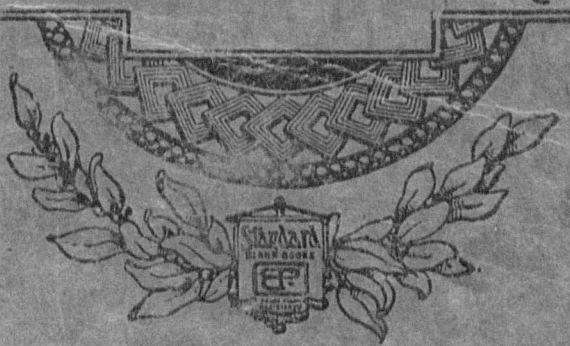
Junius Henderson
Field Notebook
No. 9
1920 - 1921

Junius Henderson,
Boulder, Colo.

Standard

NOTE BOOK



60 LVS.

No. 9. 1920-1921

Account - 1920.

May 8 -	Greenman, pencils, ink, etc. -	1.35
" "	Royce - oil	.38
" "	Co. clerk fish & game permit	1.00
" 10 -	Greenman, rubber bands	.10
" 11 -	Seller - thread	.30
" "	White - Davis "	.30
" 26.	Game & Fish Com. coll. permits	1.50
" 29 -	Greenman Tissue paper etc.	.20
June 4 -	Utterback oil & gas	3.61
June 9 -	Moyle, cord, kettles & pot etc.	8.31
" 10 -	Pие, straps on car	1.75
" "	Withers - grease & waste	.95
" "	Terry & Goodnow, 2 flash lgts	.85
" 12 -	Ham - Wolf	2.90
" 13	Blanchard, 4 doz. eggs	1.60
" 14,	Wolf - 8 lb. beef	2.25
" "	Nat. State Bank Boulder charges on checks	.75
" "	Received 200.00	
" "	Howard Gro. Co.	8.80
" 15	C. & A. Gro. - bread	.30
" "	Hall Bros. gas. & repairs	1.60
" "	Curtis - dinner for 2 -	1.00
" 16 -	Home Bakery - Laramie, cake, etc.	.90
" "	Gem City Grocery "	1.60
" "	Laramie Auto Co. - Gas & oil	1.83
" "	Fraser Garage "	(44.84) .74

June 17 – Walden Mt. Garage – belt for car	Fwd 44.84	.75
" " " " 5-gal. gas. @ 41¢		2.05
" " —— Paul Stephanie Stefanie bread & pie		.85
" 19 " " " " "		.70
" " " walden Amer. Merc. Co. – fruit		.70
" " Walden – Mt. Garage – repairs		.60
" " " " " 2 gal. gas. @ 41¢		.82
" 21 Laramie Auto Co. – pump –		3.50
" " " " " gas 1.85 oil .35¢		2.20
" " F.A. Collins-Hall motor Co. gas. 1.05 tire boot 1.10		2.15
		59.16

June 12 Recd. from Univ. —— 200.00

gave Dr. Ramaley 10.00

Eastern Colo. trip.

June 23 – Poe – repair camera case	1.00
" " – Campbell – auto repairs	8.60
" " Boulder Rubber Tire Works vulcanizing	2.25
" " " " " gas & oil	1.27
" " Howard Gro. Co.	2.70
" 24 Kersey Colo. – 3 gal gas	.99
25 – repairs	.25
" 24 – H B Wolf – Beef	2.20
25 – Bread	.65
" 26 – Orchard – R. H. Patterson valves & wrench	.85
" " F.A. Morgan – Cotter's Bakery	.75
" " " " Central Grocery	.70
" " " " Esskee & Vanbuskirk repairs .25 gas 2.08	2.33

" 28 - Lyons - G. C. Van Nordheim. gas .92

24.91

July 2 - Temple Drug Store - shaving soap 1.00
3 - H. B. Wolf - ham 2.00
6 - Brady Rock salt .40
6. Orton Smith, eggs & butter 1.55
8 Baird's Bakery .80
8 Lyons St. Train Garage gas @ 32¢ 1.60
7. Howard Grocery 3.75
" H. B. Wolf Meat 2.20
10 - Howard Grocery 1.65
10. Boulder Rubber Tire Works - gas .68
" Kream Krust Bakery .85
13 - T. T. Collins - gas 1.75 oil 70 — 2.45
13 - Longmont - repairs .75
15 - Withers - plears .45

Tolland trip

July 15 - McAllister, pole for net. .55
16 - Hubbeman - ring " " 1.00
17 - Wolf - ham 3.70
19 " beef 1.85
" Howard - Groceries 5.06
" Kream Krust Bakery .65

July 20 - ~~gas~~ 8 gal gas		2.72
26 Tollerud - groceries		.60
27 " "		.95
30 " meat		1.25
31 " Bread & milk		.42
aug. 3 " groceries		.75
5 Boulder - gas		1.70
" 7 Lyons garage - getting car out of gulch and repairs		26.50
" " fare to Lyons		1.30
" 9 repair of strainer		.35
" " " " tire ~~tube~~		3.50
" " " " spring		3.10
" 11 - Wolf - meat		2.95
" " Withers - gas		2.38
" " Howard groceries		1.80
" 13 F.X. Collins - oil, gas, grease		2.80
" 14 - Wolf - meat		5.20
" 16 - repairs on car		6.50
" " 5 1/2 gal. gas		1.87
" " Boulder - groceries 11.53 7.68		19.21
" " " bakery		.95
" 19-23 - Eldora - groceries & meat 1.05 .16 2.38 .25 .90		4.74
" 24 Nederland - gas		2.40
" 28, U. of C. camp, board		7.00

North Park Trip.

Boulder, Colo., Tuesday,
June 15, 1920.

Dr. F. Ramaley and I left Boulder ~~9 a.m.~~ 9:30 a.m. in a Ford car, lunched at Berthoud. Camped ~~at~~ about 5 mi S. of Laramie at 6 p.m. No good water. Hot morning, cooler afternoon a little rain.

Iris abundant near camp on Laramie plains

Open Mt. country, rather steadily climbing ~~until we f~~ from The Forks until we ~~climbed~~ passed into Wy then descended into the ~~a~~ treeless & shrubless Laramie Plains.

Snow clad peaks to W. & S.W., lower Mts. to E.

Camp probably on Harney Creek, an intermittent stream, 1½ mi. N. of Red Buttes Sta. on U. P. (See Laramie sheet. Pool where road crosses yielded a few dead Pisidium, Planorbis etc. & some dead land snails. At 25.2 [?] speed-

ometer reading 6827.7 – alt. 7300.
Speedometer at Boulder 6716
" " camp 6827.7
111.7 mi.

Laramie, Wyo., Wednesday,
June 16, 1920

Reached ~~camp~~ Laramie at noon,
hot morning – Speedometer 6833.
Drove on to N. to Rosler " 6854.9
Back to Laramie " 6874.+
Mall. Sto. 25 at " 6838.4
on Laramie River ~~N. of~~ below Laramie,
Water high – ~~to~~ naked bottom for
Unionidae but found none. On sand
bars found one valve of Sphaerium.
From Laramie we drove
S.W. and camped in valley bet. Mts. at
Speedometer reading 6903.6, hence
about 31 miles. Morrison formation
well exposed here.
Camp is opposite Jelm – a mile

above Woodie Landing, Wyo., just N. of S. boundary.
Cloudy, windy afternoon.

Jelm, Wyo., Thursday
June 17, 1920

Bright, breezy morning, soon clouding.
Mollusk sta. 3-5-4 - aspens S. of Jelm, N. facing slope, S. side of ravine, slope covered with debris of igneous rock resting apparently on Morrison or Lykins formation. Small Oreohelix, Vallonia & Pupilla, all scarce.

Moll. Sta. 4, 2-5-5, among roses beneath dwarf willows on Morrison formation, bottom of ravine nearly E. of Jelm (across river). Larger Oreohelix, ~~Vallonia~~ & Pupilla, all scarce.

Formations folded here. E. of river Morrison formation dips at high angle toward river. Slope above occupied by "Lykins" red beds, dipping N. E. at low angle toward top. No light-colored massive s. s. exposed at top of Lykins.

Started on at about 11:30.
Crossed river at speedometer 6911.4 +

began climbing the divide bet. Laramie & North Platte Rivers.

Mollusk sta. #23-6 about 2 mi. up hill in first aspen grove on road W. of river. Oreohelix (1 dead shell), Valonia, Pupilla, Succinea, Vitrina (small, dead), Lonitoides & Pyramidula & Lymnaea here.

Crossed state line (speedometer 6923.6) just beyond "Wyo-Colo" on the Railroad line.

Reached Walden at 3 p.m. Speedometer 6947.3. Had new fan belt put on car.

Drove N.E. to 2-bar ranch, following Mr. Blevins, owner & camped at ranch - 9 mi from town - speedometer reading 6956.3.

Streams in Park, as on Laramie Plains, full & overflowing into sloughs & little hope for freshwater Mollusks now.

Birds

at first camp Brewer's blackbirds at various places in Wyo. - a few redwings.

shore larks most common birds along

roads on Laramie plains.

