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The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

University of Florida

University of Florida
Civium in moribus rei publicae salus
In God we trust
1853

Property of David J. Rogers

Class [illegible]

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Geology -

1. Physical - processes which produce materials of earth's surface - weathering, erosion (in Fla., groundwater), wave action,
2. Physiographic - geological history, principal agent - sedimentation

Sect 2 - General -

A. Astronomical Setting -
1. Plane of the ecliptic
2. Earth inclined 66½° to plane of ecliptic
3. Climate reqd. for weathering.
4. Climatic variation in history due to the wobbling of the axis.

Solid portion of earth - lithosphere
Watery " " Hydrosphere
Atmosphere -

Radius = 4000 mi.
Atmosphere - 200 mi.

Factual aspects -
Density of earth = 5.5
" of lithosphere = 2.7
Meteorites -
Seismic
Temp. - 1° increase in 60' - in a gen.

Increase in pressure.
Zonal distribution
1. Outer zone or crust - appx. 30 mi.
In this zone rocks tend to be brittle.
2. Inner zone - radius 2000 mi -
Fe + Ni - Density of 8.6
3. Nife zone - metallic sulfides
4. Rock outer " - basic rock -
complex Fe, Al, silicates.

E pirie seas - inland extending seas.

Continents -
Continental shelves
Ocean deeps assoc. with mountain heights
Continental masses are lighter than
floor of the ocean bottoms.

Lab. 1 -
Chara for recog of crystals
1. Crystal form
2. Cleavage -
3. Hardness - distinguished by degree
1. Soft - talc
2. Gypsum fingernail 2½
3. Calcite - copper penny
4. Fluorite
5. Apatite - primary - knife blade plane
6. Feldspar
7. Quartz
8. Topaz
9. Corundum
10. Diamond
4. Color - by streak on porcelain plate
Streak is det color of ferromagnesian rocks
Hematite - Fe_2O_3 - iron - red
Limonite - yellow brown - $Fe_2O_3 \cdot H$
Iron pyrites - black - fool's gold.

Mineral definition - a naturally occurring, inorganic subs. whose comp is expressed by chem formula, and chara. by defin. set physical properties + commonly occurring in geometric forms -

A rock - essential portion of earth's crust -

Sect 3 - Materials of earth's crust.

1. Soil - variable.
2. Bedrock - a gradual gradation in sandy soils. Hard solid material, below zone of altered material
3. Mantle - the material covering bed rock, the portion altered by weathering + changed by erosion.
4. Earth's crust has 92 elements, 8 of which make up 98.5%
   O_2 - 46 + Si 27, Al_2O_3
5. Primary materials.
   A. Igneous rocks - solidified from molten material. The character of the rock depends upon the rate of cooling - fast cooling, small crystals; slow cooling, large crystals.
      1. Light colored rocks
         Composed mostly of SiO_2 + feldspar, Quartz.
      2. Dark colored - mostly ferromagnesium + dark feldspar.

1. Light colored rocks - related to acid rocks
   The dark " " basic rocks.

Texture	Light	Dark
Coarse -	Granite	Gabbro
Fine	Felsite	Basalt.
Glassy	Obsidian	
Large + small crystals	Porphyritic (conglomerate)	
Vesicular (holes)	Pumice	Vesicular Basalt

Grain of igneous rock is angular.
Light rocks, most of land mass are lighter than the dark rocks, which are under the ocean.

Process of weathering of above primary rocks causes the production of sedimentary rocks -

B. Sedimentary rocks -
   1. Clastic rocks - fragments, Ex. gravel, sand, mud or silt.
   2. Chemical - $CaCO_3$, SiO_2, Fe compds.

Consolidation of the above materials forms the sedimentary rocks.
Gravel - conglomerate.

Unconsolidated — Sedimentary Rocks

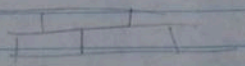
~~Acid~~ — ~~Basic~~

Gradation
Sand - sandstone
mud or silt - shale
$CaCO_3$ - limestone

Metamorphic rocks - caused by change of conditions of heat + pressure. Derived from igneous or sedimentary rocks.
Gneiss - coarse banded.
Schist - fine foliation from shale
Marble - Recrystalized limestone.
Quartzite - from sandstone

Igneous metamorphose into Gneiss + schist.

Sed. 4 —
Large % of earth's rocks is sedimentary.
Igneous rocks tend to be massive
Sedimentary " " " " layered.
Both are fractured by contortions.



Processes of modification of

Proc. of mod. of primary material.

1. Weathering -
(a) Chemical (Decomposition) most prevalent in warm, humid regions
Processes -
(1) Oxidation
(2) Hydration - by seeping down
(3) Carbonation -

Ex - Granite composed of:
Quartz
Feldspar
Fe Mg mineral - attacked easily in forest + rain
oxid. fed. iron oxides + changed to red yellow Fe_2O_3
Hematite Limonite

Hot climate, abundant rain, + organic material produce red rocks -
Cold climate, less rain, the Yellow rocks.
Silicates of Fe Mg minerals go to silica gel. (a colloidal state)
Feldspars compound of
$Al(SiO_4)$ w/ Ca, Na, K
1st breakdown products - carbonates of Ca, Na, K.
The rest of the feldspar forms clay, of which there are many forms, but largely complex Al Si.
Quartz - SiO_2 - largely, being relatively inert does not break down, ending

The general end product of weathering of granite is a red-stained clay w/sand.

Ex. Limestone - a rock of soluble material, $CaCO_3$ (essentially comp.)
Rainwater containing CO_2 forming
$CaCO_3 + H_2CO_3 \rightarrow Ca(HCO_3)_2$
Solution is dominant in modification
Readily easily ppt.

b. Mechanical weathering (disintegration)
1. Jointing - the cracks + crevices + the spacing of cracks in up
2. Temperature - expansion + contraction due to changes. Rocks are poor conductors, + the exterior only heats, producing strain.
3. Mechanical effect of decomposition. The addition of O_2 causes new minerals, forcing apart primary materials.
4. Mechanical work of plants + animals. Ice - alternate freezing + melting expansion.

c. Factors influencing rate of weathering + character of weathered surface
1. Climate - in warm regions, chemical
in cool " , mechanical
Precipitation rates
Vegetation
2. Topography - shape of land surface -
(a) Rough - weathering speeded,
(b) Level - chem. weathering at great depth
3. Rock composition -
(a) Acid rocks of quartz - large amts of sand
(b) Basic ~~sand~~ rocks - super abundance of clay.

