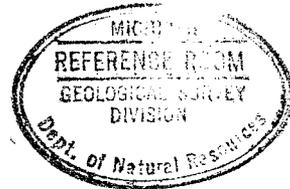


Field notes of Frank Leverett;
Notebook no. 294 (1937)

NOTEBOOK 294 - Frank Leverett



OK also 159 170

Partly filled by some member of U.S.C.S. and turned in, then sent to Leverett. This has a compilation of early papers in Ohio and Pennsylvania - but is mainly notes made in Florida in 1930.

Orteris?? table of thickness of drift deposits - Geol. of Ohio Vol VI, pp. 776-782:

	<u>Thickness of Drift</u>			<u>Altitude</u>	<u>Rock Floor</u>
Auburn, Indiana			282	860	578
Kendallville, Indiana			400	979	579
Butler, Indiana			378	362	484
Fayette Ohio?, Indiana			200	800 +	600 +
Blissfield, Mich.			200	693	493
Bryan, Ohio	154	146	176	157	764
Wauseon, Ohio				156	768
Delta, Ohio				115	719
Toledo, Ohio		113	120	120	586
Hicksville, Ohio				128	754
Chicago Jc., Ohio				126	923
St. Henry, Ohio		174	187	187	973
Ft. Reeverry, Ohio				146	923
Wapakoneta, Ohio				153	891
2 miles NW of Miester				228	950 +
New Brunen				116	945
Endersville & vicinity	170	308	300	335	428
2 miles S. of St. Mary's				375	875 +
St. Mary's	110	121	220	320	875
Washington Boro. sec. 19				400	875 +
New Berlin				428	1068
Bellefontaine				150	1216
Marysville				106	999
Union City				104	1105
Troy				133	850
Urbans	102	133	155	155	1030
St. Paris		370	520 +	520 +	1238
Mechanicsburg				280	1058
London		155	250	250	1049
Columbus		104	123	123	781
Newark		165	235	235	819
Camden				181	839
Ogborn				207	830
Circleville				140	720
Lauenstor				132	854
Hadley Jc.				335	883
Carroll				260	835
Hamilton		200	214	214	597-610
Cincinnati Gas Co.				120	500 +
Lebanon				126	709
Coshocton				171	771
Dayton				247	743
Wellington				108	859

These are all that exceeds 100' in Orteris tables.

col. 12/29/37 one / Geology - Michigan in Michigan Geology

Rock floor along and near old Newark valley.

	<u>Ft. A. T.</u>
Hedley Jc.	548
Carroll	575
Newark	594
Swan (E. of Newark)	546
Boston	573
Near Black Hand	542
Frazzysburg	570
Black Run	570
W. of Brinway (Sec. 7, Cass Twp.)	565
Coshocton	600 to 594
W. of W. Lafayette	Below 600 to 610
On Mills Cr. W. of Plainfield	575 and 600
Uhricksville	650 to 630
New Philadelphia	620 to 640
Fort Washington	625
New Comunstown	610
Dover	700 to 660
Strasburg	660
Mascillon	714
Barbarton	570

For later records see p. 64 of this notebook in which the rock floor near Beall and Baltimore is found to be about 455' A.T.

Borings near Independence and in Cleveland show a rock floor nearly down to sea level.

See Bulletin 14 (Columbus area) Ohio Geol. Surv. for map Pl XV of Newark Valley. In SE part of that area rock floor is below 620 near Duvell and below 650 near Groveport. No borings show such a low altitude as those at Hedley Jc and Carroll. This bulletin seems to be based on fewer records than were available some of which show rock floor down to 450' A.T.

R. E. Hice in Am. Jour. Sci. Vol. 49, 1895, pp. 112-120 discussed inner terraces of the upper Ohio and Beaver. The rock benches under the Wisconsin gravel terraces are frequently about 30-40' above the rivers at low water stage from Moravia to New Brighton on the Beaver and 50' above the Ohio between Economy and mouth of Raccoon Creek. He said they may occupy half the width of the inner valley though very narrow on the Beaver for 11-12 miles below Wampun. The filling in the gorges below these rock benches is generally a fine silt grading up into sand and then to gravel. The stream that aggraded was at first sluggish but increased later in carrying power.

Hice cited the following literature on this region bearing on drainage features:

- T. C. Chamberlin. In Bull. 58 U.S.G.S. Bull. G.S.A. Vol. I. Am. Jour. Sci. Vol. 45 and 47.
- G. F. Wright. Bull. 58 U.S.G.S. Ice Age in N. America, pp. 287-289, 335-339. Am. Jour. Sci. Vol. 44 & 47. Am. Geologist Vol. XI, pp 195-199.
- Alfred T. King. Ancient Alluvian of the Ohio Valley and its tributaries Jan. 1854 Proc. ?? Acad. Nat. Sci. Phila. Vol. 6 1856.
- Frank Leverett. Am. Jour. Sci. Vols. 43 & 47.
- P. Max Tashay. Am. Jour. Sci. Vol. 40. Bull. G.S.A. Vol. 2
- I. C. White. 2nd Pa. Geol. Surv. Rept. Q, QQ, QQQ
- J. J. Stevenson. Geol. Surv. Rept. # K
- J. P. Lesley. Geol. Surv. Rept. Q
- B. C. Jilleon. Trans. Pittsburg Acad. Sci. & Arts Vol. I 1893 25 pp.
- H. W. Clappole. Trans. Geol. Soc'y Minnburg 1883. p. 42
- R. E. Hice. Bull. G.S.A. Vol. 2, p. 457, Science Vol. 22

In Bull. 31, Ohio Geol. Surv. on Vinton County, Ohio, Wilber Stout attempts to identify the Harrisburg peneplain and the Worthington. He also correlates the abandoned valleys with the "Parker Strath" on border of Allegheny Valley. He gives the Harrisburg peneplain an altitude of about 1060' with a range between 1020 and 1100'. He refers it to an upswinging of strata in Early Tertiary time. It is best preserved in western Vinton Co. but scattered remnants are found in the eastern part. Nearly all evidence is removed by erosion in Wilkesville, Vinton, Clinton, central Elk and southern Knox Twp. These bring part of a "low basin" which extends southwards through Gallia, Meigs, Lawrence and Eastern Scioto counties.

The peneplain is preserved in several places in NW Knox Twp. at about 1030' and in northern and western Madison twps. at 1030-1070'. The exhibit of peneplain features is still better in Brown Twp. on several dividing ridges, being 1030-1050 between Hewett Fork and Sandy Run and 1030-1070 between Sandy Run and Two Mile Run, and 1020-1040 between Two Mile and East Branch. In western Swan Twp. ridges usually stand above

1020' and ~~1070'~~ knobs 1050-1090'. In Richland Twp. the upper limits are between 1020 and 1070'. In Jackson Twp. on the main divide between Salt and Raccoon Creeks the gradation surface is put between 1050 and 1100' with "flattened knobs" on main ridge and in laterals. The same condition is found between Pretty Run and Queer Creek and between Pretty Run and Middle Fork. In Eagle Twp. the gradation plain is 1050-1100' on the main ridge and the laterals. In Harrison only a few points come up to it at 1030-1100'. The peneplain comes out well when received from a high elevation, the regularity of altitude of ridges being impressive.

Stout gives the Harrisburg peneplain an altitude of 1270' in Columbus Co., Ohio, where he has done field work. He cites the knobs E. of the Scioto near Chillicothe as residuals standing 130-200' or more above the peneplain. Also knobs W. of the Scioto in Ross, Scioto and Adams counties. Leverett thinks this interpretation by Stout as to the Harrisburg peneplain may be correct. He finds in the Ironton quadrangle an area called "Poplar Flats" at about 1025' that looks like a peneplain surface on the map. There are over 80 points in this quadrangle that rise to about 1000-1020' and nearly 70 in the Athalia quadrangle.

Stout also interprets the "Worthington peneplain" of Butts to be well shown in Vinton Co. at about 960' with range from 930-990'. This interpretation seems to Leverett more questionable than that of the Harrisburg. It is also questionable whether "Parker Strath" is to be correlated with abandoned valleys in Vinton Co. These abandoned valleys are so out of harmony with the present drainage and the present drainage has done so much work that they seem likely to be older than the channel in the loop opposite Parker's Landing to which Butts applied the name "Parker Strath" (See Kittanning Folio). See letter of Oct. 26, 1929 from Mr. Stout setting forth his views on peneplains in Ohio and the deposits of silt in old valleys, etc.

A paper by G. P. Merrill in Pop. Sci. Monthly 1906, pp. 300-322 on "Development of the Glacial Hypothesis" refers to a paper by Benj. DeWitt in Phil. Acad. 1793 that noted the great variety of webs on shore of Lake Superior - 64 kinds being recognized. He referred their occurrence to "some mighty convulsion of Nature". This seems to be one of the earliest cases of the recognition of the materials forming the glacial deposits but DeWitt had no conception of glaciers as the agent of deposition. Merrill's paper is abstracted in Notebook 291, pp. 18-19.

A book by Thomas Nuttall "Travels into the Arkansas Country" Philadelphia 1821-1821???. 296 pp and map of Arkansas Valley in Arkansas. includes an account of features along the entire length of the Ohio valley noted in a trip made in 1818. It deals to some extent with the settlers but notes the vegetation, geologic strata and alluvial material. The trip started at Philadelphia Oct. 2, 1818 and he passed through Lancaster, Middletown, Harrisburg, Bedford, Ligonier and Greensburg. Reference to the glacial gravel on the Ohio is made on p. 24 as follows:

"Everywhere along the banks of the river, particularly at this low stage, we perceive adventitious boulders and pebbles of sienite which cannot have originated nearer than the mountains of Canada, situated beyond the lakes". These notes were made when he was near Wheeling, W. Va. Notes of Mounds?? are frequent, the one at Moundville being described (p 25) and the earthworks at Marietta are mentioned as "aboriginal remains", p 26. Nuttall spent 4 days with Dr. Drake at Cincinnati Nov. 13-17. The falls at Louisville are briefly referred to. Below Louisville he made night as well as day floating with his boat tied to another one - and notes are rather scanty. The Arkansas work forms the main theme of the volume. It includes an appendix on Indian tribes.

A paper by Dr. Daniel Drake of Cincinnati entitled "Geological Account of the Valley of the Ohio" appears in Trans. Am. Phil. Society U.S.??

Vol. 2, No. 4. 1825 pp 124-139. With cross section of the Ohio Valley at Cincinnati below mouth of Licking River. It was written Oct. 1, 1817, and read Nov. 7, 1818. While it deals mainly with the vicinity of Cincinnati it bears evidence of a broad acquaintance with the Ohio Valley and its tributaries. He also had gathered notes on the distribution of boulders and of glacial gravel by his own observations in Ohio and Kentucky and New York and from other sources, notably Nuttall, elsewhere. He refers to Nuttall as having found the boulders as far west as the Mandan villages on the Missouri in No. Dakota and from there eastward to the Lake Erie basin and he himself had seen them on the Hudson Valley in New York. He had observed great blocks of the "primitive rocks" in the interior of Ohio but had not seen any of them S. of the Ohio. He remarks that "to the SE and S. the valley of the Ohio seems to constitute the boundary of this debris".

He noted that the southern tributaries have few pebbles in their alluvium. Also that they have a lower gradient in their lower courses than the northern tributaries, as shown by the distance backwater extends up them at flood stages of the Ohio. On the Kentucky it extends nearly to Frankfort while on the Great Miami it extends only 12-15 miles. The Ohio has a body of alluvium that is supposed to have been brought in by a larger current than the present river. The channel cut in the alluvium he refers to the Ohio of present size. It is noted that the excavation under the alluvium is to as low a level as under the stream. From this it is inferred that the predecessor of the Ohio extended from bluff to bluff. Wood has been found in the alluvium from depths of 10' to 90'. "It is not mineralized and appears to be of the same species of those in existing forests". The alluvium is supposed to be a lost product in the drawing off of the sea. To explain the cutting of the valley he says "Some kind of channel and some degree of declivity must have preceded the commencement of every river". He then pictures the work of the waters in deepening the valley and leaving the

alluvium in its bed. He calls attention to the terracing produced by the present Ohio, giving 2 or 3 levels. To account for the boulders he writes: "I do not entertain a doubt that these fragments were enveloped in large fields of ice in a region far beyond the lakes, and floated hither by the same inundations that brought down and spread over the surface of this country the geest in which they are embedded. In the southern parts of this formation they are not found but this should be attributed to the influence of climate. The ice to which they were attached could not of course pass a certain latitude; and from the great increase of these masses as we advance toward the north, it would seem that many of the icebergs suffered dissolution long before they arrived at this maximum. Future observers will no doubt trace them to their parent strata in the Arctic regions, as Von Buch has traced those which are lodged on the shores of the Baltic".

In Merrill's "Development of the Glacial Hypothesis", Pop. Sci. Monthly 1906, pp 300-322, reference is made to a paper by Dr. Samuel Akerley in Am. Mineralogical Jour. 1810 in which glacial deposits in Dutchess Co., N.Y., on Manhattan Island, Long Island, and Staten Island and in New Jersey are referred to a torrent brought through the highlands to the border of the ocean subsequent to the time of the Flood. No recognition of ice as the transporting agency.

Edward Hitchcock Trans. Ass'n Amer. Geol. and Naturalists for 1840-42, pp 164-221, published 1843. "The Phenomena of Drift or Glacio-Aqueous action in No. America, between the Tertiary and Alluvial Periods". He says that nearly all geologists now agree that the drift phenomena are result of joint and alternate action of ice and water. Glacio-aqueous expressed this action.