I hear redwinged & yellowheaded blackbirds and a bittern at this camp. Killdeers common ~~all~~ in North Park.

2-Bar Ranch - Friday
June 18, 1920

Cool, partly cloudy, windy.

We walked about 3 mi. E. to sand dunes, crossing several creeks at high water stage - no bridges.

Dunes form a large amphitheater mapped in North Park Bull. of U. S. G. S. Sand seems to be spreading slowly from the basin formed by the wind, and passing up over the "Dakota" ridge. Old sand dunes now well covered with vegetation surround it. I suppose the present cycle is a result of the wind getting a start cutting into the old dunes, beneath which were beds of coarse gravel composed of granite & sandstone debris etc, now exposed by erosion. ~~Ap~~ Aspens up to 8 or 10"

inches are growing on the new dunes thus formed.

Streams all too high for collecting shells.

North Park, Saturday,
June 19, 1920

Rained at intervals last evening, with high westerly winds at times continuing all night and until 9 a. m. Snow on hills. very cold all night

Heard crow this morning (saw three just north of Laramie Wednesday)

Broke camp at about 10 a.m. and ran through Walden & some miles to the S.W., then back north, camping at 4 p.m. at N.E. corner of Park where road starts over hills to Laramie. Partly clear afternoon. Much warmer at this evening's camp & well sheltered from wind & also on higher ground. Speedometer 6984.3

Mollusk sta. 257 a small, rather alkaline lake about 1/2 mi. W. & a little S. of Walden. A few dead shells, immature, of Lymnaea collected, smaller live ones of same

species seen in the water.

Moll. Sta. #2-58, a small, very alkaline lake, completely enclosed by land, about ½ mi. S. W. of Convery (about 9 mi. N. of Walden. Same sp. of Lymnaea (probably) only dead shells found, one or two mature.

A flock of 15 crows flew over camp just before sundown. Magpies & White crowned sparrows at camp.

Partly cloudy afternoon, clear in evening.

North Park, Colo., Sunday, June 20, 1920.

Cold night with a shower.

Bright fine morning.

Mollusk Sta. #2-59, aspen grove on S. facing slope about 3/4 mi. N. of camp.

Sta. #2-60 aspen grove half mi. S. E. of Sta. #2-59. Conditions appear favorable, but snails scarce.

Saw a young porcupine in aspens.

" " big trout in small brook.

We have seen several White-tailed jackrabbits in sage brush in parks and

one on Laramie Plains 4 W. of Laramie.
This camp is at mouth of ~~Pinkham~~ Canyon 2 mi. N. E. of Northgate, Colo.
Broke camp at 2:30 p. m.
Reached Laramie at 7 p. m. & camped a mile or two ~~of~~ below town on river bank.

Laramie, Wyo., Monday,
June 21, 1920.

Broke camp at 9 a. m.
Took pictures of toadstool erosion in Chugwater (Lykins) redbeds at camp, and later in day of ~~weathered~~ eroded granite at Tie siding and just as we pulled out of Laramie Plains S. of there. Also a fine picture of jointed structure in granite a few miles S of Colo.—Wyo. line.
Reached Boulder at 7 p. m.

Boulder, Colo., Thursday
June 24, 1920

Bright & hot.

Left Boulder at 10 a.m., with Ramsey in the Ford car & drove through Longmont, Platteville, Evans, La Salle, Kersey & Hardin. Below Hardin we took a road running S. over the divide to Roggen. At 5:30 p.m. we camped at an artificial reservoir formed by overflow by a ditch, 2 or 3 mi. S of S. Platte River.

Divide N. of Roggen, Colo., Friday
June 25, 1920

Cool, cloudy day.

We drove to within about 1½ or 2 mi. of Roggen and collected among sand dunes. Many depressions, some containing more or less permanent water. ~~Lost~~ Lost Creek sluggish, choked with vegetation.

Mollusk Sta. 26, Lost Creek, where we left the car. Lymnaea caperata abundant

many young toads & small fishes.
Moll. Sta. #, depression in sand dunes - pond 20 ft. x 75. Succinea common.
Moll. Sta. #, pond 75 x 100 ft. in another depression near # 11. Lymnaea caperata (a few), Succinea sp. abundant, Physa, one or two specimens narrow specimens. Saw remains of crayfish
Took an adult toad at sta 10.
Moll. Sta. #, pond 20 x 75 ft. near Stas 11 & 12, 3 Succineas.
Moll. Sta. #, another pond about same size near Sta. 11-12-13. Lymn caperata & Succinea sp. common.
Moll. Sta. #, Last creek a mi. above Sta. #. Lym. caperata common.
Captured a red striped garter snake in the tent on return to camp. Saw 2 of them at the sand dunes
The whole divide is sandy.
Saw 1 blacktailed jackrabbit.
Noted following birds today
Red wings common about ponds - must nest on ground - no cattails, etc. Willows in one or 2 places.
Killdeer - very plentiful

Horned (shore) larks & common.
Great blue heron 2
Lark bunting 1
Meadowlarks common
Mourning dove "
Nighthawk 3
Barn swallow 1
Kingbird 1
Coots and unidentified ducks on Lost creek slough. Coots common
Saw 2 big suckers in lake at camp.

Fort Morgan, Colo. Saturday
June 26, 1920

Broke camp at 9 a.m. & drove to Fort Morgan. Cloudy & cool.

Red shafted flicker 2 mi. W. of Ft. Morgan and beaver dams and stumps 7 mi. farther W.

Moll. Sta. #27 slough in bottom at Ft. Morgan. Physa sp.

Moll. Sta. #28 slough near Goodrich in River bottom. Physa sp.

In afternoon drove W. and at 6 p. m. camped at Wildcat Mound, N. W. of Platteville.

Rained a little about dark and again before midnight.

Wildcat Mound, Sunday.
June 27, 1920.

Collected some fine Halymenites, with Fox Hills marine invertebrates. Also some recent lichens and other plants.

The top of the mound is a very coarse, well consolidated conglomerate of quartz pebbles and other mountain debris, smoothly waterworn, pebbles up to 2 and sometimes 4 inches in diameter - probably Pleistocene, possibly Tertiary.

Below this is white, massive Laramie s. s., iron stained (yellow) in places, especially at top, with black specks, several concretionary bands, with a few Ostrea

globra toward bottom—perhaps 40 or 50 ft.

Below this are gray shales, about 20 or 25 ft., with a band composed of Ostrea globra near the base.

Then more s. s. with concretionary bands and shales, perhaps 10 to 20 ft.

all the above is probably Laramie.

Below that is a great thickness—perhaps 50 or 75 ft.—of massive s. s., much like the upper one, yellowish & whitish, with black specks and several concretionary bands. At about the middle is a zone filled with Halymenites major all around the gullies, with Cardium speciosum, Macra sp., Nucula sp., Tellina & other Fox Hills fossils. I would assign this whole s. s. to the Fox Hills, though I found no fossils above the Halymenites and below the oysters. Look up notes made on former visit some 8 years ago. Along R. R. track to the South about 20 ft. of shales are exposed at the base of the Fox Hills s. s. cliff.

Across the ravine to the west plant fragments and fossil wood occur a few feet above the lower Ostrea horizon. One fossil log I uncovered is a foot in diameter, but too much shattered to be of any value.

Crows common in this locality. Heard Mocking birds and Bob whites in bottom lands

Cloudy and sultry ~~when~~ most of day, hot when sun was shining, foggy in morning, cooled off with light wind and a little rain in evening.

Wildcat Mound, Monday
June 28, 1920

Drove to Boulder via Lyons.
Rained at Lyons.
Moll. Sta. 269, road by roadside 3 mi. S.W. of Wildcat Mound. Lymnaea caperata and small, immature Physa ~~sp.~~ abundant.

Moll. Sta. 270, Lake in S.E. cor. Sec. 32, T. 3 N., R. 68 W., 3 mi. E. & 3 mi. S. of Berthoud, Colo. Large Physa sp., large Planorbis trivolvis and many Lymnaea separata.

The water of this and all other lakes examined on the trip was so high it was difficult to find Mollusks and in all but this none was found.

Boulder, Colo., Thursday.
July 8, 1920

Left Boulder with Norman E. A. Hinds in Ford car at 9:40 a.m.

Where the Boulder-Lyons road crosses the Dakota S.R. close to a spring house, about 10 or 11 mi. N. of Boulder, 1/2 mi. or 1 mi. beyond Lykins gulch, S.E. of Red Hill, we found Halymenites in the upper "Dakota" sandstone.

Moll. Sta. 271, same place. Ostrea lugubris in Dakota S.R. slide under

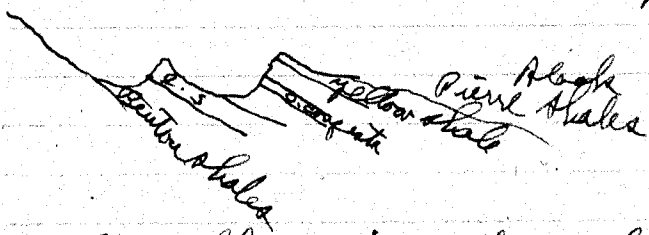
Skunkbush.

