were not as compact: they could have treasuries, stairs leading to roof, and flagpoles for standards.
- the pylons were a place for the scene of the pharaoh in hierarchical perspective.
- heirokompolis... hypo-style halls.. just halls with columns. lead to a depiction of the funerary boat of the pharaohs.
- also got darker the farther they got in.
- Medinet Habu Temple is one of the most complex funerary mortuary temple. Fortified complex basically.
- Mud brick walls on the outside were wavy, ehich added structural stability but also represented primevial water. Of course!
- altar is always in the back.
- ALL OF THESE PAST ONES WERE IN THE WEST BANK
- HOW WERE THEY TRANSFORMED AFTER _____?
- used mudramps to build walls, like they did for pyramids.
- they reused building stones, as fill. wall fill. damaged statues were used in temples in the same way.
- shrines, chapels, alters in the back, hypo-style hallways in the middle, and courtyard in the beginning of temples.
- more mystic properties in the back. where kings and gods commune.
- the hypostyle hall of karnak. 5,500 sqm largest enclosed space in egyptian architecture. 134 columns in total.
- int he book of the dead there is a tale abo0ut a field of papyrus. Therefore, these 134 papyrus columns were representative of that and the egyptian delta.
- the hall just symbolizes the whole world. The stars are on the ceiling.
- Karnak: nefertiti's temple.
- aton (eton): abstract sun looking god with human palms that embraces all humans. Handing out Ankhs.
- these open air sun god monotheistic temples do not exist any more, because the guy was so heretic. no roofs, open altars, only columns. ahket-aten was his name.
- Ahket-aten became monotheistic was because the priests were becoming more and more powerful.
- the christian exodus may ghave happened between ramses 3 and 4? or 2 and 3

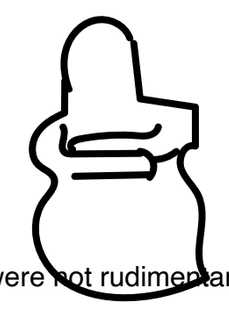
What are Steele? stones with protective texts?
steeles demarcated the size of the future city.

-
- LECTURE 16!
- knossos
- crete is known for its palaces
- Troy is in Turkey
- Prague Castle uses the Minoan Columns which taper down towards the bottom
- monumental architecture in europe is from africa
- the minoan and mycenian cultures existed at the same time as the middle kingdom in egypt,
- minoans had in-and-out room layout, no hallways and only different rooms end to end. They could be three stories tall and made of mud bricks.
- eastern greek colonies were in turkey, asia minor, and across the aegean sea.
- There are some essays to read! Made by the MET museum.
- Layout of timeline is like
  - Prehistoric Greece
    - EARLY BRINZE AGE
    - ANCIENT GREEK ART
  - The early greek world
    - DARK AGE
    - GEOMETRIC
    - ARCHAIC GREECE
  - The classical greek world
  - hellenistic world (320-31 BC)
- Akrotiri was a fabric merchant city, but got battered by earthquakes and volcanos.
- palaces and everything else on santorini islands werent reallty fortified.
- Minoans were first to use underground clay pipes for water supply and sanitation. They had a heating system, flush toilets, and all that. very sophisticated!
- MINOAN HOUSES
  - stone on ground floor with a timber frame. Also upper wood floors. had stairs up to roof.
  - windows common on upper floor, not bottom floor so much.
  - wood was just used much more often than egyptian culture.
  -

More sophisticated models:
- looked like an italian renaissance villa.

Cretan palaces:
- who built them? Minotauros. Son of the king. Built a labyrinth for him and hid him under the palace,
- almost no sources
- no name.
- Typical features:
  - central courtyard, usually north-south oriented. had Piano Nobile, or pubic apartments.
  - had very nice decorated plaster fresco walls.
  - had grain silos in interesting placement which may symbolize weath or redistributiveness of colony.
  - Had a theatere area for BULL JUMPING!
  - these palaces had magnificent stairways.
  - there were Banquet halls with mulltiple columns. Always offset from everything else in the palace complex except for the food preparation.
  - Palaces had Pillar Crypts which probably had some ritual significance.
  - all these palaces ahd the"BULL HORNS" or "DOUBLE X" motifs.
  - NO fortification again!
  - throne was TINY
  - Frescoes had Gryphons.
- KNOSSOS ARCHITECTURAL MYTH
  - this evans guy misinterpreted the Knossos temple when he did some reconstruction
  - Big sewer system in Queens apartment
- Were minoan palaces convents in which priestesses lived and preformed bloody rituals?
  - there were all these rows of heads of ladies in the frescoes. why???
- 1450 BC all Minoan palaces were burnt then or had distroyed by earthquakes, except Knossos.
- sacred caves and mountain sanctuaries: had models of bulls placed as offerings and also sacrificed bulls in their ceremonies.
- palaces had light wells
- the bathrooms were called Lustral Basins.
- in the second millenium bc Minoans continued to bury their dead in circular above-ground tombs.
- Tholos rounded tomb by Mycenae is huge. around 1250BC. Myceneans sorta stole the idea from the primitive-looking cretean tombs.