Phenomena of Drift

1. Transported boulders
2. Smoothed, polished and striated rocks
3. Embossed rocks (Roches moutonnees)
4. Valleys of erosion
5. Moraines

6. Detritus of moraines
7. Deposits of clay and sand
8. Contortions of the stratified deposits
9. Terraced valleys
10. Fractured rocks
11. Organic remains

(1) The transported boulders are often striated. The striation may have been by ice moving over the boulders or the boulders may have grated on a rocky bottom while being carried in the ice. In size boulders noted range up to 30' or more in diameter. One in Antrim N.H. is 150' in circumference. Direction of transport in eastern U. S. is southeasterly, also in Nova Scotia. In St. Lawrence valley and in western N.Y. the direction is west of south. Similar bearing is found locally in New England - in Putney, Vt., S 35° W or 27° W of true meridian. The boulders have been carried obliquely across our highest mountains but have in no case yet known radiated from them. Boulder trains generally show only slight divergence in passing away from their parent ledges.

(2) Striation. About 10 pages are given to this subject. Striae are more reliable than boulders in showing direction of ice movement. Their remarkable parallelism is evidence they were not produced by a drifting in more currents of water, especially in passing over very irregular surfaces. Reference is made to cross striation observed by Dr. John Locke and reported in Geology of Ohio. Each set is marked by parallel lines. They indicate a repetition of the striating force with a different direction of movement. The occurrence of striae at widely different levels is considered no evidence of an uplift by which those at high levels preceded those at low levels. If the high parts had risen above a water body they would have caused deflection of movement such as does not occur.

(3) On Mt. Monadnock Roches Montounees were noted. This feature is also conspicuous in the White Mts. up to within 1000' of the top of Mt. Washington. The higher part is covered with loose rocks. He noted them

near Lake of the Clouds, estimated to be 1200' below summit of Mt. Washington. Here the movement from NW to SE is very evident.

(4) Valleys of erosion. This is a discriminating discussion showing that he regarded the ice erosion a moderate factor in valley excavation. Instances of erosion in Connecticut Valley are cited.

(5) Moraines. He considers the moraines the product of drift ice. They are not made by ice descending from mountains. They are described as follows (p 191): "Moraines constitute the great body of drift; forming ridges and hills sometimes, though rarely, 200 or 300' high. The materials are much more comminuted and the pebbles and boulders more rounded than in the more scattered drift. The most usual composition of these moraines is perfectly rounded pebbles and ~~quartzite~~ sand. In a few instances, and those very remarkable, they consist entirely of sand. Large boulders, also, sometimes constitute a considerable part of the mass. But in all cases there is evidence that the materials have been subject to a powerful mechanical agency."

"Our moraines form ridges and hills of almost every possible shape. It is not common to find straight ridges for a considerable distance. But the most common and most remarkable aspect assumed by these elevations, is that of a collection of tortuous ridges, and rounded and even conical hills, with correspondent depressions between them. These depressions do not form valleys which might have been produced by running water; but more holes, not infrequently occupied by a pond. These ridges and piles form a very curious landscape, and yet not strange to an inhabitant of New England."

P. 192. "It is difficult enough to conceive how running water could pile up a ridge of gravel 20 or 30' high with a steep slope on each side; but here we have an effect vastly more difficult to explain by any such agency. Yet let us imagine a large body of field ice with its under surface very irregular, and that this by the force of currents has crowded

along the sand and gravel so that they occupy its cavities or are borne along upon its top. It is easy to conceive that in this way precisely such a singular configuration of the surface as has been described might be produced; and when the ice melted away, the irregularities would remain as we find them."

Reference is made to the moraine in Mount Auburn County in Cambridge Ms has pointed out many localities in his Final Report on the Geology of Massachusetts. He suspects they occur in New York, Michigan, etc. He refers to moraines near Victor, N. Y., west of Auburn and to the moraine at Mt. Hope 2 miles S. of Rochester. Moraines extend along the seacoast from Kingston to Falmouth, Mass., nearly 50 miles. Very sandy moraines occur near the eastern extremity of Cape Cod. They are more conspicuous on the E. side of the N-S valleys of New England than on the west. On pp 193-199 the eskers at Andover "Indian Ridge", etc., are described and a map of these forms Pl IX of this volume. The ridges on the map carry the names "West Ridge", "Indian Ridge", and "East Ridge". The map is entitled: "Moraines: Andover, Massachusetts". It is noted that the trend of these ridges is about the same as the bearing of striae but he doesn't see how glaciers could have formed them. He raises the question on p. 202 whether they may not be the same as the Oscars of Sweden described by Brongniart, Beaumont, Darrocher and others. On p. 203 Hitchcock says: "It is only recently that moraines have been described by geologists as a part of the phenomena of drift nine years ago. I described those of Massachusetts in that connection and gave sketches of some of the most remarkable cases in my report on the Geology of that State published in 1833. The last 8 pages deal with theories of drift and we are not so well grounded as one would expect after reading the descriptions of the drift. There are several interesting figures forming Pls VII, VIII and IX, illustrating the drift phenomena.

In the same volume Trans. Assoc. Am. Geologist, etc., published 1843, pp 240-241, is a notice by Prof. John Locke entitled "Notice of a Prostrate Forest under the Diluvium of Ohio". It is first noted that wood of conifers is common in the blue clay of the drift. Also that the drift has a thickness of 30-100' when one gets 60 miles N. of the Ohio River and is thick in places near the river as in the cut at North Sand, Ohio.

The notice is mainly of the occurrence of wood under the blue clay in wells about 15 miles northward from Dayton in a village called Salem. "The situation is an elevated one, many miles removed from any considerable stream, thus precluding the idea of any alluvial action. At all places in the village, where wells have been sunk, they pass through from 37 to 43' of diluvial clay and gravel, and finally reach the prostrate trunks of the coniferous trees, lying in a bed of dark sand (a "dirt bed") below which is a bed of clean sand. As soon as this sand is entered the water welling up from it to the height of 15' drives the diggers from their labors. It has, however, been ascertained that the sand is superimposed upon the cliff limestone in place (containing the *Pentameris oblongus*). No roots of the prostrate trees have been found; but still it seems to me from the extent of space covered by them from the "dirt bed" and the sand formed uniformly beneath it, that the trees have been thrown down in the place where they grew".

The name Salem seems to have been dropped and I do not know to what village this applies. There appears to have been a swamp there when the ice came in. Coniferous forests do not now occupy that region (as noted by Locke).

Prof. Locke also has a paper in this volume pp 229-238 in "Ancient Earthworks of Ohio". It gives a good discussion of Fort Ancient in the east bluff of Little Miami River near Loveland and a map Pl X Fig. 1.

An earthwork near Coleraine, Hamilton Co., is also described and reference is made to one in Highland Co. described in 2nd Rept. Geol. of Ohio 1828, p 269, called "Fort Hill". This volume also contains an important paper by W. B. Rogers and H. D. Rogers on the physical structure of the Appalachian chain pp 474-531. Also Pls XVIII, XIX, XX, XXI, illustrating the folding, etc.

October 19, 1929. A letter from Richard J. Longee to Prof. W.H. Hobbs dated at Hanover, N. H., Oct. 15, 1929, suggests naming the glacial lake in the Connecticut Valley Lake Hitchcock in honor of Edward Hitchcock. It has two levels. The upper one that extends a little farther up the valley than Hanover he proposes to call the Emerson stage and the lower one which he has traced into northern New Hampshire and Vermont the Upham stage. The difference in level is about 100'. Mr. Longee has been running a series of水准 levels this year to points on the shore to find definitely the altitudes and amount of uplift from place to place. The lower lake seems to have extended only about to Farmer's Mills, Mass. The upper extended south beyond Middletown. Its shore is 140' at Middletown; 210' near the Conn.-Mass. line and 395' near the Mass.-N.H. line; and 657' at Hanover, N. H. The lower one is 360' a little S. of Billows Falls, Vt. and 565' near Hanover, and 890' near Littleton, N. H.

I have made a tracing of maps sent by Longee showing the levels of marine submergence in Mass., N.H., and Maine and the levels of the Conn. lake (Emerson stage and Upham stage). Also of small local lakes W. of the Conn. lake. One in Farmington, Conn., valley. The other W. of trap ridges in southern Mass. This tracing is attached herewith. The letter refers to an excavation at a dam under construction in the upper part of the Conn. valley which gives an exposure 100' showing laminated clay 40' thick between two sheets of till. This is of importance in showing a readvance of ice into the Conn. valley lake.

Reference is also made to the finding of wave-notched drumlins NW of Hartford, Conn. He remarks that they indicate long continued and violent wave action within the valley. This study by Longee is under the Auspices of the Amer. Geog. Society.

Notes on paper by Wm. Maclure in Am. Jour. Sci. Vol. 6, 1820, pp 98-102, dated July 9, 1822. On p. 102, "The large masses of granite, some of them weighing tons, scattered over the Secondary between Lake Erie and the Ohio, while there is not an atom of granite in place nearer than the N. side of the lake, would seem to point at the only mode by which they could have been transported; by supposing the lake extended thus far, and that the large pieces of floating ice from the N. side might carry these blocks attached to them, and drop them as the ice melted in going south; few or none being found south of the Ohio, shows that the southern sun melted the ice before it got so far".

Dr. S. P. Hildreth Am. Jour. Sci. Vol. 13 1828, p 39, noted that between Newark and Delaware, Ohio, the rock formations are covered by drift to a depth of 20 to 50', and that the region is filled with detached blocks of primitive rocks. The drift is a yellowish loam with blue clay at base.

B. Tappan, Am. Jour. Sci., Vol. 14, 1828, pp 291-297, thinks those geologists who so confidently assert that the boulders in Ohio came from N. of Lake Erie should first show that the same kinds of rock occur there. He asks why the granite and other crystalline rocks may not have been made where they now occur as boulders. Judge Tappan has the lawyer's attitude.

Kentucky Geol. Surv., Vol. 2, 1857, has notes on p. 360 of the deposits back of Ashland, Ky., as follows: By Sidney S. Lyon. "Boulders and gravel of the drift period have been deposited upon these hills, and on the flat country N. of the main dividing ridges. These hills are from 150-175' above the banks of the Ohio at Ashland. No drift was observed at a greater elevation than these hills, nor in the valleys very slightly elevated above

the banks of the river. Nor in any of the streams behind the range of hills separating the Ohio River from the small streams running parallel to its course".

These deposits are in the path of the old Kanawha drainage.

Charles Whittlesey had a paper on the drift and alluvium of Ohio and the west in Am. Jour. Sci. 2nd Ser. Vol. 5, 1848, pp 205-217. On p. 211 he states that David Christy Limited?? the boulders in the SE to a line running from Mercer, Pa., to Zanesville and Cincinnati, Ohio, and Princeton, Ind., and the mouth of Karkachia?? River in a letter to Ver Mull in 1847. On p. 213 buried soils are reported as follows: Near Carey's Academy, 7 miles N. of Cincinnati and 900-1000' A.T. are 3 wells showing about the same section as follows:

Surface clay and loam	18'0"
Yellow sand	0'2"
Blue marly clay	1'0" 1'0"
Leaves, wood & sticks	0'2"
Vegetable mould	3'0"
Vegetable mould & marl	6'0"

Similar vegetation with mould, etc., was found 3 miles E. of New Burlington at similar altitude. In one well 15' a dirt bed lake surface soil. In another at 30' a "swamp" which ruined the water for drinking. At Cincinnati a well made by Judge Burnet near the corner of 4th & Vine Sts., struck a stump at 93' with roots attached in upright position. It terminated at low water level of Ohio River. In Am. Jour. Sci. Vol. X 1850 Whittlesey on pp 31-39 discusses the raised beaches of Lake Erie, the highest noted being 203' above the Lake ⁴⁴ $1\frac{1}{2}$ miles S. of Ridgeville Center. The S. ridge at Kingsville is only 152'.

A text book on Geology by Amos Eaton, 1830, 64 pp, with geologic map of New York, considers the drift the product of Noah's deluge. The "Proper diluvium is a confused mixture of gravel, sand, clay, loam, plants, animals, etc., so situated that it must have been deposited from water in a

violent state of action." Ultimate ~~kind~~ diluvium is a deposit of grayish yellow loam, reposing on other strata in all ancient uncultivated forests, which have not been cut away since the deluge. It is so situated that it cannot have been deposited from water when running with much velocity; but appears to be the last settlements of a deluge. In a 2nd edition in 1832, 134 pp, on p 86, "diluvium" is defined as "deposits made by the deluge". Proper diluvium is exposed along the Erie Canal from Little Falls to near the Genesee River. Ultimate diluvium in all the ancient elevated forests of New Hampshire, Vermont and Connecticut, etc.

Thomas Ashe seems to have traversed this valley in 1806. See "Travels in America" London 1809.

A paper by Dr. Alfred T. King of Greensburg, Penna., - "On the Ancient Alluvium of the Ohio River and its Tributaries" read before the Phila. Acad. of Sciences Jan. 3, 1854, appears in the Proceedings Vol. 7, 1856, pp 4-8. It discusses gravel deposits in the lower course of Beaver River that reach 150' or more above the stream, and deposits in the Ohio Valley near the mouth of the Beaver, (chiefly Wisconsin gravel). The East Liberty valley is interpreted to be an old course of Monongahela River but the thickness of alluvial deposits in it is overestimated being put at 100' or so. In a wall 20-30' deep in East Liberty a few *Unio* shells were noted in the sandy material thrown out. He decides that the range of hills N. of the East Liberty valley separated the Monongahela and Allegheny Rivers nearly to their present junction in Pittsburgh.