Camped at Lykins Ranch at mouth of Little Thompson canyon at 3 p. m.

Ralph Bennett a former student of D. W. Spangler & Clare Coffin, is occupying the ranch.

Lykins Ranch, Friday.
July 9, 1920

N. of creek the Niobrara forms two distinct ridges, dipping East. The basal limestone forms crest of ~~ridge~~ W. ridge, with Inoceramus deformis. The Ostrea congesta horizon is at base of 2nd Ridge, with yellow shales at top.



I roughly estimate the Niobrara here at 150 feet or more. The shales are very dark gray, weathering on the

surface to a very light gray except a few feet at the top where it weathers to dull yellowish brown. This upper strata may be seen along the base of the foothills for many miles N.— at least to a point W. of Fossil Ridge.

I obtained O. congesta just below the yellow zone here. Doubtless it & S. depressa range through the formation, the latter being flattened & crushed beyond specific recognition in the shales but the prismatic layer being found with the Ostrea attached as usual.

Dip of Niobrara here about 15° almost due east along both ridges. 1/4 mi. or more N. of creek and several hundred yards E. of E. ridge, dip in a ravine is 80 to 85° almost due west, then it swings first S. then E. thus throwing the formation well to the E. as it passes northward.

The lower part of the W. ridge is Benton & roughly estimate the Benton here at 150 to 200 ft.

The top is a s.s., as it is 6 mi. N. of Boulder. A few fragments ~~in the~~ of the plant stems in the s.s. seem to be Halymenites.

40 or 50 ft. below top of Benton I found Inoceramus labiatus and a small fragment of cephalopod. There was the usual shale with several 6 to 8 inch l.s. bands, one of which contained the fossils.

At about the middle is a thin, irregular l.s. band forming a low ridge. One (or more) thin layers consists of the same undescribed species of Oyster that is found about 6 mi. N. of Boulder.

Below the Ostrea horizon are the usual thin bedded black shales. These rest abruptly but apparently conformably upon the upper "Dakota" s. s., the the contact being beautifully exposed in one small ravine.

25 ft. above the base of the Benton are banish fish scales in indurated shales.

The Pierre shale is exposed ~~to~~ of the Niobrara.

Mt. mahogony common on the Niobrara ridges.

One shrunk bush 7 ft. high at foot of ridge.

Mollusk sta. 872, Type loc. of Oreohelix henderson Pils. Under shrunk bush clinging to roots at foot of low cliff of basal Niobrara l.s., where fine talus surrounds roots. Open dead shells near top of cliff on slope. None found on E. ridge of upper Niobrara shales - talus not suitable cover poor.

Good exposure of upper & middle "Dakota" S. of creek where road crosses just below ranch house. Halymenites in hard, quartzitic upper sandstone. Did not find the usual marine invertebrates in the softer underlying ss. The exposure of upper Dakota, Benton, & Niobrara herein one of the best I have ever seen.

Little Thompson, Saturday
July 10, 1920

Drove to Boulder with a load of fossils this morning, back at 4 p. m.

Mockingbird common among the narrowleafed cottonwoods along this creek. One oriole about camp.

Saw 2 white-tailed jackrabbits across creek yesterday.

Bobwhite very common in bottom.

Raccoon tracks along creek.

Cottonwood Canyon, W. of Loveland
Sunday, July 11, 1920

Moved camp to this canyon today. The creek cuts through the fountain into the quartzite.

Heard mockingbird and saw two bobwhites near camp, also a ring-necked pheasant.

The crossbedded Eagleside s. s. here rests directly upon the more

massive L.S. above the Fountain. at one point the two are sharply faulted, folded & more or less crushed together.

Big Thompson Canyon.
Monday, July 12, 1920.

Drove over here without breaking camp, to examine the quartzites, shists, granites, etc.

Mollusk Sta. 273, Big Thompson Canyon ~~also~~ at 1st ~~St~~ open space above Narrows in the quartzite-shist rocks. Valvata and Vitrea - scarce.

Moll. Sta. 274, below 273 - Oreoleb[illegible] scarce & immature

Tuesday, July 13, 1920

Broke camp at 9 a.m., drove to Wellington, thence N. a mile or 2, W. 2 or 3 mi., then N. several miles, did not see the Hygiene sandstone. Then went to the ~~de~~tach bank where we collected upper Pierre fossils near the

railroad bridge N. of Wellington, but found the shales so weathered that we could get no fossils worth while.

Then returned to Boulder at 6 p.m.

Tuesday,
Boulder, Colo., July 20, 1920

Left Boulder alone in a Ford car with camp outfit at 9 a.m. Repairs on road above Rollinsville and an accident delayed me, so it was noon when I arrived at Tolland and put outfit in Dr. Ramaley's tent house

Mollusk sta. 275; Black Canyon, S. of Tolland, alt. 9300 to 9400 ft., about 7 or 8 species of land snails, mostly along bottomland where there are sparse aspens.

No rain today, though it had been raining every day.

Sta. 275 - Vallonia, Zonitoides, Succinea, Pupilla, Vertigo (or Bifidaria), Euconulus

Vitrina and agnolimax (Black form - mountains).

1

Tolland, Colo., Wednesday
July 21, 1920

Another bright, hot day - somewhat cloudy at noon. Collected mollusks 9 a.m. to 2 p.m. N. of town.

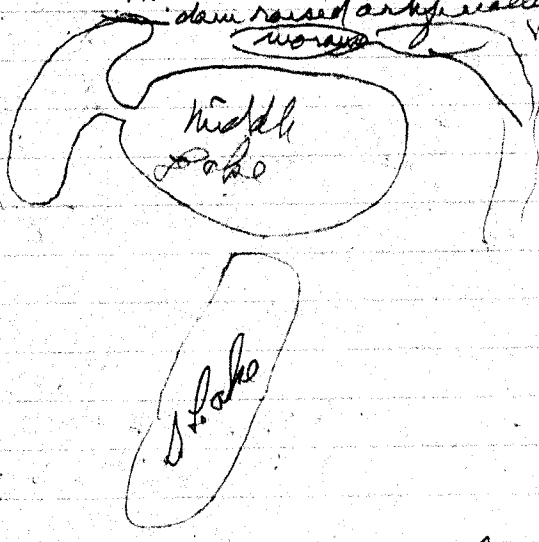
Sta. 276, big groves of small aspens & facing slopes on N. side of valley, just N. of town. alt. 9200-9300 ft. Pyramidula, Zonitoides, Vallonia, Euconulus, Agriolimax (light form - campestris), Cochlicopa, Vitrina, Vitrea, Pupilla, Vertigo (or Bifidaria)

Spotted sandpiper at lake. Dusky grouse and green-tailed towhee in aspens. Robins about town.

Tolland, Colo., Thursday
July 22, 1920

Went up fairly good road up Mammoth gulch to Taller Lakes. They are in the Moraines ↑ network of

Mollusk Sta. 277. Middle Teller Lake. One decayed Planorbis on east shore. Potamogeton abundant in vegetation - sedge - Carex aquatilis in shallow water, especially along N. shore of West portion. Shape of the lakes



No streams flow into these lakes and they are not connected by surface flow one with another, the flow being entirely by seepage through the moraine

Moll. Sta. 278, Lake N. of 277 about same area, but almost quadrangular, length (N.-S.) about twice the width. A few small Potamogeton at N. end in 3 ft. of water. How did mollusks get

into this + No. 277 — also 279. Very little vegetation here except at S. end

Many aspen sticks from which bark has been gnawed by beaver about the shores of both lakes.
South Teller Lake.
Sta. 279, algae etc. Pisidium in ~~true~~ moss ^not^ ^Sphagnum^ on W. side. One Physa on a rock, same side.
Long-crested Jay.
White crowned sparrow
Spotted sandpiper
robin

The dams of all three Teller Lakes have been raised by artificial means, but the water is now about at the ~~usual level~~ original level. A small ditch has been cut through from North to middle lake, thus doubtless at one time connecting them, but the water is now too low to flow through.

~~Rained~~ Rained a little toward evening.

Tolland, Colo, Friday.
July 23, 1920

Bright, warm morning - Cloudy afternoon.

Mollusk Sta. 286 - East Lake, just below Tolland, S. side of Valley, apparently an old ox bow loop cut off long ago. Type loc. of Planorbis similaris Baker, collected by Prof. Frank Smith. I found only 5 or 6 Planorbis in 2 hours search, but found a lot of Pisidium, not mentioned for this lake by Smith. Alt. about 8800

Moll. 285 - slough opening into creek at railroad bridge N. by W. from 286. Pisidium large & abundant - collected one hour. South

All altitudes in creek bottom at Tolland are between 8800 and 8900.

~~Sta 284 Park Lake~~ Rain in evening.

Tolland, Colo., Saturday
July 24, 1920.