Lab 2 - Rocks
1. Igneous
2. Sedimentary limestones:
1. Lime rock - chem. ppt limerock with large no. of animal remains.
2. Coquina - shell fragments, cemented with $CaCO_3$
3. Fossiliferous limestone - gives the remains of animals.
4. Oolitic - fine, small pellets.
5. Lithographic - dense, very fine grains.

Sedimentary (cont.)
Precipitates - from silt.
1. Chert
2. Flint.
Clays -
1. Bentonite - puffs in water - slick. used in filters.

Sect 5 - Products of weathering.
1. Residual Mantle.
a. Consist of everything from bedrock to the surface.
b. Nature depends upon nature of underlying rock.
c. Thickness depends upon length of time it is exposed to weathering.
2. Thickness of mantle indicates length of time the material has been exposed to weathering.
The residual mantle of the Piedmont is Rich.
2. Residual Boulders.
a. Weathering produces boulders along the joints. In limestone regions, residual boulders.
b. Scattered on surface, or within the residual mantle.

3. Soils - the end product.
Agents of transportation of weathered products.
1. The force of gravity - tending to move toward lower level.
a. Soil creep - in cool climates by frost action - alt. freezing & thawing causes the creep, H2O acting as a lubricant for movement. Not so much in sand.
b. Landslides - steep slopes essential.
2. Agents of gradation.
a. Common objectives.
(1) Water & wind are dominant agents.
(a) Running water
(b) Ground "
(c) Standing bodies of water
(d) Glaciation.
Wind -
1. Removal of weathered products.
2. Erosion of bedrock surface
3. Transportation of that material.
4. Deposition.
Methods of transportation.
1. Rolling - water & wind.
2. ~~Sand~~ Saltation - (bouncing) for lighter weights
3. Suspension -
4. Solution.

General aspects & possibilities

A. Requires energy — solar insulation causes evaporation, winds action.

1. Running water — most dominant agent of gradation

a. Precipitation

1. Run-off the surface
2. Evaporate
3. Sink into surface.

B. Method of operation:

1. Hydraulic action — essential
2. Abrasion
3. Solution

C. Rate of operation depends on

1. ~~Steep~~ Slope or gradient.
2. Volume of water.
3. Load — certain amt. can be carried.
4. Velocity is most important, depending on the gradient.

Sect. 6 — 6/23

Summary of life cycle of a stream.

Beginning w/ an area first exposed to weathering.

At first level — Ppt. would soon form a drainage system thru low spots. A V-shaped notch formed. Flatlands left between drainage system. A youthful stream has large no. of rapids & falls, usually straight.

Eventually, by erosion, the stream forms a regular slope by removal of all obstacles.

After maturity, the movement of the stream becomes lateral.

The topography at maturity of the stream is rounded hills, with little flat lands. As time goes on, the land may be reduced to an undulating plain called a "Peneplain".

The rate of life cycle depends on the nature of rocks, the amt. of ppt., etc.

The deposit of eroded material is controlled by a change in velocity — either when water evaporates, or runs into ocean.

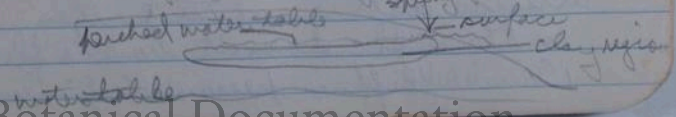
Materials carried produces a delta when stream flows into a standing body of water.

If stream does not flow into standing body of water, an ~~alluvial~~ alluvial fan. Stream flows into a flat level area.

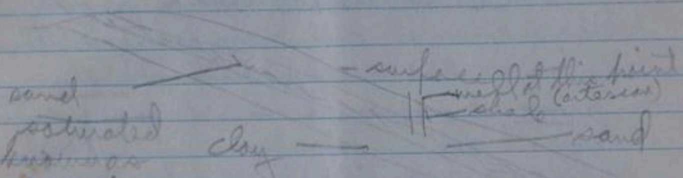
Flood plain - caused by stream cutting away one bank of valley & depositing on the other bank.
Natural levees are those deposited by streams where ~~the stream~~ 1st flow out onto flood plain.

Sect. 7 - Precipitation that sinks in -
1. Aquadation from surface to bedrock.
2. Assume a permeable natural area, homogeneous
A. Factors controlling amount of ~~seepage~~ groundwater
1. Rainfall -
2. Slope - steep, runoff great; level, percolates
3. Vegetation retards percolation, by roots, by organic detritus.
4. Porosity & permeability.
Permeability of a rock depends upon connection of openings.
Sand is ideal for permeability due to large space between grains.
Porosity depends upon "how much you can get in the rock".
Ex. Sandstone 30-40% porosity.
5. Joints
6. Degree of saturation

General characters of ground water:
1. Storage space
2. Geological process - in Fla. dominant factor controlling topography.
A. Upper surface generally follows the surface topography - ~~Where~~ Water table is upper surface of zone of saturation.
Ppt. migrates toward w. table in the process called Vadose water.
Material in zone of saturation ground water.
Lower surface or limit of zone of saturation variable.
Variation of ppt. causes variability of ground water level. Degree or rate at which ground water moves to surface depends upon porosity (at streams, etc.)
Fluctuations of level important, caused naturally & by man.
In homogeneous material - ground water level conforms to surface topography.
If heterogeneous material, irregular.
Springs caused by a clay region



Differences in rock structure influence level of water table.



aquifer - a porous or soluble region [illegible] which the ground water can pass.

Attitude of rock is important.

A stream above water table flows only after rain.

Permanent stream cuts water table.

Two kinds of springs:

1. Gravity,
2. Hydrostatic head or artesian - due to porous nature of a layer, with a hole

Springs may come from the bedding planes.

Artesian well is one that rises in the well - doesn't have to flow.