This is perhaps the earliest notice of the East Liberty valley. B. C. Jillson's paper in Trans. Pittsburgh Acad. Sci. Vol. I was published in 1893. He had a report on Allegheny Co. published in 1866 which I have not seen.

Brief mention is made by Dr. King of high level gravels on several tributaries of the Allegheny as well as the Allegheny Monongahela, Ohio & Beaver Rivers.

Darius??Dorius?? and Increase A. Lapham, Am. Jour. Science, Vol.22, 1832, pp 300-303, "Observations on the Primitive and other Boulders of Ohio". "The occurrence of each rocks in bed and banks of Ohio River is noted." Also that they occur "mixed with clay and sand forming banks and even hills of moderate elevation that are entirely beyond the influence of the Ohio or any other existing current of water".

When cemented by a stiff blue clay it is called "Hardpan"; when by carbonate of lime it forms a puddingstone. It is diluvial earth and in opinion of most geologists is referred to some flood or deluge. The thickness in places is 80-100'. The source of the boulders of primitive rocks is put beyond the Great Lakes. Secondary rocks occur which are probably of less remote derivation. It is noted that some classes of rock such as granite, weather so as to have a rough surface while certain greenstones retain a smooth surface. It is thought it would be "vain to speak² of the cause for these deposits. Ice is not mentioned in the paper.

The following letter to Mr. Charles Butts, U.S.G.S., deals with features noted by Leverett near Huntingdon, Penna., and the finds here reported make necessary a change in the report submitted for publication.

Harrisburg, Penna.
October 31, 1929

My dear Mr. Butts:

Recalling your report on Gravels ~~and~~ on the Juniata River below Tyrone, and Professor Leverett's similar report: I have sent two of the boys up there to look over the ground, map the gravels, etc. They have come back with several bags of specimens and report that the "gravels" near Spruce Creek they find to be weathered limestone pebbles and they brought quite a bunch of them in. They were not able to find the gravels you reported just east of Petersburg. However, gravels reported at two points by Prof. Leverett they find to be the result of the disintegration of a conglomerate, presumably in the Oriskany. That applies to the gravels at 1050' north of Huntingdon, and at 800 odd feet NW of Huntingdon. They brought back some chunks of the unweathered rocks as part of the evidence.

Very truly yours,
G. H. Mehly, State Geologist

I wrote to Dr. Ashley, Nov. 2, stating that the pebbles at 1050' north of Huntingdon seem to be in the line of a shallow valley, while those at about 800' on W. side of the river are in a well defined river terrace. There are pebbles on the slope E. of Huntingdon, down to about 800' A.T. that were probably weathered out of the conglomerate. (See my notes in Notebook 292, Sept. 21, 1927). In this letter I mentioned the finding of a granite pebble Sept. 30, 1893, at Climax, Penna., in an old oxbow of Red Bank River about 100' above the stream, or 1120-~~7~~ A.T. and raised the question, "How did it get there?"

Records of Wells near Basil & Baltimore, Ohio

A letter from Lewis K. Cook of Basil, Ohio, dated Feb. 14, 1930, gives the following data on wells in the old "Newark Valley" in his vicinity:

"At Baltimore Camp Ground 2 miles S. of Baltimore the drift is only 20'. A mile south of Baltimore on the 380' level the drift is about 100'. About 1200' NE a well showed 339' of drift. About 1/2 mile S. of Baltimore W. of road near two houses on 840' level a well required 337' of drift, so rock floor is 503'. Just S. of Basil right on the bank of creek a well was drilled on the 820' level, drift 371', making the rock level 449'. In Basil just E. from the street running N. from the graveyard two wells recorded 375 and 347' respectively, making a rock level of 485 and 513' as the wells are on 860' level. North of the railroad and on the 860' level Brown well No. 2 showed 341' of drift making rock level 519'."

Between Baltimore and Basil just N. of the connecting street, and between the canal and creek Wagner well gave 367' of drift on 820' level, or rock level of 453'. This is about 1/2 mile from the Will Haynes well noted above with rock level of 449'. These records were obtained from A. J. Weaver, who was in charge of the drillings of the South Liberty Co., a local

corporation. Tabulation of above:	<u>Alt.</u>	<u>Drift</u>	<u>Rock Floor</u>
Well 1/2 mi. S. of Baltimore	840	337	503
Just S. of Basil, Wm. Haynes	820	371	449
In Basil - 2 wells	860	375	485
	860	347	513
In Basil N. of railroad	860	311	519
Between Basil & Baltimore	820	367	453

Trip from Toledo, Ohio, to Jacksonville, Florida

March 11, 1930, Ann Arbor, Michigan. We started for Florida going by auto to Toledo via Ypsilanti, Whitaker, Oakville and Temperance on Route 23. We took Big Four train to Cincinnati. The country has very little relief until we pass the divide between Lake Erie and the Ohio River, or even until we are some distance S. of the Scioto which we crossed at Kenton. Rock is near the surface much of the way across the State of Ohio.

We stayed in Cincinnati at Grand Hotel overnight. On March 12 we took Southern RR across Ky. and Tenn. to Atlanta, Ga. The gently undulating Blue Grass Country is traversed as far S. as the vicinity of Danville, Ky. and shows the Lexington peneplain to good advantage. We wind around among knobs between Danville and the Cumberland River and on in rather rough country about to Harriman, Tenn. There is a peneplain about 1300' A.T. near Cumberland River. We there go W. over a low divide and enter a country that is moderately undulating that extends to Chattanooga. It shows cuts with deep weathering of rocks. In some cases cuts 30-40' deep do not get down to solid rock. There is some limestone in cuts near Chattanooga but generally the rock is of some other kind. The limestone has outcrops of large chunks in slopes but other rocks seldom show solid outcrops.

There are some prominent areas such as Lookout Mt. near Chattanooga and hills some hundreds of feet high are present W. of the railway as far S. into Ga. as we got before dark. The country seemed to be more plain to the E. from the RR. We spent the night at Atlanta at the Terminal Hotel near the depot.

On March 13. We went from Atlanta to Jacksonville, Fla. The country is rather strongly undulating about to Macon but has very little relief farther south. We went to Valdosta, Ga. and then E. across Suwanne River S. of the Okeepuckee Swamp. There is considerable swamp near the river and in places farther east.

We stayed at Jacksonville over night at the De Soto Hotel near the depot - a place too near the railway trains.

On Railway Jacksonville to Tampa

On March 14. We went from Jacksonville to Tampa. This took us thru rather flat land to Baldwin and S. from there nearly to Highland. Between Maxville and Highland we rose from less than 100' to more than 200' above sea level. There are cuts 6-8' deep near Highland. Those S. of the village have some stones exposed. Very little undulation here. I noted palm trees near Starke.

There are cuts in sand S. of Weldo and S. of Orange Heights. We noted the first orange trees near the latter place. There is flat Pleistocene near Hawthorn. There is undulating sand between Citra and Sparr and there seems to be higher land to the west. There is rolling upland between Ocala and Summerfield - many places with relief of 30' or more above valleys.

Limestone shows in ditches N. of Wildwood and near Coleman and also in fields occasional limestone blocks noted farther S. past Catherine. Red sand becomes conspicuous N. of Dade City. Some of it in and near Dade City seems to be pebbly. There are variations of 30' or more in altitude in vicinity of Dade City. A more level country is entered near Plant City and this extends W. into Tampa. We reached Tampa at 4:30 P.M. our train being 2 hours late.

E. E. Park and daughter, Helen, met us at the depot and we were entertained at their home until March 18 when we located at the Bay Shore Royal Hotel in Tampa.

March 15. We went with Mr. Park and family to St. Cloud and back to visit with Mr. & Mrs. E. E. Phillips of Denmark, Iowa, who have spent the winter in Florida.

Tampa to St. Cloud

We traversed a district covered by Pleistocene marine waters until nearly to Lakeland. Parts of it show moderate erosion with valleys 20' ~~+~~ in depth but much of the surface is flat and poorly drained. There is, however, considerable land under cultivation between Tampa and Plant City. Strawberries are an important crop and various vegetables also; but orange and grapefruit are not grown here so much as farther E. between Lakeland and Davenport. The upland from Lakeland to Loughman is sandy so that cuts 20' deep show no hard rock. There are numerous lakes in basins all over this upland. It is a great orange and grapefruit region. There are dunes SW of Loughman on the border of the highest marine Pleistocene terrace that rise 30' or more above it.

There is much swamp land between Loughman and Kissimmee and large lakes between Kissimmee and St. Cloud. One N. of St. Cloud is 8 miles in longest diameter. One S. of Kissimmee is still longer. The lakes are less than 10' below the level of the bordering plains.

We returned on same road that we took going over to St. Cloud.

Tampa to Bradenton & Anna Maria

March 16. We drove from Tampa to Bradenton on the highway near the bay and returned on the Tamiami Trail, which circles through a district farther east. This is all a district so low as to be crossed by the Pleistocene marine waters. Most of it is less than 25' above sea level. We saw no rock exposures. There are large groves of orange and grapefruit E. of Palmetto. One orchard of grapefruit has 99 rows of trees each a mile long. From Bradenton we drove to Bradenton Beach on a reef several miles W. of the city and then followed the reef to Anna Maria where we met Prof. C.H. Gordon & wife from Knoxville, Tenn. The reef is 1/2 mile wide at its NW end at Anna Maria, but generally is less than 1/4 mile and it stands less than 10' above Gulf level. It is composed largely of shells, of marine mollusks.

There are some palm trees along the reef and many in the village of Anna Maria.

On March 18 and 19. I worked on a moraine beach in Tampa tracing it from Jefferson Ave., ENE to the city limits at 40th Street. It cuts into land that stands above 40' and a maximum of about 60' in N. part of the city E. of Hillsborough River. The moraine level probably was not over 35'. Data on March 21 seem to make it 33'. The following altitudes of street intersections were obtained at the City Engineer's office. There seems to be no contour map of the city in this office.

	<u> Ft. A. T. </u>
Michigan Avenue at 12th St.	44.28
14th "	41.94
15th "	45.97
17th "	47.65
19th "	46.86
20th "	43.95
22nd "	39.59
24th "	42.22
26th "	45.69
29th "	41.90
34th "	29.61
Eleventh Ave. at 14th "	33.99
Ross Ave. at Jefferson St.	50.25
Seventh Ave. & Florida St.	32.99
Michigan & N. Burlwood??	20.21
Michigan & Howard	21.57
Cypress & Roosevelt	29.34
Thirtieth Ave. & 26th St.	60.31
" " & 29th "	57.78
Twenty-first Ave. & 34th St.	51.88
" " " & 36th "	46.31 in 4' cut
Twenty-sixth Ave. & 34th "	59.
Hillsborough Ave. & Highland	25.22
" " & Florida	32.36
" " & Branch	39.95
" " & Central	36.56
" " & Talisferro	41.39
" " & Nebraska	45.8
" " & 13th	50.45
" " & 15th	52.15

Tide reaches up Hillsborough River to the dam near the waterworks. North part sec. 29, T 28 S, R 9 E.

At the office of the County Engineer in Court House I obtained data on Hillsborough Ave. as follows:

Hillsborough Avenue has a summit W. of Hillsborough River at Armenia Street 45.3'. From there westward is a steady gradual descent for some miles to Memorial Road 5.6'. The profile on Hillsborough from 40th St. eastward nearly $2\frac{1}{2}$ miles shows the following fluctuations:

<u>Chains</u>		<u>Ft. A. T.</u>	<u>Chains</u>		<u>Ft. A. T.</u>
0	40th St.	56'	84	Crest	63
5	Sag.	47.3	88	Sag	56
16	Crest	59'	90	Crest	62
24	Sag.	55	94.4	Brick road	38.2
29	Crest	65.5	97	Top of grade	40.3
37	Sag	58.8	101-111	Low area	32-34
45	Crest	66	111	W. Base slope	32
50	Sag	60	123	Crest	43.3
56	Crest	67	126	Basin	36
73	Sag	46.5	129	Summit W. of Orient Road	47

To Lake Wales

March 20. We went with Dr. & Mrs. David Mills of Tampa to see the Bok Singing Tower N. of Lake Wales about 65 miles from Tampa. We took the highway leading past Hopewell, Mulberry & Bartow. Just E. of the intersection of the Palm River road and Hopewell road in SE part sec. 20, T 29 S, R 20 E we came to a beach that seems likely to be the continuation of that trend through the NE part of Tampa yesterday, the alt. of which is a little less than 40'. It runs SE across NE corner of sec. 29 into sec. 28, T 29 R 20 E. There is a rise of about 20' in $\frac{1}{4}$ mile or so E. of it.

On this higher plain there is some undulation with shallow saucer-like depressions and low swells. It has a whiter sand than that on the lower plain. This plain which seems to be about 60' A.T. extends past R 20 E to a higher tract about a mile wide E-W, and more than 20' above the plain each side of it. (Summit 98'. See p 72). We came down to the plain west of quarter post of secs. 24 & 25. This plain extends E. beyond the branch of the Seaboard Air Line RR which the highway crosses near W. end of line of secs. 20 & 29, T 29 S R 21 E. A rise of 30' or more is made just E. of this RR crossing to a high tract which extends but a short distance N. of the

highway in secs. 20 & 21 and covers the NE part of sec. 29 and NW of sec. 28. It is scarcely a mile across from W. to E. This high tract reaches about 130' at intersection with Dover road.