Rained more or less most of ~~night~~ night. Clouds massing. Hard rain at 10.30 to

11 a.m. and lightly until mid afternoon or a significant rainstorm

Mollusk Sta. 282, Park Lake, shallow & gravelly along east shore & S. shore. Deeper near shore on W. side, with some fine mud & scattered sedges. Here I found Pisidium common in 1 to 2 ft. of water 4 or 5 ft. off shore. No other mollusks in 2 hours collecting around the lake - 1 hour at Pisidium station.

At 3 p.m. the sun came out and it dried rapidly. At 3:30 I went to the small pools north of the N. P. R. depot. Found nothing in the first two examined.

Moll. Sta. 283 pool about N.W. of Water tank, partly surrounded by willows, muddy bottom - a thin film of mud on gravel, some sedges. Pisidium common. Had just found a few Lymnaea when another storm broke and I returned to the cabin. Will continue work on this pool Monday. My impression is that I never collected Lymnaea at so great an altitude before, but I obtained some at between Wood and Gresham years ago.

Tolland, Colo., July 25 (Sunday) 1920

Cloudy & rainy most of day. Stayed in camp all day.

Tolland, Colo., Monday, July 26, 1920

Collected some more at Sta. 283, which is N.W. of water tank, a few rods E. of the R.R. Wye. about 25 x 50 ft.

Moll. Sta. 284, pond a few hundred yards W. of the Wye. Pisidium common. One Aplexa, quite rotten, crushed before it could be cared for. Doubtless A. hypnorum.

Moll. Sta. 285, pond at Schoolhouse about 1/2 mi. W. of town. Pisidium common.

Redwings & Brewer's Blackbirds common in bottom-lands. Grayheaded Juncos common in woods. Say's Spermophiles in forests and also in holes several hundred feet from trees.

Moll. Sta. 286, dense alder thicket on wet slope S. of Schoolhouse, Pyramidula, Zonitoides Vitrina, Euconulus (scarce), Pupillidae (abundant), Vallonia found up slope under elderberry, in dryer situation, not under alders. Agriolimax campestris, from light to dark brown, some black.

Tolland, Colo. Tuesday, July 27, 1920

Bright morning.

Walked to Crater Lakes with Ramaley

Moll. Sta. 287, S. of the one marked Lower Crater Lake on topog. sheet, Mostly gravelly, no mud + almost no visible vegetation. Pisidium ~~abc~~ common. Dodds named this South Crater Lake

Moll. Sta. 288, Upper Crater Lake (See Topograp. Sheet) no visible vegetation Pisidium at one point in coarse gravels more abundant in a pool below the lake, but did not collect any.

Moll. Sta. 289, Lower Crater Lake conditions about same, Pisidium

common in one place, occasional all round shore; very rocky.

Moll. Sta. 290, Lake below Lower Crater Lake, unnamed on Topo. Sheet. We followed the N. shore and obtained a few Pisidia. Conditions about same as at No. 289.

The best collecting at all these lakes was in fairly coarse sand not in fine sand or mud. There was almost no vegetation growing in the water ~~though~~. Even algae is seldom found in them, according to Dr. Ramaley. Ramaley saw four deer.

July 28
Tolland, Colo., Wednesday
Ramaley & I started for the Eldora Lakes at 8:30 a.m.

Moll. Sta. 291, Swamp ~~choked~~ choked by sedges, very shallow water, about 100 X 100 about 1/4 mile E. of Lilly Lake. Pisidium & Planorbis abundant.

Moll. Sta. 292, small pond bet. 291 and 293. about 15 x 100 ft.

Pisidium + Planorbis common, former very slippery with algae slime which discolors the surface

Moll. Sta. 293, Lily Lake, only lake around here having pond lilies, according to Ramaley, not named on topog sheet about 200 ft long N.W.–S.E. by 100 ft. wide, deeply divided into 3 portions. Pisidium + Planorbis common

Moll. Sta. 294 small pond about 50 ft. diameter about 100 yds E. of #292. Pisidium Planorbis common

Moll. Sta. 295, small pond about same size as #294 a few rods E. of #294. Pisidium scarce.

Moll. Sta. 296, small pond about same size as #295, 150 ft. W. of road, only one we have seen from the road. Pisidium and Planorbis abundant.

All these localities are West of the westernmost old road from Elbora to Tolland, apparently not travelled at all now, and all in dense conifer forest, with sometimes a few aspens along the shore.

Before reaching Elbora we passed

another pond close to the road but did not stop to collect until on the way back. It is

Moll. sta. 297, and ~~sandy~~ yielded Pisidium & Planorbis in some numbers.

Moll. sta. 298, Eldora Lake. Pisidium, Planorbis and 4 small Lymnaea in fresh (very small) beaver swamps at the N.W. corner.

Visited the lake on the ridge N. of the (sta. 321) W. end of Eldora Lake, where I collected last August. Found a few Planorbis trivolvis (dead) on the shore and a few Pisidium in the water. Water was quite high. Lake about 150 X 250 ft. A small pond just S.W. of it on same ridge contains Musculium & Pisidium, but we saved none.

Examined three other lakes E. and S.E. of Eldora Lake but water was high & we found nothing.

No sandpipers about the small lakes in the forest. Killdeer at Eldora Lake

Nighthawks at Tolland.
Hummingbirds " "

Hot day without rain, partly cloudy.

Tolland, Colo., Thursday
July 29, 1920.

Cloudy, warm morning.

Left Tolland at 7:40, reached ~~alder~~ first station at 8:15.

Moll. Sta. 299, open alder thicket ~~at~~ head of park, where creek emerges from the canyon, not so moist ~~as~~ as Sta. 286, which was a dense, very wet thicket on a steep slope. This station is in the bottom land close to the creek, shade dense but ample space between trees for easy passage. The alders grow in clusters, branching from the ground. This is the first place on the trip where I have found Vitrina the most abundant mollusk. 5 were taken from beneath an old shed. Agriolimax ~~common~~ common. I believe I have

before obtained so many in the same length of time, all the snails here I have found under sticks - very few logs found. The Pupillidae under very small sticks, often only 1/2 to 1 inch in diameter. At #286 most of the Pupillidae were in plain sight on logs and sticks. Many logs there. Alders here up to 2 inches diameter and 20-25 feet high. Agriolimax here mostly quite dark brown, a few light brown, none black. Station probably subject to occasional overflow. Plenty of herbaceous vegetation under the trees. About 200-300 ft. below R.R. bridge - small thicket. No Vallonia here. 1 hour here

Moll. Sta. 300, open thickets of small aspens on dry, flat ground about ~~1/2~~ 3/4 mile above 299 near creek. Pyramidula, Vallonia, Succinea, Zonitoides, Euconulus, etc. Vitrina most abundant, many small ones not taken. Agriolimax common, dark brown, very small ones (not taken) black.

Sta. 301. dense willow thickets

along creek at head of fork below
299. Vitrina alaskana, Succinea
common, a few Pupillidae, Agrishinax
common, light to dark brown, mostly dark.
Half hour here. Swallows dark.

The lakes and ponds of this region are
mostly of glacial origin. Park Lake is proba-
bly a depression in the ground moraine, a
similar depression nearby is now a meadow.
The small ponds visited yesterday are
moraine depressions. Taller Lakes are
probably formed by small low terminals connec-
ting the high lateral or medial moraines.
Part or all of the crater Lakes are
retained by moraines. There is no
crater there. ~~South evidently misstook~~
~~South crater for Upper Crater Lake~~
Eldora Lake is moraine. The two small
ponds on mt. N. of W end of Eldora Lake
I believe are rock basins. Possibly a
low lateral moraine may impound them
(connecting 2 rocky knobs). East Lake
is a former ox-bow, also some ponds
about it, while others are beaver
ponds. Sta. 297 is on topog. sheet,
but 291-2-3-4-5-6 are not.

These are surrounded by dense coniferous forests and hard to find — probably seldom visited by aquatic or shore birds. We did not see the usual sandpipers. How did two species of mollusk get into each one? They are close together — never more than a few hundred yards apart. The mollusks may have been first carried to Eldora Lake by killdeer, etc., then dispersed short distances to the ponds in mud carried by deer, etc., and later by cattle, but it is strange that both Pisidium and Planorbis should have been thus carried to each one. See if the species are always the same.
In case of the Crater Lakes and Tallac Lakes they are larger and more open, probably visited by spotted sandpipers and perhaps by killdeer and in migration by shorebirds, rails or herons. A dead rail was found by Frazer in Arapahoe Glacier. Smith (Baker's) paper says two of the Crater Lakes are without mollusks, but we found Pisidium in all four.

Rained in afternoon
The lakes with here have vertical

banks of from one to several feet due to pressure of ice in winter.

July 30

Tolland, Colo., Friday

Bright + warm morning.

Drove to Pactola pool, below Rollinsville in car alone.

Coll. Sta. 302, Pactola (Lns ?) pool. Physa, Pisidium + Musculium abundant. Lost a bottle of latter two.

Sta. 303, open, rather dry willow thickets several hundred feet from creek below pool. Vallonia, etc. Small Vitrina abundant. Hastily collected though.

Sta. 304, small pool half way between #303 + mouth of Beaver Creek. choked with vegetation 10 x 12 ft. Pisidium, Aplexa etc.