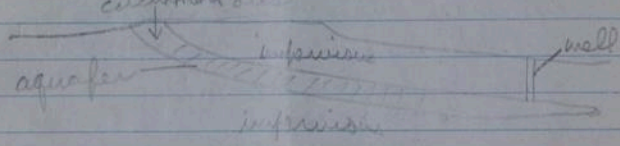
1 Caused by diff. in pressure (2) Confining layer

Gab 3 - Field trip to Alachua Army air base -

Area examined consisted of sedimentary material, largely consisting of unconsolidated quartz sand, stained by iron oxides above, a layer of Fullers earth, 3-10' in depth underlain by a sandy clay layer with phosphate nodules. This area, as evidenced by fossil remains at the phosphate nodule level was the floor of the ocean.

Sect. 8. Ground Water of Florida from sands & limestone returns to surface from springs & wells.

Topography of Fla.



Gulf Coast salt water may be in some wells & fresh water. this fresh water having a lower sp. gravity, floating on top of salt H₂O.

Geological work of Ground water.

1. Ability to act as a solvent.
2. Deposition - why?
   a. Loss of CO_2 in H_2O. When CO_2 decreases, this will cause ppt.
   b. Evap. causes ppt. of material
   c. Change in temp.
   d. Chemical reactions.
   e. Algae causes ppt. of $CaCO_3$

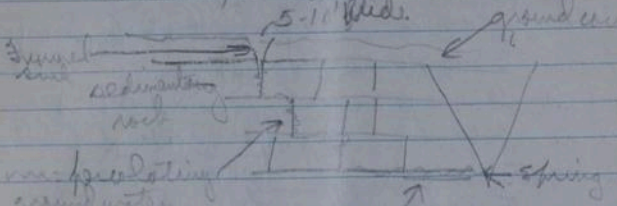
3. Results of deposition.
   a. Cementation of the sediments.
   b. Geodes - a hole ~~filled~~ by dissolved by ground water filled with various materials such as quartz - give rise to agate from ppt. of $CaCO_3$
   c. Replacement of one thing by another, Fossils thus formed
   d. Concretions -
      Rounded nodules formed along bedding plane where water has filtered thru
   e. Spring deposits -
      (1) Hot Springs - siliceous sinter.
      (2) Cold Springs - calcareous tuffa

Sect. 9. Effects on Rocks result of dep.

1. Most effective on soluble rocks of carbonate nature which consist of
   1. Limestone (Ls.)
   2. Marbles - metamorphosed limestones
   3. Dolomitic Ls & marbles to less extent soluble.
   4. Salt
   5. Gypsum ($CaSO_4$) slightly sol.

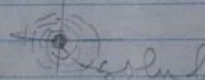
a spring is the natural return of ground water to surface.

Erosional effects
1. Principal unplugged:



Solution widens joints with formation of widening caves + cavities
As a result, weathered material of surface sinks down forming the kind of sink hole.

Sinking down in the rock —



Rock like a rotary drill has been used to form funnel sink.

Solution will tend to deepen caves, due to water percolation, until finally the upper surface collapses - forming a collapsed sink

Some lakes in Ky depend upon solu. - example Payne Prairie, produced by a series of collapsed sinks draining down into Ocala limestone.

Caves produced by solu along joints.

Topography produced in Ky region is Karst topography where solu is dominant.

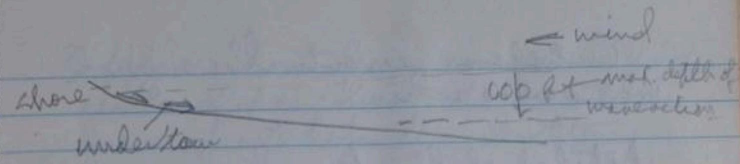
Karst - General lack of streams, large no of sinks, caves, natural bridges, etc.

Deposition - in caves, stalactites & stalagmites ($CaCO_3$) deposits. Found in pools within cave, pebbles of $CaCO_3$ -
All deposition in layers -

Sect, Wednesday, July 3rd

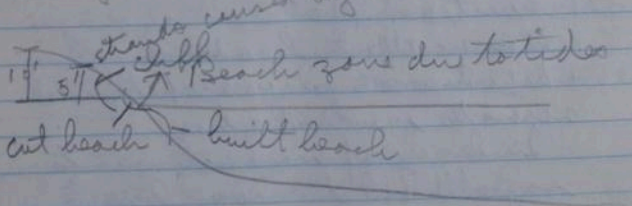
Sect. 10 – Gradational influence of Wave action + long shores of standing bod.

1. Principle of wave action
   A. Wind causes friction – causing wave
   B. In waves, an orbital action of individual particles, depending upon velocity. With a slight amt of transitory motion, but mostly up + down.
   Wave length crest to crest distance.
   Amplitude – trough to crest distance
   Zone of agitation – maximum depth is 600 ft. greatest region of agitation is along shore.
   Definite relation between amplitude + agitation.
   Oscillatory or up + down motion is tipped as wave approaches shore, causing increased energy.
   C. Undertow – return of water after wave as struck shore along the bottom – also an oscillatory movement



Long shore current caused by waves striking beach at angle, forming an oscillatory long shore current. Migration of materials called this, forming spits + bars.

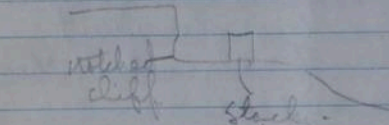
2 kinds of return undertow
(1) On long low beach without bars, little undertow, but where undertow is constricted by bars, great action.
(2) Long shore current.
Idealized action caused by storm beach



Wave action on beach erodes beach, making small notch, rate depending on size + energy of wave action. Depositing eroded material on the filled beach (built beach).

A balance eventually achieved when wave action

Notched cliff formed when material of headland is unconsolidated.



The presence of waves grinds up boulders etc., with characteristic shingle or oval or disk shaped rocks.

Depositional features
Waves attack headlands, etc. + deposit material in a spit formed across mouth of a bay.
Tendency of wave action is to smooth out the coastline.
Spits usually formed in a direction from South to North.
Longshore currents assisted by rapid oceanic movements (E. to W. flowing streams)

Offshore bar found on generally gentle slopes - built up at point where waves first hits the bottom, causing an eroision.
Indian River is a lagoon formed by an off-shore bar.