Trip to Lake Wales and Bok Tower

There is then a descent to a plain bordering Turkey Creek. This plain shows marked dissection. Between Turkey Creek and Little Alafia River there is a plain 15-20' above these streams, on which some rather black sand occurs. It is about 90'. But E. of the Alafia River it is not so noticeable. The plain extends E. past Hopewell rising to 113' at 1/2 mile N. of Hopewell. There are immense pits excavated both N. & S. of this highway apparently for phosphate rock. It seems to be brought up by dredging. The walls of the pits above water level are sand. We did not stop to examine the materials. We found the plain extends E. into Polk Co. past Mulberry about to Ridgewood. We there rose into the undulating tract above the Pleistocene marine levels. This has very gently undulating surface past Bartowneately to Lake Wales. Stronger undulations there set in and lakes are 30-50' lower than bordering hills. There is a hilly tract N. from Lake Wales past the Bok Singing Tower. The tower is on the highest hill its alt. being 324' A.T. at base of tower. This is in Lat. $27^{\circ}56'10''$ and Long. $81^{\circ}35'$. It is known as Iron Mt. The surface is a white sand. It stands about 75' above surrounding low tracts but there are hills N. & S. of it only a little lower than Iron Mt. The tower is 205' high.

Features near Bok Tower

We heard the carillon of bells in the tower played by Anton Brees, a most gifted player. The program included "America", Mendelssohn's Wedding March, Lowell Mason's "My Faith Looks up to Thee", Gruber's "Holy Night", Sneart's "Hark, Hark, my Soul", and Saint-Saens "My Heart at they Sweet Voice" from Samson and Delilah, and several less familiar pieces. It lasted 45 min. - from 3:00 P.M. to 3:45 P.M. Bok's body was buried at the N. side of the tower

near the "Great North Door" and the grove is outlined by a bordering panel of plants.

The bird sanctuary around the tower embraces 43 acres and carries a great variety of trees, shrubs and plants which were planned by Frederick Law Olmsted. The tower is built of the gray creole and the pink Etowah marble from the Tate quarries in Georgia and the coquina rock at Daytona, Florida. The pink marble forms the buttresses and the coquina rock the walls between while the gray marble is around the base. This hill had an original pine forest. It now carries over 1000 live oaks, 8000 azaleas, 100 Sabal Palms, 300 magnolias, over 500 gardenias and 10,000 sword and Boston ferns (as stated in the guide book). More than half the plants in the sanctuary are native within 20 miles of the tower. Some of the most important exotic plants are Azalea Indica, several kinds of acacias. Cattley guava, duranta, flame vine, white banhinia, primrose, jasmine, Sabal havanensis?? and cybedium, a genus of Terrestrial orchids native to the mountains of tropical Asia.

There are extensive groves of grapefruit and oranges through which the road winds in passing over the hills between Lake Wales and the Tower - a distance of 4 miles, and such groves are present for some miles in all directions from Lake Wales. There is very little uncultivated land in that district. But lakes are numerous. 13 lakes are visible from the base and 36 from the top of the tower (as stated in the guide book).

March 21. I got the following data on altitudes from the County Engineer of Hillsborough County:

About $1\frac{1}{2}$ miles E. of main part of Plant City near center sec. 27, T 28, R 22 E	147'
At E. line of county on highway 17	140' A. T.
One mile N. of main part of Plant City at road intersection near center of $20\frac{1}{2}$ sec. 20, T 28 S, R 22 E	126'
The alt. in Plant City at crossing of highway 17 & Dade City road about	120'

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About 3 miles S. of Plant City at corner secs. 8, 9, 16 & 17, T 29 S, R 22 E	111'
Intersection with Hopewell road corner secs. 20, 21, 28 & 29, T 29 S, R 22 E	113'
At Hopewell in E. part sec. 29, T 29 S, R 22 E	100'
Line of Twps. 29 & 30 S. about 1½ miles S. of Hopewell	100'
Summit S. of center sec. 5, T 30 S, R 22 E	107'
Crossroad at Alafia near center sec. 8, T 30 S, R 22 E	41'
About 80 rods N. of this road intersection	49'
On Hopewell road at corner secs. 23, 24, 25 & 26, T 29 S, R 21 E	92'
High point near intersection with Dover Road on Hopewell road	130'
High point near W. end of line of secs. 24 & 25, T 29 S, R 20 E	98'
Intersection of Hopewell and Lithia roads	57'
Intersection with Palm River road - about	33'
Road intersection at "South Tampa" SE part sec. 13, T 29 S, R 19 E	30'
West of Plant City on Highway 17 near line secs. 25 & 26, T 28 S, R 21 E	100'
Intersection of highway 17 and Seffner?? road in sec. 35, T 28 S R 20 E	80'
About 120 rods E. of this intersection	85'
About a mile W. of this intersection summit near center sec. 34, T 28 S, R 20 E	104'
An altitude of 100' is reached at a road crossing on line secs. 23 & 26 of the NW Twp. of Hillsborough Co. near Cosme.	

Tests for a water supply for St. Petersburg are being made around Cosme.
There is about 60' of sand above the rock (so I am told by the County Engr.)

From the city engineer of Tampa I got the following data:

Hendon and Central Ave.	25.91	Nebraska & Kirby	25.34
Sligh and " "	43.97	Nebraska & Hamilton	40.71
Hamilton & " "	38.54	Nebraska & Sligh	53.27
Knollwood & " "	43.89	Nebraska & Idlewild	44.09
Hanna & " "	38.05	Nebraska & Hanna	48.51
Hillsborough & " "	36.56	Sligh & 15th St.	44.47
Buffalo & " "	47.07	Hamilton & 12th St.	44.55
" & Tampa	33.03	Broad & 12th St.	29.75
Indiana & " "	42.42	Ola & Plymouth	31.41
26th Ave. & " "	33.19	Ola & Michigan	42.91

I traced an old marine beach northward through Tampa which seems to be about 33' A.T. where Hillsborough Ave. crosses it and also on Tampa Ave. at Buffalo and at 26th Ave. Also on Florida at 7th Ave. It is finely developed in Woodlawn Cemetery as a bar running SE^W with a bog E. of it that extends N. about to 26th and Tampa. The beach crosses Tampa NE of the cemetery at Buffalo Ave. where it is 33'. It is marked by a cut bank E. of Florida Ave. from Cayuga R. that rises abruptly 15' or more.

N. of Hillsborough Ave. it is rather vague. It seems to keep W. of Central Ave. as far N. as Hamilton and crosses Nebraska Ave. near Broad St. and runs up the S. side of Hillsborough River about 1/4 mile S. of the stream past 15th St. which is the E. city limit there.

March 22. I went to Hamilton on Central Ave. and traced a bar SW across Florida Ave. near Sligh St. It runs along or a little W. of Florida Ave. as far S. as Hanna and then crosses to E. side of Florida and runs out near Henry St. A gap extends to Comanche St. where a strong beach sets in that I traced yesterday. There is very little rise E. of this bar to Central Ave. and even to Nebraska Ave. N. of Hillsborough St. The alt. at Hanna and Central is only 33' while the beach at Hanna and Florida is probably 39' or more. I went W. on Hillsborough across the Hillsborough River to Armenia St. I came to the beach about where Francis St. would intersect Hillsborough if put through. There is a rise of 10-12' from it to Armenia and Hillsborough, the alt. there being 45.3'.

The beach runs S. 1/2 mile near Francis St. and then turns SW and crosses Armenia about 5 miles S. of Hillsborough. It has less relief here than at Hillsborough road and seems to die out in S. part of sec. 3, T 29 S, R 18 W.

From the intersection of Hillsborough and Armenia I noted that a level above the marine beach is maintained for a mile or more N. along Armenia and for 1/2 mile or more W. on Hillsborough. As noted March 19 the

profile on Hillsborough that I examined in the county engineer's office shows a steady descent W. from Armenia St.

At the City Library I consulted a report of the Florida Geol. Surv. published in 1926 that gives altitudes in Florida. In some cases there is a difference of several feet from the altitude of the same railway stations given in Gannett's Dict. of Altitudes. This seems to show the Florida Survey data to be more accurate. The ACL and SAL stations in some towns differ considerably as given by the Florida data. Thus Auburndale ACL is 167 and SAL is 141'.

- At Lake Wales one station is 142' and the other 153.7'.
- At Kissimmee one is 70 and the other 79'.
- At Largo S. of Clearwater one is 50 and the other 56'.
- **At Plant City the SAL is 127' and ACL 137'.
- At Clearwater one is 26 and the other 29'.
- At Belleair one is 42 and the other 49'.
- At Bartow one is 115' and the other 126'

** (Stations SE of Plant City, Trapnell 120', Coronet 120')

Lakeland	206'
Haines City	166'
St. Cloud	63'
Seffner on ACL is	74'
Mulberry	100'
Brandon	44'
Bradley Jc.	141'
Durant	40'
Goldstein	43'
Tarpon Jc.	18'
Dade City	98'
Knights	106'
Hopewell	114'
Turkey Creek	94'
Valrico??	65'
Nowatney	53'
Chapman	64'
Bruing	70'
Lutz	73'
Boyette	80'
Wimenzua	100'
Lithia	75'
Balm	128'
Edison Jc.	117'

The ridge on which Balm stands seems to be well above the highest of the marine terraces. There may be considerable land above these terraces in SE part of Hillsborough county.

Tampa to Tarpon Springs, Clearwater & St. Petersburg

March 23. We made a trip to Tarpon Springs, Clearwater and St. Petersburg with E. E. Park and family returning via the Gandy?? bridge across Old Tampa Bay. We went W. on Memorial Ave. in W. part of Tampa and crossed a summit in the highway near Armenia St. There seems to be a low ridge running NW that crosses Cypress St. 1/3 to 1/2 mile W. of Armenia. This comes to Lincoln St. 1/4 mile or less N. of Cypress. I need levels on it to determine if it correlates with the 33' marine shore.

The beach I saw yesterday on Armenia S. of Hillsborough I visited again and would locate it about 1/2 mile S. of Hillsborough and it runs westward from there as I could see from Tampa Bay Blvd. looking N. from sec. 10 into sec. 3, T 29 S, R 18 E. We went W. on Hillsborough from Armenia and came down to the marine 33' beach about a mile from Armenia St. The road running N. in sec. 34 (SW $\frac{1}{4}$) T 28 S, R 18 E is on it and a tributary of Sweetwater Creek cuts through it where this road runs W. to the sec. line of 33 & 34. The road runs along it northward to Willis?? City at Sweetwater Creek near line of secs. 16 & 21, T 28, R 18 E.

There is not a definite connection on W. side of this creek but a sandy ridge in NE part of sec. 17 may correlate with it. There is also a suggestion of a shore in SW part of sec. 8 along this road. There are detached sandy ridges just E. of Spivey and W. of Citrus Park that seem likely to be near the 33' level.

We went N. from sec. 3, T 28 S, R 17 E rising into a region of lakes that are about 100' as stated by the county engineer. Tests for water north of Cosine show sand 60' and hard rock below as noted on p. 72. The land bordering the lakes in this region is only 5-10' above them.

We went W. from Lake Fern to Tarpon Springs. There was a plain until we were within 5 miles of Tarpon Springs. We there entered rolling land in which some hills are 30-40' above the lowlands around them. There is a rolling sand dune topography in and S. of Tarpon Springs with dunes 20' ~~+~~ in height.

We visited the "Sponge Exchange" at Tarpon Springs and saw a great variety of specimens of marine life in the shops. We then went S. 3 miles to the Lithia Spring (Wall Spring) where a strong flow of water comes up through an opening shaped like a woman's profile (see card showing it). This water is said to have a constant temperature of 74°. There is a swimming pool here filled from this spring.

We continued S. along the shore past Palm Harbor but got farther inland between there and Dunedin. Possibly the alt. is 33' but it seems lower than to the S. in Belleair and Largo. A strip of land there gets above the 33' terrace and lies within 1 - 2 miles of the Gulf Coast. The land is lower farther E. and this high tract seems to extend only about to latitude of Indian Rocks. The whole peninsula E. and S. from there seems to be below 33'.

March 24. I went to Sulphur Springs and got data on the great Spring that boils up in Hillsborough valley there just west of Nebraska Ave. It boils up in a bathing pool whose surface is about 10' above river level. Its flow ranges from about 32,000 gallons per minute upward, there being a stronger flow in rainy seasons than in dry ones. The depth of the pool is about 25' and there is a coral rock in the bottom. The water has a constant temperature of 72°F.

A printed analysis of the water is given but not the name of the analyst.

	<u>Gr. per Gallon</u>
Magnesian sulphate	15.303
Ferrous sulphate	4.955
Calcium bicarbonate	15.542
Sodium Chloride	89.882
Silica	2.565
Total inorganic solids	112.017
Total solids	140.039
Oxygen consuming power	4.54 gr per 1000 pints
Combine traces of lithium and ammonium nitrate and sulphates.	

The county engineer thinks the water which feeds this spring sinks into the ground in the north part of sec. 13, T 28 S, R 18 E about 2 miles NNW of Sulphur Springs. It carries the drainage of several square miles N. of the intake.