Sta. 305, open pool connecting with creek at higher stage of water 6 x 6 ft. Physa abundant. Below 304

Sta. 306, dense alder thicket beside creek where Nederland - Central City road crosses creek bet. Pine Cliff + Pactola.

Zonitoides + Pyramidula abundant, Succinea common, one or two Pupillas, a few very young Vitrinas + Helix hour here

The big Physas from #302 are all immature, very thin shelled, and many broke in collecting + cleaning them. The smaller ones from #301 are all mature + all shells saved were taken alive.

Rained a little in afternoon

Fresh beaver work and old beaver houses at Pactolus Pool.

Tolland, Colo, Saturday.
July 31, 1920

Bright, warm morning, cloudy at 10 a.m.

Coll. Sta. 307, ~~violet~~ small, vegetation-choked rivulet that crosses the wagon road a few hundred feet west of the old school house, about 3/4 mile W. of town. It comes from mouth of Mammoth Gulch, but is not Mammoth Creek, which crosses the road and flows into S. Boulder Creek at the head of the

Park, just below the R.R. bridge. Pisidium abundant amid sedges, etc., in very fine mud. None in sand or gravel. Three or four small Lymnaea in an hour's search.

Rained at 10:30

Beaver cuttings and other Beaver work all through this region.

Sparrowhawk in Park

Tolland, Colo., Sunday, Aug. 1, 1920

Cloudy morning. Rankin and I drove up into the canyon, then walked to Forest Lakes

Moll. Sta. 308, the first lake, stained mud, sand + gravel clear around the shore and only got 3 Pisidia. No fairy shrimps, ~~for~~ no aquatic insect blood except caddis larvae, only one beetle, a few leeches. fish seen

Moll. Sta. 309, lake 75 x 150 ft. on bench about 1/4 mi. N.E. of 308. Pisidium abundant in muck. Tadpoles seen. No stream from this Lake. No shrimps

Moll. Sta 310, large lake above 308, not shown on topographic sheet, west to steep, high bench. Pisidium abundant in mud between rocks.

Moll. Sta. 311, upper Forest Lake at timber line on high bench, shown on topog. sheet. Pisidium abundant in coarse gravel. No other animal life seen in water. White crowned sparrows here. Close to top of divide 311.

Examined a small lake S.W. of 311 on a lower bench just west of 310. Film of mud over most of bottom. Found no mollusks or other life.

Rained at 1 p.m. & again at 3 p.m.

Dusky grouse a mile or two below Forest Lakes.

Tolland, Colo., Monday
Aug. 2, 1920.

Walked to Yankee Doodle Lake (~~Lake~~) above. Cold, bright morning.

Moll. Sta. 312, Lake first below Yankee Doodle Lake opposite R.R. sign post reading "Dixie Lake 1 mile."
Very shallow. Pisidium abundant. Collected over 200 in about 20 minutes. No other aquatic life seen. Probably goes dry in very dry seasons.

Moll. Sta. 313, Yankee Doodle Lake, deeper than any other yet visited, & believe, shores very abrupt, coal cinders from R.R. which nearly encircles it covering much of the bottom. Altitude 10,710 ft. Got about 40 Pisidia in an hour. No other life found except fish which were constantly jumping.

Sta. 314, ½ mi. below Yankee Doodle Lake, under conifer logs at edge of forest, alt. 10800 ft. Dead Victimas common, 2 live ones found in 5 minutes search.

Rained a little during the day.

In afternoon I visited Jennie Lake (= Dixie Lake) but found no mollusks there. Also a very small, shallow lake within 150 ft. of railroad S.W. of Dixie Lake. The topographic sheet does

not correctly represent these lakes. There is no small lake below Jamie Lake.

Tolland, Colo., Tuesday,
Aug. 3, 1920.

Warm, cloudy morning.

Coll. Sta. 315; Sluggish, vegetation-choked rivulet about 1/4 mi. below East Lake, in old abandoned bed of the stream where the creek was diverted into a new artificial channel ~~in the~~ when the railroad was constructed. Pisidium very abundant among the sedges.

Cloudy all day, Rained in evening

Tolland, Colo., Wednesday
Aug. 4, 1920

Rained at intervals during night. Raining in morning when I started alone for Boulder in car.

Mosquito Harbor
Mod. Station 316, Pisidium and Physa fairly common not abundant. Water high. Lake either artificial or expanded by artificial dams. Not much vegetation in water. Filled by artificial canal coming in from the west.

Sta. 317, Smartweed Lake, shallow at shore with sedges smartweed etc. Planorbis, 2 spp., Physa & Lymnaea. Water high. No Pisidium. Lake completely enclosed. Perch plentiful. Collected several.

Sta. 318, lower Lox Lagoon (Saynes Lakes), Large Planorbis, small Planorbis and Lymnaea palustris common. Pisidium rare. Found dead perch.

Sta. 319, Upper Lox Lake, Large and small Planorbis and Lymnaea palustris abundant dead on shore. Picked up a few before storm broke and I returned to car.

Sta 320, sedge choked lagoon N. or N.E. of # 319. Pisidium and Lymnaea common. One dead Planorbis.

of the parvus type.
Sta. 321, visited July 28, 1920, same as station of Aug. 31, 1919, N. of head of Eldora Lake, alt. 9,600 ft., on ridge

Boulder, Colo., Wednesday
Aug. 11, 1920

Hinds and I drove to Four-mile Canyon, N. of Boulder.

New quarry opened in Lower Morrison formation near mouth of canyon — same horizon as Bond quarry, further north. Green shale, about 1 or 2 ft., rests directly upon red Lyons s.s., with some sandy layers toward top, then abruptly above about 20 ft. of nearly white, massive, rather soft sandstone, above which is green shale again. Lyons does not change to creamy & white toward top, and is not so massive as further north.

Rained hard in afternoon & evening

Boulder, Colo., Friday
Aug. 14, 1920

Hinds, Henry, Talcott & I drove to Owl Canyon, N.W. of F.T. Collins & collected Gypsum, Celestite, etc.

Roads very bad following Wednesday rain. about 70 miles each way, 4½ hours going 3¾ returning.

Boulder, Colo., Tuesday.
Aug. 17, 1920

Karl S. Kittle & I started up creek at 10 a.m. in Ford car. Spent an hour at lunch at noon and camped above Hessie at 2 p.m. Rained at 3 p.m.

Mollusk Sta. 322, aspens at Hessie. Vallonia Pyramidula, Zonitoides, Vitrea, Vitrina, Pupilla, Eucomulus, agriolimax, more abundant, some large Vallonias, Pyr. & Zonitoides. N. of Hessie, E. of North Fork of creek.

Eldora, Colo., Wednesday.
Aug. 18, 1920

Collected again at Sta. 321, Large & small Planorbis, Pisidium & Musculium

Sta. 323 (Correct, the labels), small, very shallow pond a few rods W. of 321, probably connected in very wet seasons in the past. Pisidium & Musculium.

Revisited Eldora Lake Sta. 298, and got a few Pisidium, 2 Lymnaea (small) & 2 or 3 small Planorbis.

Rained at 2 p.m. & at intervals the rest of the afternoon and evening & night.

Eldora, Colo., Thursday.
Aug. 19, 1920.

Kittle and I walked up to Jasper Lake. Water has been raised from 6 to 8 ft or more by a dam so recently that favorable conditions for mollusks near shore have not yet been established, so we found none. Then I crossed the ridge to Diamond Lake.

moll.
Station 324, Diamond Lake, very shallow, very little vegetation. Pisidium fairly common, not abundant.
Cloudy most of morning and rained most of afternoon.

Eldora, Colo., Friday,
Aug. 20, 1920

~~Sunny~~ Cloudy foggy morning.
We walked to East Lake.
Sta. 325, sedges at W. end of East Lake. Pisidium rather abundant on N. shore. None elsewhere ~~along shore~~. Many logs in water along shore.
Rained at 10 a. m., and most of the time from then until dark, sometimes quite hard. East wind.

Eldora, Colo., Saturday,
Aug. 21, 1920

Partly cloudy morning. East wind.
Sta. 326, beaver pond by roadside

about quarter mile below Hessie. Large Pisidium abundant. Bottle full in an hour.

Moll. sta. 327, open grove of small aspen about half mile W. of Hessie, W. of creek. Vitrina, Valvata + Lymnaeidae abundant, Pupilla, Succinea, Physanophora and Vertigo (or Bifidaria) uncommon.

Rained at 1 p.m. + we drove to Eldora, cleared at 2 p.m. + Kittle went to Last Lake fishing. Rained again at 4 p.m.

I examined a big rock slide above camp, granite debris, with large elderberry, etc., overhanging the base and growing in the slide, but found no Oreohelix - an ideal place for them, except for the absence of limestone.

The beaver ponds at #326 were opened and drained a few days ago, but the beaver promptly repaired the dams.

Beautiful roche moutonnees occur just above camp on S. fork.

Cleared in evening. Fresh snow on range this morning.

Eldora, Colo., Sunday.
Aug. 22, 1920

Fine, perfectly clear morning.