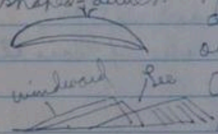
Sect. 11-
~~Offshore~~ bars - show lines of emergence.
Principal involved - degree of slope of ocean bottom is very gentle.
Barrier beaches - ~~offshore~~ bar.
May be 15 or more miles out, but migrate toward the shore. The waves attack the seaward side and winds + waves push the bar to landward side.
Size of particles or sediments variable, dependent on amt. of wave action.
Detritus also goes to make up bars etc.

Agents of Erosion - Wind.
1. Factors controlling wind action.
A. Amt. of precipitation } closely allied.
B. Vegetation
C. Nature of material - depend on geology + processes of. Kind of vegetation
Sandy - great, clayey - small.

D. Wind Velocity -

Source of material for wind action - on surface. Irregularity of surface causes eddies in the wind - turbulence. Wind in eddies picks up materials used in abrading rocks. Fretted surfaces formed.
No depth beyond which it may not operate.
Abrasive actions etches out small basins in a process called deflation.
Wind operates in same manner as other agents of erosion except for solution.
Products of deposition -
1. Sand dunes -
A. Barchane dunes formed on typically flat country. In profile, dunes are sloped gently on one side, steep on the other. Crescent shaped when seen from above. Lee slope is steep, not more than 45°. Erosion on windward side + deposition on Lee. Produced characteristically a group of confused layers, the bedding plains crossing each other - "cross bedding."

Barchane shaped-dunes.



The dune, therefore, migrates - this type dune only formed only on areas of limited material + constant wind direction.
Principal of migration -
Irregularly spaced dunes due to irregularity of wind direction. a
Reasons for production of dunes along shore
1. Sand is handy due to wave action.
2. Characteristically associated with shore-line.
Dunes migrate only as far as vegetation permits.
~~B. Loess~~ -
2. Loess - fine, wind-blown material.
Yellowish, fresh material, occurring as a veneer - along bank of Mississippi, also in Lee of Mongolian deserts.
Not decomposed - porous, rich

Deposited to the Lee of the area which provided it.

The Story of sedimentation.
I. Groups of sediments.
1. Clastic - larger bodies actually carried.
B. Chemical - dissolving of soluble material.
C. Organic - coal, petroleum.
II. Conditions of depositing by deduction.
A.
Dunes have lack of moisture which would prevent wind from throwing up dunes.
Vegetating conditions prevent anchorage.

II. Clastics of: (constituents) -
1. Gravel + 3/8" - conglomerate
2. Sand + 1/250 → 3/2" - sand stone (SS
3. Silt - 1/250 → Shale or siltstone
3. Clays - 1/250 (colloidal)
5. Muds

A high velocity agent carries all the above - Slow down velocity causes the largest material dropped first. Gradual drop of velocity causes even deposit of precisely sorted materials + excellent layering.

Sect. 12 - Sedimentation (completed)
The chemical sediments.
Soluble forms
($CaCO_3$ in greatest amt in solution.
small over order of solubility. $MgCO_3$ found with $CaCO_3$
Colloidal silica (SiO_2)
Iron compounds - transported as colloids
In deposition, $CaCl_2$ comes out first NaCl
MgCl
Sulfates of Ca, Mg, + K.

Sediment

$CaCO_3$ Limestone - deposited in extensive layers in warm regions
Bahama limy ooze is ex.

Limestone - Limerock - any rock somewhat friable.
following types:
Chalk - fine chem ppt. w/ frag. fossils
Lithographic Ls. - dense fine grain.
Oolitic Ls - small rounded pellets.
Dolomitic Ls - involves addl. of $MgCO_3$ with a replacement of Ca by $MgCO_3$.

Fossiliferous Ls.

Silica - Chert or Flint - lenses like deposits on the top of the bottom of the ocean. Later bedded within formations. May also occur as secondary formation in thin layers - alternating with chert.
Flint - dark color
Chert light "

Sediment

Iron compounds - produce Colors (red, orange, purple).
NaCl, MgCl, K, Ca, MgSO_4 - last to come out of solution - require evaporation to remove. important beds of K_2SO_4 in Strassfurt Germany + West Texas. Usually only place beds occur are in bays which have been cut from the ocean.

Organic sediments -
1. Remains of animals -
   A. Shells of invertebrates + bones of vertebrates
      The foraminifera - one-celled shells are very important.
2. Coal deposits - swamps, which prevented oxidation + bacterial action.
3. Petroleum - organic material, both plant + animal.

Change of sediments - consolidation
1. Mechanical process
   A. Pressure from overlying material causes compaction. + Resizing.
2. Chemical -
   A. Cementation - sands, $CaCO_3$ etc. in solution, the sands cemented by soluble items. Iron + silica, clay act as cements.
   Older rocks more indurated than younger rocks.
   B. Crystallization - occurs when suff. amounts of materials present.
      Calcite in Marble.

Sedimentary rocks separated by bedding planes -
Cross-bedding is result of shifting of currents, etc.
(2) Ripple marks - current ~~symetrical~~ ripples - asymmetrical.
Symmetrical ripples formed by wave action.

Lab 4 - Topographic maps -
Army Engineers' Map -

Township + Range
Base lines - E-W, N+S
Area layed off in 6 mi blocks.
Base lines N-S called Rangers -
" " E-W " Townships.
The 6 mi area is also known as Township.
Township ~~was~~ laid off into units 1 mi sq - each sq called a section. Numbered 1-36, starting in the NE Corner
Sections divided into quarters.

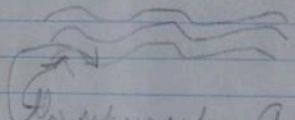
Kinds of weathering - principals
Agents of gradation - their work
Sedimentary rocks - change from
unconsolidated to consolidated.

Sept. 13 - ~~Pro~~ Concepts of Erosion
Processes bringing about inequalities.
1. Erosive action of agents of weathering.
2. Deflation.
3. Erosion by streams.
Processes leveling out.
1. Product of stream - peneplain.

Processes making inequalities.
1. Hardening of magma into igneous rock
2. Volcanoes - ex. Mt. Shasta is
accumulation of volcanic material
3. Columbia plateau

Diastrophic movements (bringing about
inequalities in earths crust).
1. Warping - shoreline well inland
Hudson Bay - a broad down warp.
⅓ of Ga. has been bulged up.
The contingents caused by diastrophic
movement.
A general warping - diastrophism.