Age of Alligators

There is an alligator garden at Sulphur Springs with alligators ranging in age from less than 2 yrs. to an estimated age of 300 yrs. The following classes are made each in a separate pen:

- | | | |
|---------------------------------------|---|----------------|
| 1. "King Tut" over 300 yrs. old |) | |
| 2. General Pershing over 200 yrs. old |) | All very large |
| 3. Dempsey the Giant Fighter |) | |
| 4. Tom the Moving Picture Star |) | |
| 5. Breeders 100-150 yrs. old |) | |
| 6. Breeder 60-100 yrs. old |) | |
| 7. Breeders 40-60 yrs. old |) | |
| 8. Alligators 10-20 yrs. old |) | Small |
| " 7-12 " " |) | |
| " 5- 7 " " |) | |
| " 2- 3 " " |) | |

Alligators lay 15 to 60 eggs.

The county engineer gave the following data on roads:

Crossing of Florida and Waters Ave. N. of Hillsborough R	56'
Plain on Waters Ave. 2 blocks W. of Nebraska Ave.	31.5
Waters and N. Boulevard	28'
Waters and Rome	30.6
Waters and Armenia	43.4

On Gunn Highway from Armenia Ave., NW to county lines:

SW corner sec. 22 T 28 R 18 E	49'
At Tampa and Gulf Coast RR crossing	40'
Ridge in E. part sec. 17	50'
Near center sec. 18	41.5
Near range line (secs. 7 & 12 T 28 S Rs 18 & 17 E)	47'
Brushy Creek	32'
Ridge 1/2 mile W. of Brushy Creek	41.5
Rocky Creek	28.5
Near line secs. 2 & 11 T 28 S R 17 E	44'
South part of sec. 2	34'
At sand ridge near center sec. 2	40'
Near Citrus Park	44'
High point in sec. 2 S. of Twp. line	49'
Near Twp. line	41'
From sec. 35 N. through sec. 26 a plain 53-57'	
At well derrick testing for water for St. Petersburg near Conroe	57'
Brooker Creek	47'
Plain between Brooker Cr. & Lake Fern about Creek near Lake Fern	63'
Near line secs. 2 & 11 T 27 R 17 E	54'
800' farther on	59'
3/4 mile S. of county line	49'
At county line secs. 3 & 34	47'
	52.8'

The county engineer outlined on my map the extent of a large swamp E. of Harvey that stands a little below 20' A.T. Hillsborough River is held up to 22' A.T. by the dam in N. part sec. 29 T 28 S R 19 E and until a levee was built near Harvey?? its water would partly escape into this swamp and be drained S. through Six Mile Creek. The swamp covers 7 or 8 square miles. It has canals leading into Six Mile Creek and is a very rich truck garden district. The county map shows the distribution of the main canals.

From Sulphur Springs I went W. on Waters Ave. crossing a hill at intersection with Florida 56' A.T.

The 33' beach is well defined on its east, south & west borders. I descend on the W. side to 28' at N. Boulevard. The 33' beach runs a little W. of Waters Ave. in SW part sec. 24 and SE of sec. 23 T 28 S R 18 E and crosses into sec. 26 near Rome Ave. The altitude at intersection of Rome

and Waters being 30.6'. I went $\frac{1}{2}$ S. to Sligh Ave. in Rome and had the beach in view as it runs S. through $\frac{1}{2}$ of secs. 26 & 35. I went E. on Sligh across Hillsborough River to Central Ave. and took electric car to Sulphur Springs where I got dinner. I went east on Temple Terrace Highway. This seems to be below the 33' beach until I get E. of the railroad in sec. 19. There is, however, a knoll S. of here on W. side of the railroad in sec. 19 that is above 33'. There is undulating land in $\frac{1}{2}$ of sec. 19 and in sec. 20 N. of the river with points between 40 and 50' A.T. There is undulating land in NW part of sec. 28 on N. side of river.

I crossed the river near line secs. 29 & 30 and went up to the dam. This raises the water to 22' from tide level. There is a power station here. A reef of limestone is exposed in N. bank of the river below the dam and rises to about 5' above the river. There are pot holes and irregular cavities formed in it by the stream. It is fossiliferous. Like that at Sulphur Springs it probably is Oligocene. The 33' moraine terrace extends into the $\frac{1}{2}$ of sec. 29 S. of the dam. There is a rise S. of it in S. part of the line of secs. 29 & 30 of about 30' or to fully 60' A.T. South from here in sec. 32 there are shallow sinks some with water in them. I went S. through central N-S road in sec. 32 to the Belmont Heights car line and took that back to Tampa. A knoll near E. line of sec. 32 N. of quarter post has a hydrant in it, whose alt. should be ascertained as it is on the highest point passed today and seems to be 70' or more A.T.

March 25. I went E. on the Broadway line to 36th St. I then went N. from E. Broadway on 40th St. and came to the 33' ^{marine} ~~terrace~~ shore near 30th Ave. It runs northward through W. edge of sec. 9 T 29 S, R 19 E. and then curves around to the E. and then SE passing out of sec. 9 S. of the quarter post. It runs eastward across S. part of sec. 10. There is a bar S. of the main shore in SW $\frac{1}{4}$ sec. 11. The main shore runs NE across sec. 11 to the Orient Road in SE part sec. 2.

There is a recess at Bellows Lake with a width of $1/4$ - $1/3$ mile and length of a mile extending to NW corner of sec. 2. The big swamp that I outlined on map from data given by the county engineer yesterday is entered by State Road 17 near corner of secs. 1 & 2, T 29 S & 35 & 36 & 28 S, R 19 E. It is largely in forest in this W. part. At Harvey^N?? there is a narrow gap through which the swamp connected with Hillsborough River. A levee along the railroad now fills it so that swamp cannot receive the water from Hillsborough River. The river has only a narrow strip of land bordering it below the 33' level from Harvey^N?? E. through Temple Terrace only about $1/4$ mile wide. It is $1/2$ mile or more wide W. from Harvey^N?? and becomes about a mile wide near the dam. But it narrows to scarcely $1/2$ mile at Florida Ave.

The N. and E. sides of the big swamp have the 33' shore close by in secs. 19, 20, 21, 28 & 33, T 28 S R 20 E. But the S. side of the swamp is bordered by a plain below the 33' bench so the swamp is the head of a bay opening to the S.

March 26. I took street cars to end of Belmont Heights line and went E. from there on Hillsborough Ave. (State Road No. 17). Between 35th & 40th Sts. I passed a large mass of coral rock 3' in longest diameter that seems to have been dug out there. There are fragments of molluscan shells in the cuts in a loamy sand under about 5' of clear gray or white sand. This is at about 60' A.T. The high points on the road from 40th St. E. across secs. 4 & 3 are 60-67' and in bordering fields some are as much as 70' A.T.

I crossed the southern part of the large swamp. The dry land crossed on line of secs. 6 & 31 and SW part of sec. 32 stands above the 33' marine level. The greater part of secs. 5 & 6 is above that level. The S. edge of the secs. and W. edge of sec. 6 are below 33'. The big swamp extends into the NE part of sec. 5 and into $N\frac{1}{2}$ of sec. 4, T 29 S, R 20 E.

The SW $\frac{1}{4}$ of sec. 4 is largely muck land draining S. into the Mango Lake drain. The plain E. & S. of it is 12-15' higher and may be above the marine 33' level. The muck strip along the Mango Lake drain is probably below 33'. It extends into the SW part of sec. 10 and N. part of sec. 15.

Probably the SE part of sec. 16 is above this marine terrace. There is an elevation in S. part of sec. 16 and N. part of sec. 21 that is 15-20' above bordering nearby level tracts. But there are basins in these level tracts. The lake in sec. 21 is probably below 33'. But the land N. and S. of it seems likely to rise above the 33' level. It is 10-15' above the lake.

There are sandy ridges crossed by the Plant City Highway in sec. 7 T 29 S R 20 E, that may be close to 33'. They do not connect at the N. with higher land there being a swale through which the Mango Lake drain runs. The hill crossed by State Road No. 17 in sec. 34 T 28 S R 20 E reaches 126' A.T. about 40 rds. S. of the highway. The summit on the highway is 104'. The alt. is 59-60' at the base of the steep slope on W. side of the hill. This may be an old marine level.

I found a pebbly sand in gullies E. of the road near N. end of line of secs. 4 & 5 T 29 S R 20 E at an alt. of about 80'. Most of them are 1/2 mile or less in diameter but I found one over an inch. There is not a definite terrace at this place. I seldom see any pebbles in the sand in this county.

The county engineer A. E. P----? and his draftsman, Ed. E. Ireland, gave me further data on alts. on a road that leads from Temple Terrace Jc. N. on the range line of Rs 19 & 20 E T 28 S to the SW part of sec. 6 and then NE to the Morris bridge on Hillsborough River. There is a large swamp N. of Hillsborough River and it also extends E. of the river about to the Atlantic Coast Line RR in T 27 R 21 E. Its W. edge is W. of Cypress Creek in secs. 4, 5, 8, 17, 20, 29 & 32 T 27 S R 19 E.

Cow?? House Creek in NW part of T 28 S R 20 E has a swampy strip 1/4 mile or more wide along it that is below 33'. The dry land NW of it has points up to about 60' A.T. The alt. comes down to about 31-33' in a few places along the highway.

The following data were set down:

Chains	Ft.A.T.	Chains	Ft.A.T.	Chains	Ft.A.T.
0	51'	138	50	247	49
16.5	40	152	60	249	47.6
24	49'	167-175	35	258	49
32	48.5	179	33	264	51
44-50	58	190	41	280-285	33
79 at Fowler Road	56.5	202-209	32	295	34.5
87.5	33	210	33	302	40.6
92-104	31	224	58.4	330	36.6
113	35	230-233	46	340 at river	31.5
120	46	237	44	bank	
				Morris bridge	32.7

March 27. I went with E. E. Park by auto on 40th St. to Hillsborough River. On the S. bluff there is a ridge in which oyster shells are a conspicuous feature. By hand level they are up to 55' or 33' above Hillsborough River above the dam. There are also lumps of indurated rock imbedded in a clay and some concretions several inches in diameter. The oysters are in a loamy material. There is very little clear sand here - a coating 1-3' thick.

We continued N. across Hillsborough River and found the river and bordering low plain about 3/4 mile (by auto measure) in width. The N. shore is where the highway runs E. to 46th St. We went N. on 46th to a sink in S. part sec. 16 T 28 S R 19 E. It is 15' or more below the road and is like an exposed sec. of a subterranean drainage line, about 1/4 mile long and only a few rods wide with a stream 20' ~~4~~ wide in it.

We went N. to Cypress Creek in NE part of sec. 4 and found sandy land with pine timber clear to the creek in sec. 4. The land is at about 33-35' as far out from the creek as the line marking edge of higher ground that I traced from the soil map of Hillsborough County. There is some sandy

land on the E. side of creek in SE part of sec. 33, T 27 S, R 19 E but it reaches scarcely 5' above the swamp. Cypress Creek is deep at this bridge fully 10' as determined by running a pole down from the bridge. We went back to line of secs. 9 & 16, T 28 S, R 19 E and then E. on Fowler Ave. to the same line crossing Hillsborough River 3 miles W. of that line. It is in a narrow valley here 60 rods or less in width. The valley is also narrow where it runs E. in sec. 11. The valley becomes wide in N. part of sec. 11. In fact the river is in a broad swamp above there nearly up to the county line in N. part of T 27 S, R 21 E. We drove out to the Morris Bridge on the asphalt highway that runs between Cow House River and Hillsborough River. The Cow House has a swamp 1/4 - 1/2 mile wide that is below 33'. I find the level of the river at the Morris bridge is 27.7' A.T. or 5' below the bridge floor. The bordering swamp land is about 31' and the sandy spots N. of river are about 35'. The border of the dry land S. of the river in secs. 32 & 33, T 27 S, R 20 E, is irregular.

We went back on the old railroad grade in secs. 5 & 8, T 28 S, R 20 E and found some swamp in it before reaching?? Cow House swamp. This is 1/2 mile wide at this crossing. We took road E. on line of secs. 8 & 17 to Thonotosassa and got lunch at a bathhouse on the shore of Lake Thonotosassa. The lake has been lowered several feet by the opening of a canal N. from it along Flint Creek. Its present level is probably about 28' but its former level was at least 32'. There is a dry sandy strip between the lake and the river swamp standing 40-50' A.T. The outlet of the lake had a very narrow passage through it 100-200' wide. Lake Thonotosassa may have been cut off from the estuary on Hillsborough River by a sandy bar.

There is considerable muck land along the stream that comes in from Seffner and on a western tributary in secs. 22, 23 & 24 & 26, T 28 S, R 20 E, through which canals have been run so it can now be cultivated

though Mr. Park thinks it is subject to frost. The swamps or muck land around Lake Weeks and Lake Hooker near Seffner seem to be over 50' A.T. ^{for} from Seffner is 74' and the highest land in Seffner seems to be not more than 20' above these lakes.

From Seffner we went W $3\frac{1}{2}$ miles and then N. to Highway 17 on line of secs. 5 & 6 T 29 S R 20 E. The marine 33' shore line runs through the S. edge of these secs. as noted yesterday.

We went N. on Highway 17 a mile and then N. into the big swamp. We entered this on line of secs. 32 & 33 T 28 S R 20 E about $\frac{1}{3}$ mile N. of Highway 17. We went to a small island or sandy knoll in the swamp in SE part of sec. 29. It is 15' ~~+~~ above the swamp so is about up to the marine 33' beach. There are a couple of dwellings on it. Very little land in the swamp is under cultivation.