PREHISTORIC GREECE IS 4500-1000 BC
4500-3200 is considered as late neolithic.



- earliest sculptures of human beings
- called cycladic art, all fertility statues, prominent beaked nose
- Cycladic art is known for "Elemental simplicity"
- many come from graves, they are all laying down
- went until around 2000. 3200-2000
- cycladic art was very influential for modern artists.
- though the statues were rudimentary, there were other statues that were not rudimentary, hence human playing harp.
- detail probably depended on the comission. artists would put in as much detail as was normal.

MINOAN RELIGION
Mother Goddess is the goddess with snakes, partly nude, made of faience.
The bull was a very important animal
Minotaur
votive offerins include terra cotta and stone and bronze vases. Exvotive when you come to a grave a leave stuff to please the gods
around 1700, minoan palaces were destroyed by earthquakes but rebuilt again, into a flourishing period.
Frescoes used PAINTED PLASTER. colors were normally of mineral origin.
bull jumping happened during religious ceremonies.

KAMARES VASES (first generation of this stuff) also came along famous minoan jewelry.
Amithyst and lapis azuli were heavily used in minoan jewelry.

for the second palace period, we get more realistic jugs and vases, called MARINE STYLE.

frescoes were just beautiful and displayed of the minoan internationa style

TROY: discovered by german archaeologist who was motivated to prove the homer was writing truth

Schiemann found "Priam's treasure" , which he thought proved priam was real and he had found troy, but it wasnt true. But the troy part was true. the priams treaure was way too early (2000) but trojan war most likely happened around 1200.

LECTURE EIGHTEEEN

Large courtyards and grandstaircases for palaces. 1st palace period ended around 1900 and 2nd finished 1500.
MYCENEANS: Greeks before greece.
THOLOS are myceanean rounded tombs.
- ruins of mycenae are very well excavated.

MYCENEANS:
- More greek than minoans
- warriors who took over minoan trade and took over crete.
- about 1400, because lords of minoan palaces.
- indo-europeans (russia ish area) who decended south and took over crete and stuff.
- Wore bronze armor, topped with boar tusk helmet.
- the most striking difference between minoans and mycenians were the myceneans massive strong stone walls.
- trojan war was probaby about 1260.
  - troy has two walls, inner acropolis
- great stone workers. comparable to Hitties, in the 14th century.
- 1550-1100 BC was the MAIN MYCENEAN PERIOD.
- Name derives from the Mycenea area.
- very rich burials.
- Cultures were transferred from minoans to myceneas, but also warred.
- Myceneans had better taste in materials than the minoans. a typical trait of later greeks.
- Built great palaces too, but centered around a great wall construction.
  - NESTOR'S PALACE AT PILOS, and other MYCENEAN PALACES:
    - 1300-1200 BC.
    - Has a archive, with a bunch of clay tablets in good quality
    - FEATURES: building technique almost purely minoan
      - brick walls at the base.
      - walls reinforced by a frame of horizontal beams, which included doors and wins-mall dows.
      - MEGARON: a typical feature in mycenean palaces: a large central hearth. had four columns around it, and had a throne in the back of the room too.
      - Had an open porch always oriented towards the sun, and a large center MEGA-RON.
      - The enterpiece of mycenean palaces was the encosed megaron hall, minoan palaces had the courtyard as their centerpiece.
      - walls were mud plastered and important rooms had lime plasters and maybe even frescoes too.
      - share painted cement floors with minoan palaces.
      - had drains for carrying wastewater.
-
- Mycenae is off the greek mainland, to the west. by corinth.
- The central Mycenean Lion gate was the first European Architectural Sculpture.
- Big gates to thiis Mycenean temple
  - round burial grave
  - where Schliemann found "mask of agamemmnon"
  - Myceneans ran out of room, so they moved outside of the city and built the tholos tombs, which are completely subterrainian,
    - THOLOS TOMBS (1600-1200)
    - and after the last burial the entrance was filled with soil.
    - have corbel vaults
    - built of giant polished stones. They probably put them in place first and then polished them.
    - 9 of them are places around the mycenae.
    - Most likely for the rich!
    -
  - TREASURE OF ATREUS(tomb of agamemmnon)
    - tallest and widest dome in the world until the construction of the pantheon dome in rome.
    - The inside was luxurious
- MYCENEAN FRESCO DETAILS
  - Mycenean women were portrayed in more modest clothing
  - still displayed the hunt
  - had grey-blue backgrounds
  -
- Schliemann excavated troy 1-2, much older things, middle kingdom egypt time. Found "priams treasure, which was not. Early brinze age, not when king priam was living.