Kittle went up to Goat Lake to fish.
I followed later to take pictures. He was fishing at a depth of 16 ft. on a raft about 75 ft. from shore and his line was not at the bottom.
Kittle caught 3 salmon trout (one 13 1/4 inches long) and we had all we could eat for dinner.
Clear all day, a few clouds.

Eldora, Colo., Monday, Aug 23, 1920

Bright morning.
Kittle + I started at 6:45 a.m.
Sta. 328, pond 30 X 50 ft., not over 18 inches deep in center, gravel + sand bottom, little vegetation, in timber below Lower Lake N. of Woodland Mt., Land-locked. Pisidium common.
Sta. 329, Lower lake at head of drainage N. of Woodland Mt. Pisidium abundant in spots.
Sta. 330, upper lake, Pisidium very abundant - got several hundred in 3/4

hour in coarse gravel.

Sta 331, Lalger lake on N. branch N. of Corona. Pisidium abundant in gravel.

Upper lake, about an acre of ice on surface & lots of snow about it. Almost no mud, sand gravel or vegetation in it. We found no mollusks. The ice is floating, drifting with the wind — an ice-floe or iceberg. It stands 2 or 3 ft. above the water at our edge.

It was so late when we got through here that we did not visit the small lake just north of Corona but snow extends down to the water and probably conditions are unfavorable for mollusks.

Two magpies above camp.

Clear all day

Eldora, Colo., Tuesday, Aug. 24, 1920.

Partly cloudy morning.

Started for ~~camp~~ University camp with car & outfit.

Examined lake on flat below Needleleaf,

a glacial lake, land-locked, gravel bottom. Found no mollusks

- Moll. Sta. 332, small, sedge-choked pond, 25 x 25 ft., glacial, shallow, on same bench, N.E. of lake above mentioned. Lymnaea & Musculium abundant.

Sta. 333, small beaver ponds in bottom lands, just N. of lake, No. of pond #332. Pisidium abundant

Clear all day.

New University Camp, N. E. of Silver Lake
Wednesday, Aug. 25, 1920.

Clear morning.

Little, Ferg. Thompson, Charlie Brown & I walked to the creek S. of Silver Lake.

Moll. Sta. 334, pond about 100 ft. diam. S. of Prof W. C. Huntington's cabin, upper pond of series. Pisidium abundant in muck under vertical bank in S.E. corner. Water nowhere more than 18 inches deep. Must freeze to bottom in winter. 53 Pisidium in one 6 inch jar full. Rocky bottom except for coat of muck at S. end. No outlet except

~~in high water~~, but doubtless slow seepage through the soft, swampy ground into Sta. 335; both on a swampy flat, 335 a few feet lower than 334.

Sta. 335, below (south of) 334, about 75 X 150 ft., perhaps 2 or 3 ft deep, vertical sedge ~~ge~~ covered wall all around, bottom deep muck. One small fish seen. Limnocalanus common, Planorbis of parvus type less common, a few Pisidium, all at edge in muck at ~~roots~~ roots of sedges. No outlet except slow seepage through swampy ground to next lake below.

Sta. 336, large beaver pond, much fresh beaver work, below #336; smoothly choked with dead dwarf willows, etc., the bottom thick muck of partly and wholly decomposed vegetation. A few Pisidium obtained in one little muck 5 ft. in diameter. None found elsewhere.

Sta. 337, lake S.E. of 336. Dam has recently been cut, lowering the water several feet. A very few Pisidium were found in gravel, more in glacial mud and none in muck at head of lake.

Skipped a small pond shown on map,

then tried lake below without success. It was sedge margined, with muck composed largely of conifer needles. Examined beaver ponds just below without success.

Sta. 338, beaver ponds where trail from old University camp reaches creek N. of Silver Lake. Kittle obtained Pisidium.

Sta. 339, first small pond on trail back from Silver Lake road to camp, on hill, about 25 ft. diameter, in forest. Pisidium common at base of several big rocks.

Sta. 340, larger lake, 75 X 150 ft., separated from 339 at one place by an embankment of only 6 inches. Pisidium rather scarce. Neither of these ponds have any outlet.

Sta. 341, next lake, on trail, landlocked, about 200 X 400 ft., muck bottom, small Pisidium abundant under bark, a few larger ones.

Sta. 342, next lake, nearly as large as 341, with soft, mucky bottom. A few small Pisidium. Landlocked.

Rained hard at 2:30 P.M.

University Camp, Thursday.
Aug. 26, 1920.

Partly cloudy. Kittle went to Silver Lake with "Laddie" Thompson. My boot sole was worn out, so I stayed behind & collected snails at camp.

Sta. ~~2~~ 343, aspens along small brooks on S. slope about camp. Agriolimax from medium to dark brown, very small ones quite black. Vitrina very abundant. Zonitoides & Succinea common, Pyramidula less common. Pupillidae (Sphyradium?) abundant in moist places. No Vallonias seen yet & no Pupillas.

Kittle & Laddie examined Goose Lake. The water is very ~~low~~ high & they found no mollusks.

~~Sta.~~

Sta. 344, small pool, 15 x 20, shallow, ~~and~~ not receiving water from lake but from spring up hill, & draining by swamp seepage. Pisidium abundant

Sta. 345, Island Lake, water very low, Pisidium in decomposed vegetation.

probably peat moss, above water line.
Rained at 11 to 12,+ sprinkled at intervals in afternoon.

University Camp, Friday
Aug. 27, 1920

Partly cloudy morning.
Collected at 343 again. Found large, fine Agrobium, all brown, more dark specs & very small ones.
Hail in late afternoon.
Three of us picked a gallon of wild strawberries.
Windy evening.

University Camp, Saturday
Aug. 28 1920

Very windy morning. Four tents blew down.
Drove to Boulder in forenoon.

Saturday
Boulder, Colo., Sept. 4, 1920

Theodore Beard (a student) and I walked up into Two Mile Canyon, north of town, in the afternoon.

The formation where Beard & Johnson found the ripple marks, supposed by them to be the Lyons, is upper Fountain. It is 25 or 30 ft. below the uppermost conglomerate of the Fountain.

On the way back we visited an old quarry, the large one farthest north the drainage from the north of which cuts a ravine through the Dakota ridge instead of flowing S. into Sunshine creek. On the old dump we found a remarkable lot of fine dendrites, and set them out to be brought in next week. In the valley draining northward into Two Mile we found and examined two large, very fine pieces of Lyons s.s. slickensided. There is a great deal of it on the W. side of this valley and the one draining into Sunshine.

Boulder, Colo., Monday,
Sept. 6, 1920

Dr. F. Ramaley, T. R. Beard and I took the Ford car as far as we could up the lateral valley back of the Dakota ridge, N. W. of the Sanitarium, and carried down to it the dendrites (26 pieces, including several large slabs) and slickensides discovered Saturday. ~~They~~ They made several heavy packloads and involved a lot of hard work, but we had the material all in the museum by supper time.

Boulder, Colo., Friday,
Sept. 10, 1920

Theodore R. Beard and I drove east on Base Line Road (40th Parallel of latitude). Found no mollusks in Base Line Reservoir.

The Lafayette town reservoirs, three in number, just S. of road about 1/2 mile W. of the town, is said to be no longer in

use, as the town has built a pipeline to Eldorado Springs.

Sta. 346, Middle Lafayette Reservoir, well filled with vegetation. Planorbis parvus (?) several Physa sp. and young Lymnaea, Succinea

Sta. 347, Upper Lafayette Reservoir, shallow, rather free from vegetation. Planorbis trivolvis (?) very abundant dead shells, a few found alive. Lymnaea, Physa and Planorbis parvus less common.

~~Sta. 348~~ Then we drove north one mile and turned West on Valley Road at Ten Mile corner.

Sta. 348, Frank Prince reservoir, where road turns around it to the north, about half mile West of Ten Mile corner. A few dead Planorbis trivolvis, P. parvus and very young live Physa.

Sta. 349, Erie Reservoir, north of #348, water high. a few dead shells of Planorbis trivolvis, P. parvus & Physa on the beach. None found alive.

Sta. 350, small, cress-choked rivulet 1 mile West of Sta. 348. Small Physas and Pisidium abundant.

Boulder, Colo., Saturday,
Sept. 11, 1920.

Beard and I drove E. on Valley Road (Arapahoe Ave.) Hot afternoon

Sta. 351, small sluggish roadside ditch, W. of [illegible] 'rock' bridge, choked with grass and cattails & sedges, a foot or two wide. Pisidium and Planorbis parvus abundant. Juvenile Physa and Lymnaea caperata common.

Sta. 352, small, very shallow, sedge and cattail choked sloughs in pasture N. of #351. Pisidium + Planorbis parvus abundant. A few small Lym. caperata.

Sta. 353, Lake 1/4 mi. N. of Road, ~~#~~ S. of White Rock (Teller Lake). Planorbis parvus and immature Physa common.

Sta. ~~35~~ 354, ditch emptying into 353 Small Physa common.