We returned to Highway 17 and went W. to Orient road and then N. to Harney?? as Mr. Park wished to see the spillway there between Hillsborough River and the big swamp. We then took the "brick road" SSW to Highway 17 and returned to Tampa on it and 34th St. March 28. I went by auto with Helen Park to Gibsonton where she is teaching school. From there I went E. to the "Tamiami Trail" near Riverview. The marine beach at about 33' crosses this highway in a SW-NE course near the center of sec. 20 T 30 S R 20 E. I can see another ridge $\frac{1}{2}$ mile S. crossing the "Tamiami Trail". A rain set in when I got to Riverview so I had to quit work. I rode with a bakery wagon to Mango and took a bus from Mango to Tampa. The bakery wagon went E. on Palm River road to Hopewell road and on the latter to a store at middle of line of sec. 24 T 29 S R 20 E or past the summit of the highland 98' A.T. on line of secs. 24 & 25. This is near Valrico Sta. It is 41' higher than the intersection with Lithia road (57' A.T.)

We went back to the road that runs into Brandon in SE part of sec. 22. We then took a road on line of secs. 22 & 23, 14, & 15, 10 & 11 to

Seffner. This is through rather prominent land decidedly higher than a mile to the W. and much of it is in citrus fruit orchards.

At Tampa I got data from Mc. McElroy, an engineer, on levels from Hooker Lake E. of Seffner N. to Thonotosassa or about 44' A.T. The canal N from Lake Thonotosassa lowered the lake nearly 6' as there was 6' fall from the lake to the Hillsborough River Swamp. The present level of the lake is about 30' A.T.

Mr. McElroy has contour map with 1' contours from Hooker Lake to Lake Thonotosassa. Mr. Sullivan, a civil engineer, of Tampa put in the Mango Lake Drain. This lake is about 24' A.T. The swamp on Six Mile Creek where this drain enters is between 15 and 16' A.T.

The Florida book of Altitudes published in 1926 gives points W. and SW of Lake Okeechabee that are above 40' as follows:

Hall City	44'
Palmdale	52'
Eddy	45.5'
Imnokalee	44.3'
Lake Okeechobee is	20' A.T.
The S.A.L. RR at Bradenton is	21'
Parrish NE of Bradenton is	41'
S. of Bradenton is Onee ²	30'
S. of " is Bee Ridge	36'
Verna is is	100'

North from Plant City Sta. altitudes are as follows:

Near N. edge of Plant City	126'
Knights Station	106'
Crystal Springs in edge of Pasco	
County	72'
Zephyr Hills	88'
Dade City	98'

March 29. I worked on the 33' shore line from Hillsborough Ave. north and west in T 28 S Rs 18 & 17 E. It is within 1/2 mile SW of Gunn Highway between streams and comes up to the highway near Sweetwater Creek, Brushy Cr. and Rocky Creek. It runs across secs. 13, 4, & 5 T 28 S R 17 E. There are no roads near it in SW part of T 27 S R 17 E. It seems to run into sec. 32, and may leave Hillsborough Co. from sec. 31. The district

along and NE of this shore line is partly in citrus fruits where the alt. is 40-55'. But the district below or SW of the shore line is wet land and scarcely at all developed.

March 31. I examined a district in the W. part of Tampa from the Memorial Highway northward past Tampa Bay Blvd. The highway is 23.6' at Lincoln Ave. and seems to be lower at all points further E. It is less than 23' at the monument near Moody Ave. where there is a perceptible relief above land E. and W. of it. It is 21.16' at Albany St. and Grand Central?? - Memorial Highway. I find a sandy bar N. of Cypress St. from near Armenia westward beyond Lincoln which stands above 33'. It is about 5 or 6' above the level of Roosevelt and Cypress which is given as 29.34 by City Eng'r so is 34-35' A.T. It is about 1/8 mile wide and is clearly defined for a mile W. from Armenia. Some of the land N. of it is below 33' and all the land S. of it.

The intersection of Habana and Dewey is 37.67 and of Habana and Main is 36.24. Armenia and Main is 33.79. Armenia and Dewey is 34.36. Armenia and Kathleen is only 27.76. It is probable the Alt. reaches 33 on Kathleen and Michigan near Habana. Armenia seems to be below 33' for about a mile N. from Tampa Bay Blvd. A drainage ditch leads E. through this low area. A considerable part of the district W. of Armenia from Tampa Bay to Cypress seems to be above 33' as far W. as the city limits on Lincoln. I got alt. of stations in Pasco County from the Florida Altitude Bulletin as follows:

Keystone Park	32	Greer	91
Odessa	57	Browns	66
Drexel	79	Loyce	77
Ehren	90	Greenfield	75
Pasco	110	Denham	74
St. Leo	140	Deer Lake	75
Trilby	69	Ellerslie	118
		Millard	94

April 1, 1930. I took a bus to Clearwater from Tampa via Safety Harbor. There is land near Safety Harbor in sec. 34 T 28 S R 16 E that seems to be about the height of the 33' marine beach and land of about that Alt. comes nearly to the shore of Old Tampa Bay in secs. 4, 9, 16 & 17, 19 & 20 T 29 S R 16 E. Farther S. there is a broad area of low land W. of the bay. I learn from the county engineer, G. E. Burleson of Clearwater, that the highest land in Pinellas County is 99' A.T. and is near the line of secs. 29 & 30 T 28 R 16 E crossed by Highway No. 48. This highway is above 33' E. from there to within 1/2 mile of Tampa Bay on line of secs. 21 & 28 T 28 S R 16 E. Highway No. 3 which runs E-W about 3 miles farther across secs. 9, 8, 7, 12 & 13 T 28 R 16 & 15 E is above 33' from near E. side of sec. 8 westward to E. edge of sec. 11.

Its summit is 73' in NE $\frac{1}{4}$ sec. 7 near where Highway 44 crosses Highway 44 is above 33' as far N. as center of sec. 31 T 27 S R 16 E. Farther ~~S~~ north a few points come up nearly to 33' while others are down to 15' or less. The county engineer outlined the rolling land N. of Tarpon?? Springs on N. & E. sides of Lake Butler, much of which is above 33' A.T. The highway (No. 45) running E. from Tarpon Springs past north end of Lake Butler gets up to 33' near center of SW $\frac{1}{4}$ sec. 8 T 27 S R 16 E, is mainly above 33' as far E. as the E. part of SW $\frac{1}{4}$ sec. 10. On the plain E. from there it is 18-27' except a knoll just W. of the county line where it gets to 33' but is below 33' at the county line. The rolling land covers parts of secs. 8, 9, 10, 15, 16, 20, 21, 28 & 29 T 27 S R 16 E. The land is above 33' in much of secs. 1 & 12 T 28 S R 15 E. There is great irregularity in the border at 33' S. from there to Clearwater. A bar runs SW across secs. 26 & 27 into NE part of sec. 34 T 28 S R 15 E along or near Highway No. 1. The main 33' shore runs through W. part of sec. 25 NW corner sec. 36 and SE part of sec. 35 T 28 S R 15 E and W. part of secs. 2 & 11 T 29 S R 15 E.

The greater part of sec. 15 is above 33' but there is a lower strip along its E. side. The S. part of sec. 16 in Clearwater is above 33' and a bar runs N. between the railroads and the shore that is about 33'. The A.C.L. RR station is 29' but is above 33' in S. part of Clearwater. The present shore & 33' shore are close together from Clearwater S. past Indian Rocks?? to Indian Pass in sec. 30 T 30 S R 15 E.

Land above 33' extends S. on W. side of Long Bayou into sec. 34 T 30 S R 15 E. Its border is about 1/2 mile W. of the Bayou from sec. 34 northward to sec. 10. The shore line (33') continues N. through E. part of sec. 2 and of sec. 34 (T 29 S). It there turns NE through sec. 26 and S $\frac{1}{2}$ of sec. 24 T 29 S R 15 E and central part of sec. 19 T 29 S R 16 E near shore of Old Tampa Bay. I examined these shore features as far S. as Largo in morning and NE from Clearwater past Dunedin?? in afternoon making a circuit in secs. 26, 27, 34, 35 & 36, T 28 S R 15 E and secs. 1, 2, 3, 10 & 11, T 29 S, R 15 E. I returned to Tampa on bus on No. 2 Highway. Tests for oil are now being made in W. part of sec. 2, T 29 S R 15 E. One well is said to have struck some oil at about 900'. It is planned to make another boring of greater depth.

April 2, 1930. I got the following data from county engineer on altitudes on Michigan and Tampa Bay Avenues W. from Lincoln Ave:

Michigan and Lincoln	36.6
200' W. of Lincoln	38.8 general level of area
600' W. of "	34'
900' W. of "	36.5'
1200-2400 of "	34' in cypress swamp
3/4 mile W. of Lincoln	37' at summit of ridge
1 $\frac{1}{2}$ miles W. of "	23' near corner secs. 8, 9, 16 & 17
4400' W. of Lincoln	33' on W. slope of sand ridge

On Tampa Bay Boulevard:

Lincoln & Tampa Bay Blvd.	37.5
1600' west	40'
3/4 mile west	38'
1 $\frac{1}{2}$ miles "	35'
1 $\frac{1}{2}$ " at crest of sand ridge	36' This is at corner of secs. 4, 5, 8, 9
2 miles west	28' Near airport buildings

The sand ridges that stand 36-37' here are probably to be correlated with or included with the 33' shore line. They are in an exposed situation where SW winds would tend to build a beach a little above ordinary water level. There may have been an island in secs. 4, 9, 10, 15 & 16 T 29 S R 18 E separated by a narrow strip of water from the S. end of the peninsula in secs. 2 & 3 but the water had very shallow depth. I examined the beach on W. side of this island today.

April 3, 1930. I went by auto with E. C. Park into the NW Twp. of Hillsborough Co. and found the road that runs across secs. 29, 30, 19 & 18 is along or near the 33' marine shore. The low rise in the Highway 45 just W. of the county line is probably near the county line N. from there to Pasco Co.

We took Highway 45 W. past the N. end of Lake Butler crossing the range of hills in secs. 8, 9, & 10, T 27 S R 16 E. We went S. on the paved road W. of Lake Butler rising and falling over a series of sandy knolls and ridges, the highest of which seem to be nearly 33'. We came to the 33' shore N. of the center of sec. 31. It passes SE a few rods N. of the center of sec. 31 and runs eastward into sec. 32 to the S. of the quarter line road.

The shore is N. of this road in NW $\frac{1}{4}$ sec. 31 and a short distance into sec. 36 T 27 R 15 E. It then runs to the SW corner of sec. 36. It there turns S. and runs for two miles near the line of secs. 1 & 2, 11 & 12, T 28 S R 15 E. There is a low strip extending ESE in S $\frac{1}{2}$ sec. 13 but most of secs. 13 & 24 are above 33' and the shore traverses the eastern part of sec. 23. The part SW from there into Clearwater was mapped April 1. We went E. over the high tract in secs. 29 & 30, T 28 S R 16 E which reaches 99' A.T. There is a slope from it down to about 75' A.T. which changes at that level to an imperceptible slope. It is probable that 75' marks an old marine shore. The area above 75' lies mainly in secs. 29 & 30 but may extend S. into secs. 31 & 32. The toning down that this shore line exhibits is markedly

greater than in the 33' shore line.

We spent some hours mapping the 33' marine shore from sec. 5, T 28 R 16 E southward across sec. 8, 11, 16, 21, 28 & 33, and the island N. of Safety Harbor in sec. 34 and adjacent parts of secs. 27, 28 & 33. The western part of sec. 4, 9 & 16, T 29 S R 16 E rises above 33' though there is a low strip along the S.A.L.R.R. in sec. 8 that is probably below 33'. We worked no further S. than Safety Harbor today. There are salt springs at a bath house here.

On our return we visited the Tampa Archeological Museum N. of Cyprus Ave. about $1\frac{1}{2}$ miles W. of Lincoln Ave. A large number of human skeletons of various cranical types have been dug up here on ground that stood only about 2' above the general level. Pottery of various kinds is found with the skeletons. One skull has a remarkable thickness, about $1/2$ inch. A circular issued by the Archaeological Society interprets three kinds of culture. The lowest extending down to 6' below the surface being dated back about 1,000 yrs; the middle about 3' down is dated back 700 yrs.; and the highest very near the surface is dated back 400 yrs. to the time of the Spanish mission. The middle zone is said to have more highly marked artefacts than the zones above and below.

Some residents of Tampa are incredulous as to the above history and think these skeletons are of recent burial at time of some yellow fever epidemic when deaths were so numerous that the bodies were dumped into a pit at this place. It is a question for an anthropologist to clear up. On referring to the 20th Ann.Rpt. Florida Geol.Surv. I find a paper by George A. Simpson dealing with extinct animals of Florida.

On page 264 a list of 44 species of land animals many of them of extinct species is reported from a "bone bed" in Seminole field W. of St. Petersburg. Reference is made to O. P. Hoy's?? Hay's??Hog's?? notice in Carnegie Pub. 322 page 159 of fossils found at Indian Rock and around Tampa.