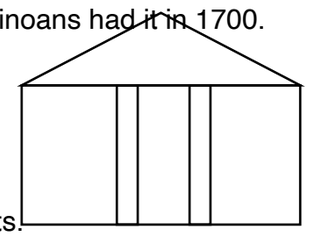
ARCHAIC GREEKS
- stone monumental architecture began in greece around 600 BC, is the base of Western architectural tradition.
  - Was it a greek miracle?
  - what are the roots?
- The greek cultural revolution did not take place in their classical epoch, but in 1200-600, when the building material was wood and mud.
- "Dark Age"
- construction techniques were interrupted by migrations after 1300. all these tribes pushed each other down south.
- BRONZE AGE (minoan and mycenean)
  - bronze swords appear around 17th century bc
  - around 1000 BC replaced by Iron swords.
  - **had Palaces, monumental tombs, no temples.**
- IRON AGE
  - Iron sword was cheaper and better, and cavalry now existed.
  - **NO PALACES, Simple tombs, very big temples**
- Went from citadel to city state.
- renewal of sacral architecture
- 900bc first representation of mythical greek hero
- post-mycenean greece was fragmented. small communities surrounded by mountains. end of cultural homogeneity, competing evolution
- abstract geometric vase art.
- In tyrin, the megaron was replaced with a smaller one... weird right?
- megarons got reinvented, but just more modest. always gathering area.
- TOUMBAS are heralds of green peripheral temples. (a row of columns on the outer sides)
- EXCEPTIONAL DARK AGE CITY: SMYRNA.
- IMportant: GEOMETRIC GREECE
  - mud brick walls on stone foundations, wooden columns with stone bases. interior columns in one row surrounded by walls. later added exterior column ring.
  - these temples were not meant for congregations.
    - they were homes for gods, ceremonies were outdoors.
    - statues were at the opposite end of door.
    - in front of the temple doors, there was an altar for sacrifcies.
  - ORIENTALIZING GREECE
    - continuity with bronze age greeze in materials.
    - stoped being so isolated, caught up with neighbors.
    - means breaking of isolation: babylon, egypt, syria.
    - FIRST GREEK CULT STATUES (700 BC)
    - Apollo and Dionysus were first guys.
    - we can see records of greek peoples involved in abroad activites around 600 BC.
    - Greeks around this time (700 BC) learned a lot from the Phoenecians.
    - The first greek architectonic sculpture at a temple gate in crete in 600. Around this time, there was also a revival of mycenean architecture.

THE TEST REQUIRES I READ ALL THE LISTED ARTICLES AND ESSAYS!!!!!!!

LAST LECTURE

GEOMETRIC AND ORIENTALIZING GREECE
(900-650 BC)
(something traditional, and something new.
the first greek architectonic sculpture (not mycenean) in 625 BC.