Proceeded to Ten Mile corner and turned N. on Lincoln Highway to Hiram Prince Lake.

Sta. 355, Hiram Prince Lake, Planorbis trivolvis, P. parvus + Physa sp. abundant dead shells on beach. Water high.

Sta. 35-6, small shallow pond N.E. of Sta 35-5, as shown on topog. sheet. Small Lymnaea Physa common. Planorbis trivolvis, dead shells common (a few alive), also P. parvus. One dead Lymnaea.

Boulder, Colo., Thursday.
Sept. 16, 1920

Beard, Hansen & I drove E. over Valmont road,

Sta. 35-7, Hoffman Lake, shallow. Found 1 dead Planorbis trivolvis, one or two live Physa, & abundant dead Planorbis parvus

Sta. 35-8, roadside pool S. of creek about 3/4 mi. E. of N. from Hoffman Lake. Young ~~Pondium~~ Physa abundant alive. Two or three live Lymnaeas & dead Pl. parvus.

Sta. 359, Dodd Reservoir, 1 mi. W. of Niwot. ~~Pond~~ Planorbis parvus, small Physa, 2 or 3 small Lymnaea and 2 or 3 Pisidium

Sta. 360, Dry Creek, 1½ mi. S.W. of 359, small brook, Pisidium abundant, a few Lymnaea, Physa & Planorbis parvus.

Boulder, Colo., Saturday,
Sept. 18, 1920

Dr. Ramaley, Edward Ramaley, T. R. Beard and I drove to Platte River, N. E. of Milliken, Colo.

No moldichsar reptiles
Plenty of fresh beaver cuttings.
Very hot, bright day.
Rear tires gone out; 3 blowouts.

New Goodrich tire put on left rear wheel of car Sept. 27, 1920, in presence of Walter Mallory.
New Hawkeye tire on right rear wheel Mch 17, 1921. Car not driven from Sept. 27 to Mch 17; on blocks in garage.

Boulder, Colo., Thursday
Mch 17, 1921

Drove 6 mi. N. of Boulder, Colo., and back.

Golden, Colo., Friday, Mch. 18, 1921.

Left Boulder 8:35 a.m. - Warm day.

~~Roder~~ Tieje, Murray, Simpson & myself in Museum flivver. Reached Golden at 10:45; Examined Laramie S.W. of town; alternating s.s. and clay beds, dip vertical - quarried for use in Denver for brick & tile making. Shales varicolored - reddish, etc. Much evidence of movement - sliken along bedding planes approximately - leaves & palm wood.

Visited fireclay pits 2 1/2 to 3 mi. S. of Golden - dip vertical, clays quarried between ss., slicken along east wall, wonderful ripple marks on west wall, some slight E. W. faults.

Golden, Colo., Apl. 23, 1921.

Tieje, Murray, Phil Andrews and I left Boulder at 6:30 a.m. for Golden in flivver, to get big slab of ripple marks from clay pit in the

Former "Dakota" ridge 2½ mi. S. 7° E. from Golden discovered on March 18, a truck having preceded us yesterday afternoon in charge of James & Vaughn. The clay is about 10 or 12 ft. thick, between vertical sandstone walls, the west wall being covered with ripple marks, the east wall slicken-sided showing movement along a strike fault plane between the clay and sandstone, the clay discolored by percolating water along the fault plane.

It took the combined strength of 8 men with pinch bars and block and tackle to get the slab out and on the truck. Got home at 7 p.m., the truck arriving at 11 p.m. Got five photos of ripple marks in the wall of the pit. Also found leaves of deciduous plants in the sandstones.

Rear tires driven 190 ~~202~~ miles before new speedometer started

Boulder, Colo., Friday
June 10, 1921.

After waiting since Tuesday for the great floods to subside a little and the roads to dry, A. J. Tieje, F. Earle Swisher, of Palisades, Colo., left at 9:30 for Wyoming, with very heavy load in the Ford car. At Longmont crossed the St. Vrain on bridge just above town, fording several bad channels filled by flood waters.

At Berthoud we made a long detour to the east over very rough, muddy roads, because two bridges over the little Thompson were washed out. also forded one flooded channel there. Dined at Berthoud.

At Loveland water was flowing ~~flow~~ deep over the paved

road for some distance, but a temporary plank bridge replaced the one that was washed out, so we had no difficulty.

Had to ford a channel again to get to the bridge over the Cache la Poudre above Ft. Collins.

There were several bad pieces of road beyond Forks Hotel. Most of the road from Boulder to Virginia Dale was fairly good in spite of the long storm and floods.

At 5 P.M. we camped on ~~Virginia Dale~~ creek, 1/4 mi. below Virginia Dale.

Speedometer reading at Boulder 69; at Dale Creek 163

Bright day - no rain.

Virginia Dale, Colo., Saturday, June 11, 1921

Bright morning. Drove North through Laramie to Pine Ridge 2 miles S.E. of Rock River (town). Speedometer reading 228.

station 1-1921
There have collected fucoidal plant remains in the upper massive sandstone seamed by veins at approximately right angles with eachother, hardened by iron oxides so in weathering they are left in relief. x Darton x Sidebottom, in Bull. 364, says it is a Fox Hills horizon containing a little coal, and that Pierre fossils are found at the base.

Drove on and camped at a shallow, ephemeral lake just south of Como Ridge, 1 mi. E. of Ridge station on U.P. 7 mi. E. of Medicine Bow.
Speedometer 248.
Bright and hot all day.

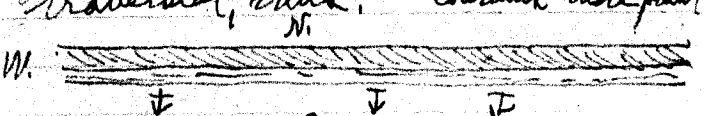
Como Ridge, Wyo., Sunday
June 12, 1921.

Bright, breezy morning, east wind.
Mollusk Sta. 361, lake at camp, ~~is~~ completely enclosed, in Fort Benton Cretaceous shale, about 2 acres, shallow, water muddy, stirred by wind. x Lymnaea bulimoides cockerelli abundant in sedges along south shore. Lake probably nearly or quite dry in dry seasons.

but no alkali along the shore.

Fossil sta 2, 1921. Upper Benton s.s. ridge just S. of camp. Inoceramus fragilis common in upper part of the sandstone, with a few Prionocyclus wyomingensis. Only upper part exposed here.

Fossil sta. 3. Following the ridge to the railroad cut about a mile west of Ridge, a good exposure was found there, showing about 15 feet of ss., underlaid by black calcareous shales. The sandstone is rather coarse, the grains of many layers a millimeter or more in diameter and some pebbles in some layers reaching a diameter of 1/4 inch. The true bedding planes dip S. about 10 to 15°, making a nearly E.-W. ridge. Part of the sandstone is crossbedded strongly along the top of the ridge the whole distance traversed, thus: Contains rude plant remains.

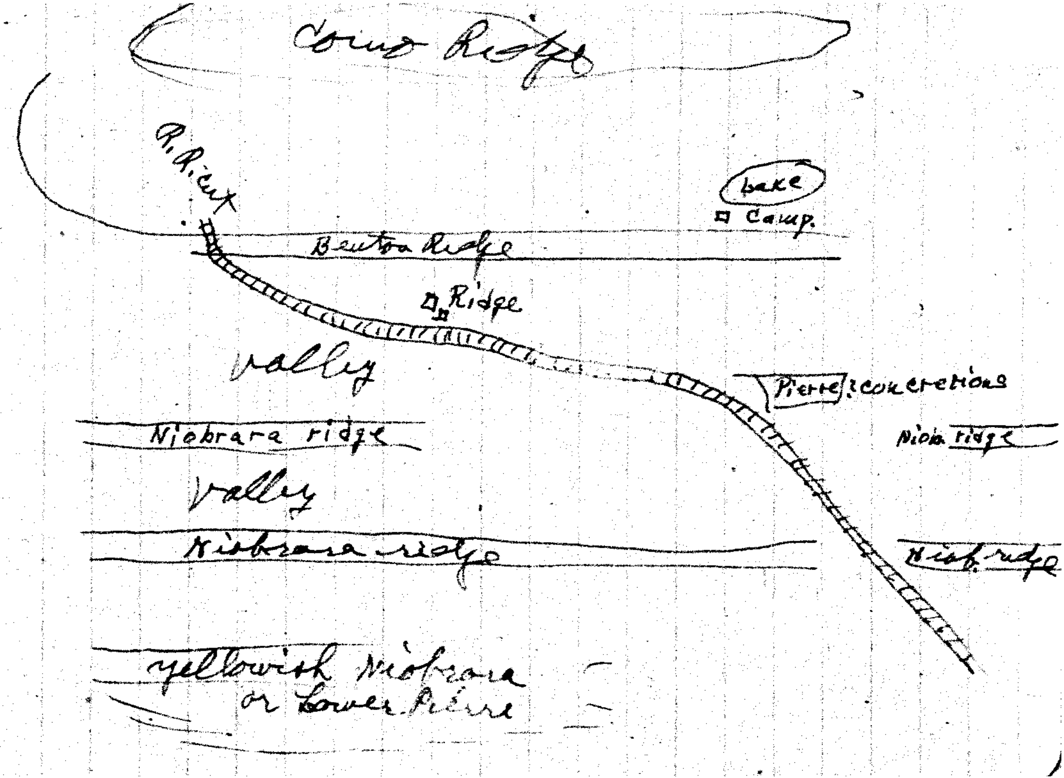


a short distance farther west the ss. and other formations swing around the west end of Cowa Ridge, which is an eroded anticline. (See map in U.S.G.S., Bull. 364.