Simpson considers the No. 2 bed at Vero and the Melbourne beds as undoubtedly Pleistocene but he is in doubt whether the No. 3 bed should be classed as Pleistocene or instead of Recent. The No. 3 Vero bed includes many recent mammals with an uncertain number of extinct forms, some of which may have been derived from No. 2 bed. He classes stratum No. 1 at Vero as "a marine deposit probably of early Pleistocene Age". While No. 2 is "a stream, swamp, and wind deposit". He favors late Pleistocene age for No. 2 and questions Hay's?? interpretation of its being Aftonian. Simpson has an earlier paper in Bull. Am. Museum Nat. Hist. Vol. 56 pages 561-599. Stratum No. 1 is called "Anastasia Formation". Cooke and Moison call the Stratum No. 2 "Melbourne beds".

April 4. I find an area just E. of Tampa has alt. above 33' that is S. of the line I previously made the southern limit. It is in $N\frac{1}{2}$ sec. 16 and NW part of sec. 15, T 29 S, R 19 E. On 10th Ave. the alt. is 34' at 40th St. and an area both E. & W. of 40th St. between 7th & 10th Ave. is above 33'. This is isolated from a tract E. of there that comes down to 7th Ave. On the tract 10th Ave. reaches 41'. From 2900-3400' E. of 40th St. it is 36.5 and reaches 41' at 3800' from 40th St. It comes down to 33' at 4950' E. of 40th St. and is 29' at Plant City road. On Michigan Ave. it is 32' at 40th St. and 33' at 50th St. and 39' 2200' east of 50th St. It is 33' at 3100' from 50th and 35' at 3500'. It is 30' at intersection with E. Exats Broadway. The following alts. on 50th St. N. from 7th Ave.

7th avenue & 50th St.	34.8'
700' north from 7th Ave.	41'
1500-2400' N. of 7th Ave.	36'
At 4700-6300' nearly plane at	46-48'
At 7400' at intersection with Fort King road	72'
On 56th St. north from Fort King road alts. as follows:	
At Ft. King Road	44.6'
At 1100' North	60'
Pond at 1900-2500'	Water 32.5 bed 29'
3600' N.	61'
6000' N.	38'
6500' N.	43'
7000' N.	35'

7800' N.	51'
8200-8800' N.	41'
9000' N.	44'
10,000 - 10,800 N.	38'
11,300' N.	34'
11,900 N.	38'
At bridge on Hillsborough River	27.6'
Water	22-23'

Altitudes on 40th St. N. from 7th Avenue:

At 7th Ave.	29'
800' N.	33'
1100 - 2400' N.	34'
2500'	33'
3300'	30.5
4200 - 4900'	33'
5900'	40
At Hillsborough River Bridge	27.4'
At 7200' N.	52'
At 7500' N.	48'
At 8300' N.	60.3
At 8900-9300'	49'
At 9800	53
At 10,300	46.5
At 11,300	51.5
At 11,800' N.	48
At 12,800 - 13,300' N.	48 55'
At 14,600' (Kahn Ave.)	49'
At 15,300 - 15,800' N.	56.5
At 16,000	58.5
At 17,500 - 17,600	51.2
At ridge with oyster bed on S. bluff of Hillsborough River.	

April 5th I went to St. Petersburg and got data from the city engineer on the area in and near that city standing above the 33' marine beach. The alt. is 34' at 4th Street and Central Ave. It is 56' on Central Ave. about 2 miles farther west. It is 44' at line of secs. 22923 and 34' at Central Ave. & Diston in E. part of sec. 21 T 31 S, R 16 E. There is a rise to 53' at 7th Ave. and Diston on line secs. 16 & 21. Lake Sheffield in SW part of sec. 9 is 48.5'. On Clearview Ave. the 33' level is at 55th St. W. of middle of line of secs. 4 & 9. It is only 29' at corner of secs. 4, 5, 8 and 9, and is 22' at crossing of S.A.L. RR on line of secs. 1 & 12. Diston and Clearview at 49th St. is 40'.

Clearview at 46th is 50' and at 43rd is 55' and at 41st is 56.5' and is 50-56.5 to 39th St. It is 54.5 at 37th St. and 53' at 34th. A ridge between 33 & 34th Sts. is 55'. Top of rail at A.C.L. RR on Clearview is 56'

at 19th St. It is 45' at Haines Road. There is a rapid drop on E. side of Haines Road to less than 33' about at the range line across secs. 1 & 12, 6 & 7. The 33' line runs through the $W\frac{1}{2}$ of sec. 7 and is near 4th St. in central part of sec. 18 and southward to Central Ave. The area above 33' seems to extend N. as far as S. part of T 30 S, R 16 E and it probably extends S. into secs. 25, 26 & ~~27~~ T 31 S, R 16 E. It is thus 6 miles or more from N-S and $3\frac{1}{2}$ miles from E-W in the part between Central Ave. and Clearview Ave.

April 6, 1930. We went with E. C. Park and family to Safety Harbor. The mounds recently excavated near there are on the bay shore near NE corner sec. 34, T 28 S, R 16 E. The work is now suspended.

We find a prominent strip of land standing above 33' runs E. through central part of sec. 9, T 29 S, R 16 E along W. side of Cooper's Bayou. We went S. on Highway 4 from quarter post of secs. 17 & 18 T 29 S, R 16 E across the canal "Cross Bayou" to the highway that runs E. across S. part of sec. 29 and 28 T 30 S, R 16 E. There is a cut 5 or 6' deep where the canal crosses Highway 4, on line of sec. 17 & 18 T 30, R 16 E. It seems to have been opened to give a free discharge for drainage of lands each side. These lands stand 15' ~~+~~ above sea level a short distance back from the canal on each side.

We find the 33' marine beach runs ENE across S. part of sec. 33 and then E. across central part of sec. 34 & 35, T 30 S, R 16 E, then SE across SW part of sec. 36 and on to the corner sec. 1 & 2, 6 & 7, T 31 S, R 16 & 17 E, then S. through W. part of sec. 7 to SW part of sec. 18. It there turns E. across 4th St. and runs S. for 1/2 mile to Central Ave. It extends S. of Central Ave. between 4th and 9th Sts. but a recess in the shore extends E. about to Central Ave. between 9th and 14th Sts. The shore there runs SSE through $E\frac{1}{2}$ of sec. 24, T 31 S, R 16 E. We do not attempt to trace its course farther W. but it is likely to run through secs. 25 & 26.

It comes N. to Central Ave. near center of sec. 21 and has a northward course from there for 4 miles to sec. 33, T 30 S, R 16 E, to where it turns eastward as noted above. We went ~~west~~ into sec. 17, T 31 R 16 E to where the Seminole Bone Pit is said to have been opened. We see only drainage ditch excavations near this highway and those have marine shells in the dump. From this place we returned to Tampa via Gandy bridge.

April 7. I went with Helen Park to Gibsonton. From there I continued S. a mile to Gardenville and then went E. I came to the 33' marine shore on the E. bluff of Bullfrog Creek. The land W. is scarcely 25' A.T. but it is fully 40' on E. bluff. I am told by residents that the E. bluff stands perceptibly higher than the W. for 4 miles S. from where I crossed or to the junction of the two forks of the Creek in SE part sec. 13, T 31 S, R 19 E. There is a plain 40 or more feet high along the Tamiami Trail in T 31 S, R 20 E. A swamp in secs. 30 & 31 drains both E. (through Bullfrog Creek) and S. (through Cypress Creek). The profile of the highway leading E. from Ruskin shows the bank of Cypress Creek to be 29' and the water level 25 or more feet A.T. The highest point between Ruskin and Cypress Creek is 36' about $2\frac{1}{2}$ miles E. of Ruskin. The alt. is 33' about 2 miles E. from Ruskin and not far from 33' after passing the ridge until one crosses Cypress Creek. There is then a rapid rise to 47' at the range line between Rs 19 & 20 E. and 63.5' at the Tamiami Trail at line of secs. 7 & 8, T 32 S, R 20 E. The alt. is 100' at Wimauma. I went N. on the Tamiami Trail past Riverview, crossing the 33' beach near center of sec. 20 as noted March 28.

I turned E. $1/2$ mile N. of Riverview and zigzagged across sec. 9 to the Bloomingdale Highway. There are sandy ridges in secs. 17 & 9 and basins but I think the ridges are less than 33' A.T. There is flat land W. of Bloomingdale road as far E. as a range of rolling land which runs across sec. 2 and NE $\frac{1}{2}$ sec. 3 into sec. 3 $\frac{1}{4}$, T 29 S, R 20 E. This seems to mark the

course of the 33' beach. There is a low tract running SE across sec. 34 that probably was a bayou at the 33' stage. The SW part of sec. 27 is also swampy. The marine beach seems to run westward across sec. 28 and turn NW across NE corner of sec. 29 to the Hopewell highway where I have previously noted it.

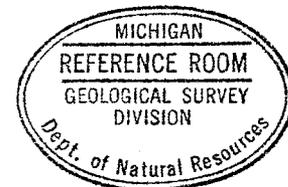
I went into Brandon for dinner and continued N. from there to Seffner. There is highland running NW from where I noted it on the Hopewell road 4 miles S. of Dover, across NE part of sec. 23 W. part of sec. 14 and sec. 11. It is 75 to nearly 100' A.T.

Notes April 14 on land 150-154' in
Eastern Hillsborough County

I went from Seffner to Plant City. The rise is gentle from the lakes just E. of Seffner up to Dover - from 44' to 98' A.T. at Dover, with scarcely any undulation. But directly E. of Dover a more rapid rise is made and there is undulating land from there into Plant City. I went E. to the point (147' A.T.) at intersection with Midway Road in sec. 27, T 28 S, R 22 E. The surface there is very flat so it does not have perceptible relief. The phosphate beds are excavated a short distance SE from here. I am told that they are covered with from 2-30' of sand, their surface being more irregular than the present surface.

I went N. $1\frac{1}{2}$ miles and find there are swales 15' or more below the general level that surround tracts about up to that level. I went W. a mile and then S. into Plant City and returned by bus to Tampa. I am in doubt whether the land above 100' in vicinity of Plant City was covered by the sea in early Pleistocene time. Matson's Pl V in W.S. Paper 319 indicates that it may have been.

April 9 Mr. Homer Patterson of Ottumwa, Iowa, (who is brother-in-law of E. C. Park) took me by auto to Riverview and we traced the 33' beach eastward on S. side of Alafia River. The paved road rises above it on E.



side of Rice Creek near W. line of sec. 21, T 30 S, R 20 E. It runs northward into the bend of Alafia River in secs. 16 & 15. It comes back to this paved road 1/4 mile W. of Bell Creek and a strip 80 rods $\frac{1}{4}$ wide below 35' extends up this creek valley into sec. 26. The land above 33' comes close to Alafia River on E. side the mouth of Bell Creek.

We crossed Alafia River on line of secs. 23 & 24 and find a plain over 1/2 mile wide below 33' on this sec. line, and it appears to hold this width across secs. 13 & 24. The 33' shore runs W. across E. edge of NE $\frac{1}{4}$ sec. 23 and then runs NNW across W $\frac{1}{2}$ of sec. 14 and loops around from a NW to an eastward course in E. part of sec. 10 and much of the NW $\frac{1}{4}$ sec. 11 is below it. It then runs NW across SW part of sec. 2 into sec. 3 as noted April 7th.

We drove N. to Seffner through central parts of secs. 23, 14 and 11, T 29 S, R 20 E, on a relatively high strip standing between 75 and 100' much of the way. This overlooks lower land to the E. in which Valrico Lake and Long Pond lie and a connecting swamp between them.

From Seffner we went W. 3/4 of a mile and then N. through E. part of secs. 3 & 34 to State Road No. 17. The high strip that passes through Seffner does not run to the highland in sec. 34 that reaches 126' but flattens out in secs. 2 & 3. We returned on State Road 17 to Fort King Highway and along it past cemeteries on the highland 70-75' A.T. near where 50th St. intersects Fort King Highway.

April 11. I examined profiles of the road that runs S. from Plant City to line of secs. 7 & 18, T 32 S, R 22 E, in order to get the part that stands above 100'. As previously noted, it is above 100' about to Alafia except a mile S. of Hopewell. Alafia River is only 20' but the road rises to 100' about a mile S. of the river in S. part sec. 19 and reaches 110' a half mile farther S., but drops below 100' in N. part sec.

31, T 30 S, R 22 E, and is 72' at a creek in sec. 6, T 31 S, R 22 E. It is above 100' nearly all the way from center of sec. 7 and center sec. 19 but drops to 64' at Hurrah Creek in S. part sec. 19. It rises to 100' opposite Hurrah Church in sec. 31 and is 124' in N. part sec. 7, T 32 S, R 22 E, and is 119' at end of road S. Line sec. 7. The highway that runs E. from Ruskin is 103' at Wimauma and drops below 100' at line secs. 11 & 12 E. of Wimauma $1\frac{1}{2}$ miles. It is below 100' for about 6 miles E. but comes up to 100' near E. end of line of sec. 11 & 14, T 32 S, R 21 E. It is 119 at road to Plant City but down to 100 about $\frac{3}{4}$ mile E. It is near 100' from corner of secs. 8, 9, 16 & 17 E. to the county line. The crest seems to lie N. of road here.

Matson's Map in W.S. Paper 319 shows an area above 100' from Balin N. a few miles and then E. into SE part T 30 S, R 21 E. It also shows a large area NW from Plant City in NW $\frac{1}{4}$ of T 26 S, R 21 E. and SE part of T 27 S, R 21 E. and SW part of T 27 S, R 22 E. Also the NE part of T 27 S, R 22 E. Kathleen in Polk Co., a short distance E. from there is 133'. Matson's map seems to be in error in bringing so large an area above the 150' contour into Hillsborough County E. of Plant City (See county map).