THE EMULATION of near eastern and egyptian styles and revived interest in the myceneans lead to the development of the classical greek style.
the acropolis at athens had some mycenean styles, palatial megaron. vestibule and porch. graves around it. cyclopean walls around the acropolis. this showed...
the REVIVAL of cyclopean mycenean masonry.
the sanctuary of hera in argos had massive bolders, and the complex was built on terraces on a hill so as to be viewed from afar.
greek architects werent as good at moving the large stones,, so they did polygonal masonry (fake cyclopean)
first temples in 750 bc were still made of light materials with thatched geometric roofs.
the simple megaron layout was turned into the three nave layout and first column hall in greece with two interior rows od columns.
THE BEGINNINGS OF GREEK ARCHITECTURAL LANGUAGE
- ionic capitals volumes first seen in 7th century bc, which hold up the architrave.
- but these ionic volute was present for a while in the orientalizing period.
  - TEMPLE of HERA 2, Samos, had interior perimeter columns, but also exterior columns (toumbas)
    - temple home of god. can see statue of hera thru front doot.
    - built on a hill, of course. prominent position.
    - First greek STOA, a columned hall, with a rear wall. But minoans had it in 1700.
    - ASKED TO MEMORIZE:



      - Distyle: two columns, between two endings of wall.
      - Double Anta has two
      - Noas, or Cela mean Megaron in greek
      - Pronaos is the vestibule
      - adyon, opisthedomos, is the treasury only for the priests.
      - Peripteral means the Naos is surrounded by columns on all sides
      - dipteral temple means two rows of columnbs
      - psuedoperipteral is like half columns on the long side.
      - psuedodipteral temple is one and a half on the long side.
      - Tholos is rounded temple. circular
      - pteron is a wing or columnade
      - peristasis is a four sided porch or hall of columns surrounding the cella.
      - portico: stoa: Colonade
      - Peristyl a interior columned porch or colonade surrounding a court.
      - Prostyle: with a colonaded porch in front of the Cella.
      - Amphriprostyle: has a colonaded porch in front and back of cella.
      - crepis: visible foundation of the tmeple with 3 layers, looks like stairs sround it, the top is column walker and bottom in solid
      - proportions of column spacing was dependant on column spacing.
    - In greece, art and architecture was always meant to honor gods.
    - until 4th century, most people lived modestly and sent capital to temples.
    - Position and shape of every member is clearly fixed and individual.
    -
    - RELIGIOUS BASE FOR GREEK CLASSICAL ARCHITECTURE. IT WAS NOT BEAUTY, BUT TO CAPTURE THE CHANGING WORLD AND TIE RESTLESSNESS TO THE ETERNAL UNIVERSE. THUS PERFECT PROPORTIONS AND COM-PLETENESS.
    -
    - Temple of Athena in Paestum is the most complete doric temple, 500 bc. it is in italy.
    - birth of greek architectural style took place from 650-500 bc. greeks were everywhere during this era.
    - the first doric temple could be isthemia temple of poseidon, 640 bc. wood and brick construction, or apollos temple in thermos, 630-610.
      - peripteros. single row of colums inside.
    - In 700bc ceramic roof tiles appear. three types: laconian, sicillian, and corinthian.
    - GREEK TEMPLES AS PETRIFIED CARPENTRY???
    - temple of hera 1.0 got rebuilt as stone
    - Doric columns were always concave fluted, after the drums were assembled.
    - the parts within are mathematically related.
  - THERES A SECTION COLUMNS AND STUFF THAT IS GOOD TO STUDY ON THESE LAST SLIDES.
    - hexastyle means 6 columns on short side
  - olderst greek temple built entirely of stone built in sicilly doric hexastyle peripteral 600-580 bc.
  - TRIGLYPHS ARE THESE RECTANGLES MAYBE FLUTED THAT ARE ABOVE COL-UMNS, VERTICAL. AT DELPHI THOLOS, THEY ARE NOT RELATED.
  - PEDIMENT is the triagle on top of temples. oldest preserved pedimenta sculpture was in Korfu.
  - sculpture distracts from strict geometry of construction.
  - at greek sanctuaries, the entry gave the best view of the temples within. The main temple was accompanied by heterogenious buildings in no organization.
  - Ionic temples has origins in the near east.
  - color duistracted from geometry of the temple. paint mostly went on non-load bearing elements.
  - REFINEMENTS: Curvature and inclanation:
    - the horizontal lines of base and entablature were raised just slightly towards the center, and entasis was swelling of columns. Inclination towards the center of the building of columns, slighty anticipating the pediment.
    - the same sorta thing happened with large bigger-than-life statues, to amke them look perfect.
    -
    -
    -
    -
    -
    - test on 18th.