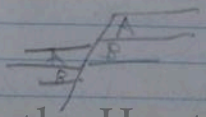
2. Folding - more intense than warping. Sedimentary rocks being most folded rapidly in the Def. regions. Thus found, gold and debris deposited. The Himalayan Embayment is example. The debris & sediments squeezed by lateral squeeze, thus making rocks into wrinkles



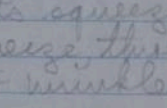
Its up warp = Anticline
Its downwarp = Syncline.
Slight folding has little effect on topography.

Geosynclins - Large synclines. 100 miles more or less across.

3. Faulting - Not all rocks wrinkle, but pressure causes breakage of crust.
One kind of fault produced by tension - a normal faulting. one side drops down



A fault is a plain in the earth's crust along which movement has taken place - usually & largely produced by tension.
Compression causes the sliding of a group of rocks over another. The Alps ex.



The east front of the Sierra Nevadas represents a fault.
Generally found more frequently in Mountainous regions.

Associated w Warping, Folding & Faulting are earthquakes - which are nothing but tremors or waves traveling in all directions from point of origin
3 waves produced -
2 go thru earth
1 follows crust
In areas of sedimentation earthquakes occur.

Elevation + Depression of the land
Embayment of the coast above
Hatteras in NC indicate a
~~rise~~ hinge, with a sinking above
this line, and the rising area
below - a warping.

Changes in sea level
1. Causes
a. Diastrophic movements
Ex Gulf of Mexico + the Baltic

2 Glaciation
Results
1. Sea level dropped during time of
expansion of glaciers
2. Oscillation of sea-level from
250 ft below present level to
a little bit above
3. Elastic depression due to wt of
ice - when ice melted, area sprang
back

Sect. 14 -
Diastrophic movements cause changes in
sea level.
Source of water for glaciers from ocean
Pleistocene was last glaciation period.

Three types of evidence for interpreting
age of an area.
1. Topographic features
a. Deposits in streams.
2. Sediments
3. Evidence from life disturbed in
sediments - fossils.

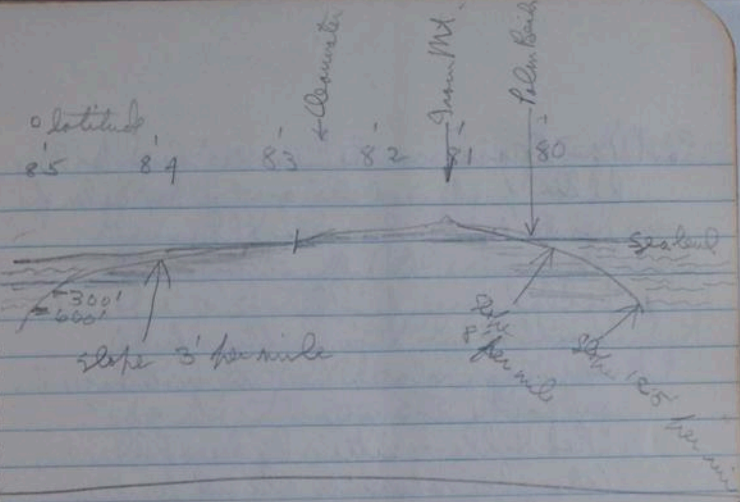
Geologic time scale
Present
Recent
Pleistocene
Pliocene
Miocene
~~Eocene~~
Oligocene
Eocene
Paleocene
} Cenozoic

Mesozoic
Paleozoic
Cryptozoic

Physiography of E. U.S.
Fenneman
Bowman - Forest Physiography -

Fla. Survey - Scenery } Cooke
Geology }
Pests - S. Fla. - Davis -
Study of Well-logs of deep wells - Coles.
Sub Cenozoic of S. Fla. - Parker.

Sect. 15 - General topographic features of Fla.
1. Floridian Plateau - 500 mi. long, 250-400 mi. wide



What is geologic structure -
1. Possibly a science - but incapable of being deduced.
Grouping of land features - A. Causes -
Results of kind of rocks -
Agent of Erosion imp. contr. factor.
Position of erosion agent in a cycle -
B. Groups -
1. Coastal lowlands - outer limit shore line.
Inner limit 100' contour interval.
Newest addition to state
Marine terraces found in this region.
2. Western highlands - Perdido to Appalachicola
Outer boundary - coastal lowlands - Highest
300'. Covered by Citronelle formation

LEARN Geologic time Scale from Cooke 17

Sect 16-3) Marianna Lowlands - low rolling hills produced by great amt of soln of underlying limestone (Suwannee, Marianna ls.) Karst topography.

1. Tallahassee hills - 25 mi wide, north of line thru Tally. from Appalachicola on west to Withlacoochee on East. Elevations up to 300'. "Red Hills" - Citronelle from Pleiocene. Citronelle represents alluvial formation leveled by sea action.

5. Central Highlands 100-325' - av. from 170 to 250. Region of diverse scenery. Contains low spots - Ocala Apopka. Oklawaha valley. Withlacoochee valley. Lime sink regions is west of Central Highlands, west of G'ville. East of G'ville - lake region.

Factors producing above conditions.

1. Erosion by surface streams.
2. Solution by ground water.
3. Work of waves, longshore currents,
4. Fluctuation in sea level.
   Terraces represent these fluctuations.

Pleistocene Ice accounts for fluctuation. Melting raises.
General lowering of sea level since Pleistocene due to continued lowering of sea bottom.
At beginning of Pleistocene highest sea level - At each interglacial period, the sea bottom was lowered.

Terraces -

1. Highest 270' elevation - Brandywine Terrace. Slope from inner to outer edge 50'.
2. Cohoire 215' elev.
3. Sunderland - 170'.
4. Wicomico - 100
5. Penholoway - 70
6. Talbot 42
7. Pamlico - 25
8. Miami - 5-8'.

Time scale of Pleistocene

1. Wisconsin - latest ice advance
2. Illinoian - next older
3. Kansan
4. Nebraskan

Wisconsin - interglacial - Sangamon
Illinois " - Yarmouth.
Kansas " Aftonian
Nebraskan

The Pamlico, Talbot & Penholloway + Wisconsin terraces in Sangamon interglacial period.
Wisconsin & Ill = ice advances.
The Sunderland + Cohasset terraces in Yarmouth interglacial
The Brandywine in Aftonian

Two advances of ice in Wisconsin
1. Cahokian
2. Late Wisconsin -

Sect. 17 - Read in Lecture description of Present shoreline.