I examined the topographic maps of all the quadrangles in Florida now issued. The Ocala map shows land up to 160' in SE part of city. The S.A.R.R. station is 63'. Dead River swamp in E. part of quadrangle is below 40' and so are Silver Springs which discharge through this swamp.

Esala Apopka Lake which is type name for the middle Marine Pleistocene terrace is only 39' A.T. Land W. of it reaches 220'. In Palm Valley quadrangle an area near Durbin reaches 70' but most of quadrangle is below 40'. So also is most of Palatka quadrangle but Palatka Heights and Satsuma Heights reach about 90'. In Orange Park quadrangle an area W. of Orange Park and one W. of Green Cove Springs are above 70' and dunes in NE part 50' but most of quadrangle is below 40'.

Jacksonville quadrangle is mostly below 30' but a strip E. of St. John's River is over 60' and does not seem to be a dune belt. Interlochen quadrangle has a strip below 40' in E. part with steep rise to 80' at its W. border Points?? Ponds? NW of Interlochen 220'. The Hilliard quadrangle is below 40' in NE and E part. The Okefenokee Swamp is almost 120' and land E. of it near Clarking, Ga., is 178'. In Folkston quadrangle land E. of swamp 150'. Highland in the Lawley quadrangle reaches 210' while Maxville is 100' or less.

April 13. I went with E. C. Park and family to Sarasota via the "Tamiami Trail". We detoured by farm roads W. in sec. 18, T 31 S, R 20 E, to the 33' shore E. of Bullfrog Creek. There is a mound at turn of road at center of SW $\frac{1}{4}$ sec. 18 about 5' high and 80' $\frac{1}{4}$ in diameter in which oyster shells are very numerous in the sand. Is it a place where Indians had feasts and left the shells?

The E. tributaries of Bullfrog Creek crossed by the Tamiami Trail on line of secs. 19 & 20, and 29 & 30, T 31 S, R 20 E, have flats 60 rods $\frac{1}{4}$ wide that are below 33'. The shore seems to run southward in secs. 30 & 31 less than a mile W. of this highway.

The width of the low plain on Little Manatee River is over 1/2 mile at this highway. The S. tributary of this stream has a low plain bordering it in sec. 35, T 32 S, R 19 E, but sec. 36 and S. part of sec. 25 stand above the 33' beach. The highway rises above 33' as it passes into Manatee County. It is near the 33' shore at Parrish, the drop to the lower plain being visible in W. part of village. The railway is 41' A.F. at Parrish.

I was unable to locate the place SW of Parrish where the highway passes below the 33' beach. There are basins and irregularities of surface at lower levels than 33'. On the return we took the Bayshore Trail from Bradenton. I noted rock outcrops a mile N. of Ruskin in ditches at roadside

at an alt. of perhaps 5' above sea level. There are similar outcrops S. of Adamsville on line secs. 10 & 11, T 31 S, R 19 E.

April 14. Road profiles in county engineer's office show a strip above 150' near E. line of Hillsborough County. The road running N. between secs. 23 & 24, T 28 S, R 22 E, is above 150' for about 1/3 mile around corner S. of secs. 13, 14, 23 & 24, and has a summit 154' very near these sec. corners. This strip above 150' probably runs N. along or near line of secs. 13 & 24 into Polk County. This road leading N. from the Lakeland Plant City highway is above 100' for 4 miles or past middle of line of secs. 1 & 2 and is 95' at its terminus 1/4 mile S. of twp. line.

The road leading W. through Knights Station is above 100' to near center of sec. 1, T 28 S, R 21 E, but the stream bed a mile E. of Knights is 99' and water 101.5' and bank 104'. The highway leading S. from this road in secs. 2, 11 & 14, T 28 S, R 21 E, is 90-98' and is 97.6' at S. line sec. 14. The 100' contour is probably near by on E. side of this road.

The beach I saw yesterday W. of Wimanna is 69' at base of steep grade 3/4 mile E. of Tamiami Trail and the top of grade near a church is 92'. Wimanna Lake is 83'. This shore line at 69' probably runs S. 1/2 mile W. of the lake.

In the Eighth Annual Report Florida Geol. Surv. p. 126 Sellards mentions the existence of a Pleistocene cypress swamp in Hillsborough Bay 20' below present sea level as evidence that the land stood 30' ~~+~~ above present sea level in a recent period of emergence. In this period of emergence underground drainage was better than now and developed sinks at corresponding levels.

April 16. I drove out with a Leverett family of Tampa to Lake Magdalene in sec. 35, T 27 S, R 18 E, and on the way examined the sink in N. part of sec. 13, T 28 S, R 18 E, that takes in the drainage from several secs. in twps. 27 & 28, S, R 18 E, and is supposed to feed the large spring

at Sulphur Springs. The amount of water going into this sink is however, but a small fraction of the amount discharged by the spring. It is probable that much of the land in the E $\frac{1}{2}$ of T 27 S, R 18 E, and NE part of T 28 S, R 18 E, has underground drainage toward Sulphur Springs for there are many sinks in this district. The lakes in it may occupy sinks that have become silted up so as to stop free under-drainage. Lake Magdalene is scarcely 5' below the plain bordering it and is probably about 50' A.T. for Nowatney Station E. of it is 53'.

April 17. I interviewed O. W. Bie, Associate Engineer in U. S. Engineer's Office in Tampa, concerning the cypress swamp that was struck in the bed of Hillsborough Bay, as noted in Eighth Ann. Report Florida Geol. Surv. p. 126, 1916. He says there were roots and limbs of cypress for a distance of about 1/4 mile at a depth between 20 and 24'. There was an earlier channel 20' deep that did not strike the cypress but where deepened to 24' it was struck. There were no stumps but the roots gave them much trouble because so hard to break. The place is about 3 miles N. of Gadaden?? Point. This deepening was about 1913.

April 18. W. from Tampa to Ocala on S.A.L.R.R. N. of Knights Station cuts show gravel. There is a low tract below 100' within 1/4 mile N. of station but farther N. for a mile or more dry land is probably up to 100'. There is rolling land N. of Zephyr Hills at a little below 100' the alt. being 88' at Zephyr Hills and 91' at Green or g and 98' at Dade City. It is strongly rolling near Cordova?? and Dade City some points above 100'. Red soil near Dade City and chunks of rock in some cuts. Near Coleman rock chunks are conspicuous and continue [&] near Wildwood are flat tract below 60' A.T. Rolling land entered between Wildwood and Oxford that continues to Ocala.

April 19. Visited Silver Springs and rode in glass bottom boat. The springs are numerous for some distance down the stream and have a combined discharge of $1/3$ of a million gallons per minute. Water is remarkably clear so small objects can be seen in depth of 35 or 40'. The cliffs now submerged are very interesting. The fishes, turtles, etc., are a great attraction. Fish come to the boat and get food handed out to them.

April 20. Jacksonville to St. Augustine, Fla. The Florida East Coast Line RR rises above the 33' beach at 18.75 miles from Jacksonville and reaches 51' at Durbin near M.P. 21. There is a crest NW of Durbin at 20.5 miles that is probably between 55 & 60'. There are other crests near M.P. 22, 24, 26 & 27. The land drops below the beach at about 29.5 miles. The Jacksonville Top. map shows considerable land above 40' E. of Jacksonville in the bend of St. Johns River and a point in sec. 12, T 3 S, R 27 E, is above 80'. This seems to be on the northward continuation of the ridge I traversed at 18 $3/4$ - 29 $1/2$ miles from Jacksonville.

This is generally above 50' from St. Johns River in secs. 34 & 35, T 1 S, R 27 E, southward to sec. 12, T 3 S, R 27 E, and land W. of it in and near Arlington & Eggleston Heights is up to 50' in several places.

I went over to Arlington on the ferry and found a marine shore occurs just above the 30' contour. The surface is undulating above the 40' contour and some suggestion of a shore of a little above 40' but not so definite as one 10' lower. The ridges that catch the 40' contour in tps. 2 & 3 S, R 28 E, may be near enough to the Atlantic to be storm beaches of same age as the 33' marine shore line. On the borders of St. Johns River this marine shore seems to be very little above 33'.

The bluff exposures along E. side of St. Johns River near Arlington seem to be entirely sand and I saw nothing but sand exposed in the ridge that I traversed for 10 miles on the road to St. Augustine. The surface part is white but some iron stain was noted in some exposures along

the road to St. Augustine. We sampled the water in the Ponce de Leon Spring at St. Augustine and found it very refreshing. It seemed cooler than spring water generally is in this latitude. I did not inquire as to its temperature.

Prof. W. B. Scott of Princeton discussed my paper on "Relative Value of Physiographic and Paleontologic Criteria in Pleistocene Correlations" presented before the National Academy of Sciences April 29, 1930, and called attention to a paper on a recent find of mastodon in Ecuador which seems to have lived as late as the 4th century A.D. as it is associated with pottery of the Maya civilization of that date. The paper was by Prof. Dr. Fr. Spillmann Quito-Ecuador "Das Letzte Mastodon von Süd America". Natur und Museum Band 59 Heft 2, pp 119-123 Feb. 1929. Frankfurt on the Main. The find was made by Spillman in April 1928 in the Inter-Andes highland of Ecuador.

In the Jour. Wash. Acad. of Sciences March 19, 1930, is a paper by Alfred P. Dachnowski-Stokes on the peat profiles of the Upper Everglades in Florida. The peat on the borders of Lake Okeechobee extends in places nearly down to sea level, from a level 17-18' A.T. and is quite generally down to 7 or 8' A.T. The broad leaved shrubs and trees have only recently invaded this district and layers of woody peat derived from them are lacking.

In an earlier paper Nat. Acad. of Sci. Pr. I vol. 8, 1922, pp 225-231, Dachnowski discusses the time involved and puts the lowest sedges?? at 11000-8000 B.C. but the reason for so estimating the time is not apparent. He tries to correlate it with the Lake Border morainic system of the Lake Michigan Basin but that is likely to be much more than 11000 years old.

It is assumed that a period of erosion preceded the peat development and that a rise of water or lowering of land started the formation of peat. Lake Okeechobee is of recent date. The water coming in from springs was prevented escape by the dense growth of sedges?? with a matted network of roots and rhizomes.

C. Wythe Cooke has discussed fossiliferous in Florida in two papers: Am. Jour. Sci. Vol. 12, Nov. 1926, pp 441-452 and Jour. Wash. Acad. of Sci., Vol. 18, 1928, pp 414-421. Cooke locates the Seminole field bone bed in sec. 5, T 31 S, R 16 E, in Joe's Creek, instead of sec. 17 as given by city engineer of St. Petersburg.

Leveretts in Tampa and vicinity in 1930

Mrs. Oscar Leverett, NW of Tampa in sec. 33, T 28 S, R 18 E

Mrs. Mirabeau Leverett (Mirabeau died at about 40 yrs. of age)

and Mr. & Mrs. Blanks E. Leverett, 713 W. Indiana St., Tampa.

Mr. & Mrs. Andrew S. Leverett, 111 W. Jean St., Tampa

Mirabeau's father's name was Harrison Leverett.

Oscar's father's name was Morgan Leverett.

The three Leverett families Oscar, Andrew and Blanks are not related to each other so far as known.

Mrs. Mirabeau Leverett has two sons in Houston, Texas: Woodfin and Sidney Leverett. All these families are southerners from Ga., Miss., and Fla. They know nothing of northern ancestry.

Wm. Leverett, 4106 Baltimore Ave., Philadelphia, is great grandson of Wm.

Leverett and Lydia Fuller of Brookline, Mass., as is also Frank Leverett.

In Philadelphia telephone directory are Mrs. Margaret Leverett a widow,

435 S. 45th St., who seems not to be related to Wm. Leverett.

The same is true of John Leverett, 6539 N. Uber St., Philadelphia.

Wm. Leverett thinks he is connected with a garage. Wm. Leverett is a lawyer and graduate of Harvard Univ. 1885. Is now with R.A. Dun & Co. Was born in Newport, R.I., in 1863, son of Rev. Wm. Leverett, an episcopalian.

(J. Oliver Tinsie, 4518 4th St., NW, Washington, D.C.; Miss Frances E. Gates, Tampa Public Library, Tampa, Fla.)

Water Supply Papers in Tampa Library: 93, 117-200, 259, 283, 293. All of the 300s except 300, 304, 311, 313, 320, 331, 332, 336, 361, 362, 389, 390, 391-394, 396, 398-400. Library has 402 and 419 but nothing later. It has

two copies of No. 319.

Catalog of Photos

Nov., Dec., 1913.

No. 1 $\frac{1}{2}$ LCCW cut in Wilcox or μ ? sands and clays L & A RR Shreveport,

T 50 Site of old steamer dock.

Jefferson Tex?? Oct. 1913

T 51 Cypress Bayou looking downstream Jefferson Tex?? Oct. 1913.

T 52 Site of old steamer dock Jefferson Tex?? Oct. 1913.

T 53 N. bank cypress bayou with small levee now used as RR grade
Jefferson Tex?? Oct. 1913.

L 2 Cut on L & A RR Shreveport

La Wilcox sands with clay breccia

T 54 levee north side of cypress bayou Jefferson Tex?? Oct. 1913

L 3 - same as L 2.