Sect. 18 - Shoreline of Fla - Lack of Barrier Beaches on W. coast due to lack of sand, the slope + amount of wave action.

Lakes - 2 categories -
1. Depression of original surface - Lake Okeechobee, Georges
2 Produced predominantly by solution

Sect. 19 - The geology of Fla -
Evidence used to determine historical aspect
1. Distribution of formations from information from deep wells,
3. Character of life in sediments

Distribution of formations - based on rocks underlying soil mantle.
Interpretation - if formations are horizontal, should generally follow contour lines.
Usually, rocks have characteristic colors on maps
Formation - def. lithologic, paleontologic
↓
Limestones dominant in Fla -
Coccina, limerock, limestone.
Paleontological - each form differs in nature of fossils contained, going on forms of evolution

Formations based on variation of lithospheric & paleontological indications.
Formations are base-like in nature.

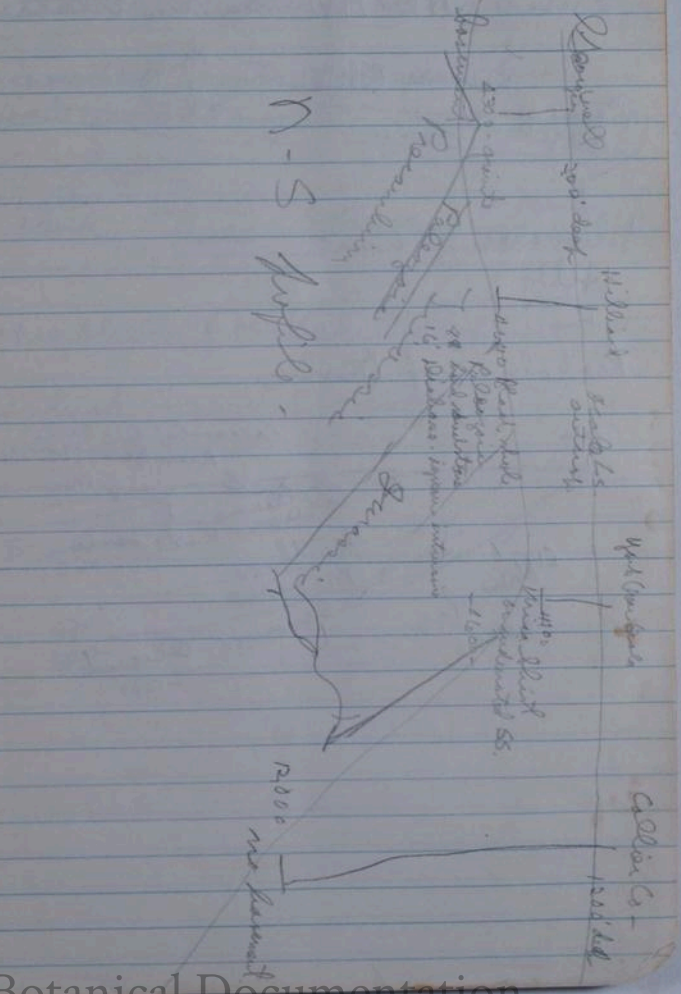
Time scale

Cenozoic { Pleistocene, Pliocene, Miocene, Oligocene, Eocene }

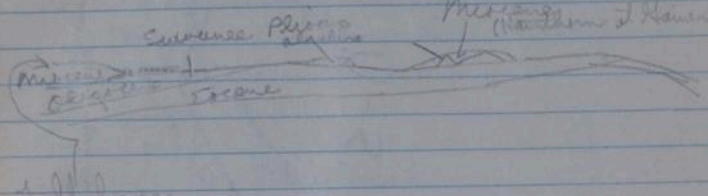
Mesozoic { Cretaceous, Jurassic, Triassic }

Paleozoic

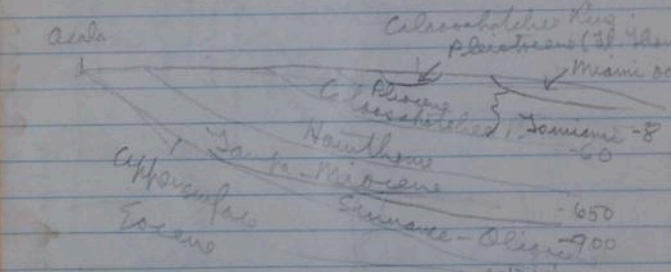
Pre Cambrian Simpler metamorphic rocks



Profile SE-NW - Southern Ocala.



Profile S of Ocala



conformable = no big break, one layer on top of another
unconformable = a break in Geologic record produced by erosion, etc.

Wilmarth - Grace, Glossary of Geology

Sequence of Events producing present day land mass -

Continental

Coastal alluvial — Tidal Flats Alachua — Estuary Bone Valley — Marine Calcareous Clay

Topog sheets from U.S. Dept of Geology -

District Engineer, Engineering Office
U.S. Engineers, Jax -

The Natural Resources of Florida.
Geological aspects.
1. The Non-metallic
A. Nature
(1) Petroleum
(2) Phosphates
(3) Clay products - bearing, absorbing
Kaolins.
(4) Diatomite - fuller's
(5) Peat + muck
(6) Crystalline stones - ballast - flint
+ chert.
(7) Limestone, dolomites.
(8) Coquina
(9) Sand + gravel
(10) Heavy minerals - confined to the
sands - titanium, zirconium.
(B) The Petroleum ~~industry~~
Conditions for production.
1. 99% confined to sedimentary rocks of
marine origin.
2. A source bed - small life of
plant + animal nature.
3. Structural traps. - petroleum
migrates thru formation, due
to diff in Sp. gr. of oil + salt
water. Tops crest of folds

anticlines, cracks. - a tight rock.

C. Phosphates - largely from organic mat. bones etc.
Types of Pliocene age

1. Sand Pebble - vicinity of Mulberry - small round pebbles - 97% of all Phosphate
2. Hard Rock - an accumulation at line of contact of limestone - Alachua associa.
3. Soft rock Phosphates - Hawthorne
4. River pebble - where streams flowed over certain portions of land.

Two horizons in which found.

1. Terrace deposits 100' level.
2. Estuary "

D. Clays

1. Kaolin
2. Fullers earth, Pliocene
3. Bentonite - from disintegrated volcanic ash - Miocene in age used as a filter, as a concrete aggregate

E. Diatomite - hydrated amorphous Si
From fresh water largely - produced presently, around Clermont, Lake Co.
Used as filler in paints & plastics & drugs. Used as an abrasive in metal powder. Probably - Pleistocene

F. Heavy minerals.

a. Ilmenite - iron titanium oxide $FeTiO_3$
b. Rutile TiO_2
c. Zircon - $Zr(SiO_4)$

Essential in metal enamels -
Conc. in Pleistocene & Recent, derived from Piedmont -

Geologic Formations in Fla.
(From Cooke, Bull. 17)

Quaternary System
Pleistocene series:
Melbourne bone bed.
Anastasia Formation, Miami oolite,
Key Largo limestone, Ft. Thompson form.
Older terrace deposits.
Tertiary system
Pliocene series
Caloosahatchee marl, Alachua
formation, Bone Valley gravel,
Chattahoochee formation, Citronelle Formation
Miocene series:
Choctawhatchee Formation
Shoal River Formation
Oak Grove Sand
Glipsla Formation, Hawthorne formation
Tampa limestone
Oligocene series:
Suwanee limestone
Byram limestone
Marianna "
Eocene series:
Ocala limestone
Undifferentiated limestone, deeply buried
Paleozoic rocks or older
metamorphic formations

Final Geology 207

1. (15) A limestone whose chemical composition in percent is as follows: $CaCO_3$-92, SiO_2-6 and $Ca_3P_2O_8$-2, the latter in rounded pellets, is subjected to extensive weathering in Florida. Discuss the weathering of this rock including (a) processes (b) end products (c) types of topography produced.

2. (12) Discuss stream erosion including (a) factors controlling the ability of a stream to erode its valley (b) three types of deposits by streams with a brief description of each.

3. (15) a. Give the names of the marine terraces in Florida and the elevations at which these marine terraces should be encountered.
   b. List the terraces which should be encountered between Gainesville and Cedar Keys.

4. (12) Give a brief explanation for the grouping of springs about The "Ocala Dome". Account for the following:
   a. Source of water
   b. Formation acting as aquafer
   c. Geological events responsible for the vertical holes from which the water flows
   d. Saline content of some of the spring water.

5. (12) Give a brief geologic history of the State of Florida including that portion of geologic time beginning with the Cretaceous and ending with the Pliocene.

6. (12) On the quadrangles listed, identify the topographic features incicated by the letters.
   (a) Interlachen A,B,C,D,

   (b) Mary Esther A,B,

7. (15) Draw a labeled north-south profile of the State of Florida showing :
   a. geologic structure
   b. approximate depth of rocks older than Cretaceous
   c. the formations to be encountered

8. (12) Comment briefly on 6 of the following:
   a. use of heavy minerals to indicate the origin of sediments along the East Coast
   b. nature of the Hawthorn Formation
   c. evidence for the presence of the Suwannee Limestone in the vicinity of High Springs
   d. probable source of the kaolins in the Citronelle
   e. time of formation of Trail Ridge
   f. Geologic formation of the "Keys"
   g. relationship of the Alachua, Bone Valley and Caloosahatchee formations

PLEDGE

Geg 207
7/3/47

1. (a) Factors influencing rate of weathering
   1. Precipitation - amount of rain
   2. Gradient - in Florida, gentle
   3. Vegetation -
   4. Porosity
   5. Joints

(b) Processes involved
   1. Chemical weathering - in Florida, more important than:
   2. Mechanical.

   Chemical weathering includes
   "a" Oxidation
   "b" Hydration
   "c" Carbonation.

   Mechanical weathering dependent on temperature (contraction) - precipitation influence, joints + cracks. Effects of oxidation.

(c) The weathered products
   1. Oxides of iron: hematite, limonite - from the Fe, by mineral (chem. weathering)
   2. Carbonates of Na, K, Ca. - limestone, dolomite from the (chemical weathering) feldspars
   3. Silicates - complex $Al\ Sil_3$ - forming clays.
   4. Quartz - forms sand, since little chemical weathering occurs. Mostly mechanical.

The end-product of a weathered granite would probably be a red-stained clay with sand.

2. (a) Processes of ground water as gradation agent

1. Biggest factor – solution – as water percolates thru porous rock, or over the surfaces of cracks and joints, or between bedding planes. Devil's Mill Hopper ex. of solution, Painter Prairie another example of soln.
2. After solution has carried away enough material to form channels, the action of ground water may become hydraulic, and abrasive.

Warren's Cave is an example of solution along a joint, and there may be some hydraulic and abrasive action, assuming that there has been formed a sufficient channel, and a stream (underground) formed from ground-water moving to a lower level.

(b) The resultant topography known as karst topography characterized by:

1. General absence of surface streams
2. Sinks and caves.
   (a) Funnel sinks caused by solution. forming an
   (b) Sinks caused by solution of material underground cave, and then the collapse of the overhead.
3. Undulating topography.

(c) Factors controlling deposition of material.

1. Soluble materials deposited when CO_2 lost from water due to heat, or by combination of soluble materials forming an insoluble precipitate.

Underground in caves, stalactites + stalagmites thus formed.

2. When springs from ground water forms a stream, the resulting stream may enter a standing body of water. Due to a change of velocity, the load is dropped, the heavy materials first.

Rapidly moving material carried the way by ground water in solution

This has to do with ground water not surface water.

2.(d) Nature of the deposits -
sedimentary rocks from gravel (conglomerate)
" sand - sandstone
" silt or mud - shale.

The above products are cemented together by the soluble materials when deposited between the individual particles. $CaCO_3$, iron and clays act as cementing elements.
Where cold springs issue, a calcareous sinter is formed.
" hot " " , a siliceous sinter is formed.

The siliceous material in solution will, upon deposition, form the chert and flints.

3.(a) Dunes caused by the work of waves and wind at an old shore line. During past ages, the level of Fla. was lower than at present, and this series represents the old shore line.
Another possibility is that the area east of this series may have been formed from a barrier reef.

(b) The long-shore currents, and tidal currents, attacked the headland first, and carried the eroded materials from this headland toward the bay. As the current approached the deep water at the mouth of the bay, the current slowed, thereby depositing its load.
The fact that it is a curved spit is due to

part to eddies, and in part, if a stream enters the bay, to the current produced by the stream.

The source of material is from the beach of adjacent headland, and the wind direction was probably of the southeast or southwest depending on which way the shore line faces.

4. 1. Red colors in sediments due to ~~iron~~ iron oxide known as hematite.

2. Formation of geodes - due to solution in limerock, forming a hole or pocket, and the deposition of $CaCO_3$ in the form of calcite quartz crystals or onyx. SiO_2

3. Barrier beaches - offshore bars formed by erosive action of waves at the point where wave action first strikes the bottom.

4. Water table - the upper level of the area of saturation by ground water.

5. arterian well - a well in which the water level rises - need not flow, but is caused by hydrostatic head.

6. Erosive power of a stream in comparison to velocity. The hydraulic power of a stream increases about 4 times when the velocity of the stream is doubled. The load carrying ability of a stream is increased about 5 times as the velocity is doubled.

8. Clastic sediments are those due to mechanical weathering, running water + wind - these sediments according to size are gravel + 3/8"

sand 1/250 to 3/16"
clays - 1/250"
silt
mud -

9. Cementation in consolidation of sediments. Clastic materials cemented by the soluble sediments of $CaCO_3$, Iron and clay.

10. Current ripple marks - caused by movement of water in streams, always assymetrical. ft. the gentle slope up-stream, ft. steep slope of ripple down-stream.

11. Residual boulders caused by weathering of the mantle along cracks and joints, removing materials along these lines and leaving rounded boulders.

Gy 207 Examination

1. Assume that a granite is exposed in the State of Florida. Discuss the weathering of this rock including: (a) factors influencing the rate of weathering (b) The processes involved and (c) the weathered products.

2. Discuss ground water as an agent of gradation including: (a) the processes (b) the resultant topography (c) the factors controlling deposition of material (d) the nature of deposits. Where applicable, make reference to nearby examples.

3. (a) A north-south series of sand dunes is located about 20 miles inland from the present East Coast. Discuss the manner of formation and account for their location.

   (b) On a north-south coast line, a northward directed curved spit projects from the south side of a U shaped bay and extends part way across the mouth of the bay. Describe the process for the formation of the spit and show the source of the material and general wind direction.

4. Identify or comment briefly upon 10 of the following:
   1. cause of red colors in sediments
   2. formation of geodes
   3. barrier beaches
   4. water table
   5. artesian well
   6. erosive power of a stream in comparison to velocity
   7. oolitic limestone
   8. clastic sediments
   9. cementation in consolidation of sediments
   10. current ripple marks
   11. residual boulders

PLEDGE

MINERALS WITH COLORLESS STREAKS

COLOR	LUSTER	H	CLEAVAGE & FRACTURE	CHARACTERISTICS	NAME
WHITE IF PURE	GREASY OR PEARLY	1	NONE	HARDNESS AND luster greasy feel.	TALC
Clear, Blue or Yellow	Vitreous	2 1-2	3-way at rt angles	Salty taste	HALITE
White if pure	Dull to Vitreous	2	none, or 3 or one good	Hardness & luster	GYPSUM
White i	Pearly	2	1 very good	Splits into thin elastic sheets	MUSCOVITE
Black	Pearly	2	1 very good	Splits into thin elastic sheets	BIOTITE
White	Dull	1-2.5	None	Earthy odor $Al_2Si_2O_5$	KAOLINITE (KAOLIN)
White if pure	Dull to Vitreaous	3	3 not at rt. angles	Effervesces violently in dilute acids $CaCO_3$	CALCITE
White if pure	Vitreous	3	3 not at rt. angles	effervesces only in powdered form $CaMg(CO_3)_2$	DOLOMITE
Green	Dull, greasy glassy	2.5-5	None	Luster & hardness	SERPENTINE
White, blue or green	Vitreous	4	4-way	Cleavage and hardness	FLUORITE
Any color	Vitreous or resinous	5	Imperfect 4-way	Luster & hardness	APATITE
Black	Glassy	5.5	Near rt. angles	Distinguished by cleavage	AMPHIBOLE
Red or Black	Vitreous to briliant	7	Splintery fracture	Fracture and crystal structure	GARNET
Any color	Glassy to greasy	7	shell-like fracture	Fracture & hardness	QUARTZ
Light	Glassy	6	2 at rt. angles	Cleavage & fine cracks	FELDSPAR, var Orthoclase
Light	Glassy	6	2 not at rt. angles	Cleavage and a series of parallel lines	FELDSPAR, var Plagioclase
Green to brownish red	Vitreous	6-7	None	Color & hardness	OLIVINE

TABLE FOR IDENTIFICATION OF MINERALS

MINERALS WITH COLORED STREAKS

STREAK	COLOR	LUSTER	H	CLEAVAGE AND FRACTURE	DIAGNOSTIC CHARACTERISTICS	NAME
Dark	Black	Pearly	2	1-way	Splits into thin elastic sheets	BIOTITE
Black	Black	Metalic	2.5	3 at rt. angles	weight and cleavage	GALENA
White to brown	Pale yellow to black	Resinous	3.4	6 way	Luster & Cleavage	SPHALERITE
Dark greenish black	Greenish Yellow to golden	Metalic	3.5 to 4	None	Color hardness Streak	CHALCO-PYRITE
Green	Black	Glassy	5.5	Near rt. angles	Cleavage	PYROXENE
Green	Black	Glassy 5.5	5.5	Not at rt. angles	Cleavage	AMPHIBOLE
Yellow Brown	Yellow Brown Black	Dull to Metalic	5-5/5 but varies	None None	Yellow brown streak	LIMONITE
Black	Black	Dull to metallic	5.5 to 6.5	None	Magnetic	MAGNETITE
Brick Red	Red to Black	Dull to Metallic	5.5 6.5 but varies	None	red streak	HEMATITE
Greenish black	Brassy yellow	Metalic	6 to 6.5	None	Hardness, Color Streak	PYRITE