In the valley just S. of the Benton ss. ridge is an exposure which appears to be typical Pierre shale with large concretions in parallel E.-W. rows, strongly stained with calcite, like many north of Boulder. Found no fossils. If it is Pierre there must be a fault. It ~~did~~ is not exposed W. of the R. R. track where the valley is covered with a thick clay alluvial deposit, but is exposed just ~~east~~ E. of the track by recent erosion.

Fossil sta. 4, Niobrara, Cretaceous, in two ridges, E.-W. parallel, both limestone weathering white, containing Ostrea ~~?~~ congesta or Inoceramus fragments. These Inoceramus fragments in the lower ridge, only exposed W. of R. R. track and farther ~~S.~~ east, are peculiar, not like I. deformis. I have found them also in Colorado.

They belong to a large species. The areal relations are roughly thus.



~~Fossil Sta. 5, Niobrara ridge~~
~~S of Ridge, Hyp. Ostrea congesta and~~
Sta. 5, middle or upper Niobrara
Cret., S. of Sta 4. Very large Inoceramus
some covered by O strea congesta. Saved
5 fragments of the outer edge of one
about 2 ft. in diameter. In shale.
~~Sta. 6.~~ Cloudy & sprinkled in
afternoon. Cleared at dusk with
West wind.

~~Camp~~

Como Ridge, Monday
June 13, 1921
Visited Sta. 5 in morning.
Sta. 6, N. of camp, just over ridge
Sundance Jurassic, dip S. Starfish,
Belemnites & small Pelecypods. Probably
same as Tiejas station of yesterday
Bright & hot most of day.
Found no fossils in the Morrison
formation.

Freezeout Hills, Tuesday
June 14, 1921

Bright, hot morning.
Drove 7 mi. W. to Medicine Bow, then 14 mi. N. to a spring gulch on E. side of Freezeout Hills as shown on Darton & Siebenthal map.

Collected from Sundance Jurassic a mile or two N. of the stream and searched the Morrison at same place.

The "Dakota" here is very quartzitic in places at the base with some not very coarse conglomerate, the upper part with a tendency to form a low ridge outside the main first hogback.

The very massive ss. at the top of the Shinumo forms a cliff which I estimate at 80 ft or more. 2 miles N. of here very similar to that at the top of the Cyclops north of Owl Canyon.

it forcibly reminds me of the La Plata in S.W. Colo. just as the sandstone in N. Colo, which I believe to be the same as here, does. Here it is overlaid by the Dundance, of which very little is found in N. Colo.

Saw an antelope three times, possibly the same one, in the afternoon, and two Jackrabbits (white tailed) and several cottontails.

Partly cloudy with cool breeze in afternoon. West wind.

Good springs here from just beneath the lower "Dakota" sandstone.

Medicine Bow, Wyo., Wednesday
June 15, 1921

Cloudy, occasionally sprinkling at daylight. Began to rain in earnest at about 8 a.m. Broke camp and drove to town. Roads very slippery. Put on chains, skidded badly.

The town consists of three hotels, 3 or more stores, 2 garages, a bank,

a depot and several other buildings, perhaps 25 buildings all-told.

Heavy rains West of here in afternoon. Roads reported very bad.

Got rooms at Virginia Hotel.

Had car overhauled, new transmission linings put in, leak in transmission case, etc. repaired.

Medicine Bow, Wyo., Thursday, June 16, 1921

Clear morning. Roads nearly dry. Drove N. to Bone Gulch, about 14 miles N.E. of town, where there are numerous fragments of reptilian bones in the sandstone beds. We collected a few, then returned to town and dined at Virginian Hotel. The town is said to be the locality for Owen Wister's The Virginian.

Afternoon we drove to Fort Steele, on North Platte, and camped at bluff N. of town.

Speedometer at Medicine Bow 326

" " Fort Steele 374

Fort Steele is a small village on the ~~S. bank~~ S. W. bank of N. Platte River. There are cottonwood groves along the river. No other trees visible from the top of the first terrace above N. of the river. Not a field of any sort to be seen - not even a garden, ~~so~~ only one ranch house out of town; a few houses on S. side of river by R. R. track.

Fort Steele, Wyo., Friday
June 17, 1921.

Sprinkled toward morning, but sun rose bright and hot.

Worked north.

First bench above the bottom land is a thin bedded ss., dips N.

Sta. 6, thick bed of shale, with typical Pierre concretions forming a valley. Found one small Inoceramus and a fragment of Baculites. Shales rather sandy.

Second bench another brown ss. similar to first, dips 20° N. 10° W., the strike swinging to S.W. a quarter mile farther north, the ss. exposure at least 20 ft. thick, perhaps extending into talus.

N. slope approximately following dips, as in first bench. Rude plant fragments probably marine algae in both sandstones.

N. of this rise bench after bench of sandstone with thin intervening shales. In one place oyster fragments are abundant but the stratum was covered by talus evidently. Beyond this is a broad playa valley, the strata of the hills farther north apparently still dipping north.

The shale valley between the first and second benches north of camp is about 600 or 800 yards or more wide, between the 2nd + 3d benches about 200 yards wide

The town evidently occupies an eroded anticline cut by the river deeply into the Niobrara shale, which may be seen in the hills just S. of town for beyond which benches of ~~the~~ Niobrara s.s. dip southward.

Sta. 7, Ostrea Lorisoni, mentioned above about middle of formation, one s. s.

stratum, a broad flat oyster, fairly common, one fragmentary baculite? This is at the base of the third ~~xx~~ [illegible] below I believe. A little below this occurs Halymenites.

Mosquitoes are terrible here.

Rained a little after dark.

Tieje has been sick all day, so we took him over to town and found a room for him and a nurse.

They use river water here.

Rawlins, ~~Colo.~~ Wyo., Saturday,
June 18, 1921.

Bright & windy morning. Cloudy, windy and cool afternoon. Wind west all day.

Tieje better, but still ill and weak, so is going to Boulder. Swisher and I came on to Rawlins.

Town water alkaline here.

About town a thick, hard quartzite, partly conglomeratic, portions resembling the "Dakota", several hundred feet of it resting on granite, overlaid by a thick limestone, which in turn is

overlaid by several hundred feet of strata in rounded hills S. of town which at the few small exposures shows a soft yellowish and whitish sandstone, poorly consolidated & do not recognize the formation at all. The l.s. just S. of the R.R. track contains large chert concretions up to 6 or 8 inches in diameter.

Cloudy, with strong cold wind in evening. Quartzite & l.s. quarried in several places. Thin shale layers in quartzite.

Rawlins, Wyo, Sunday
June 19, 1921.

Moved to a place N. of town for better shelter from the wind. Cloudy, cold, misty all day.

Drove 8 miles N.W. of town on Lander road. Same quartzites & l.s. ~~S.~~ S. W. of road - covered on other side of road.

Cold. Rained just before dark. Wind still west.

Rawlins, Wyo., Monday,
June 20, 1921.

Bright morning, cold west wind.
Partly cloudy forenoon.

Drove 15 miles N.W. on Lander road, with ridge of Paleozoic quartzites & limestones on our right, a steady climb for about 10 or 11 miles then down grade. Road good.

Sta. 8, about a mile N. of Lander road, 15 mi. N.W. of Rawlins. Sundance Jurassic with Belemnites, Ostrea and Camptonectes. ~~Exposure~~ Exposure not good.

Above this the Morrison is covered, but indicated by large bone fragments on the lower slope.

30 or 40 ft. of lower "Dakota" (or Cloverly) conglomerate, massive, hard, with pebbles up to 2 inches in diameter, forms the rim rock.

Below the Sundance is the Chugwater (= Lykins), several hundred feet thick, perhaps 1000 or more. Light colored sandstones at the top and two or

were limestones, but mostly very red sandstones & shales. One limestone forms the cap of a great terrace north of the road.

Dips all northerly about 10°.

Continuing down the short sharp gulch S. of the road, found about 60 ft. or more of drab and gray l.s. and s.s. beneath the ~~Dakota~~ Chugwater, which in turn are underlaid by rather thinbedded, strongly cross-bedded sandstones forming a high ridge and where the gulch leaves the ridge below forming a cliff at least 100 ft. high. I take this to be Doctor's Tensleep (Pennsylvanian) ?

Camped 17 mi. from Rawlins. Cool west wind all day.

N. W. of Rawlins, Tuesday, June 21, 1921.

Bright, hot morning.

E. & N. of road is a great exposure of Upper Mancos and Mesa Verde dipping

S.W. at a high but variable angle, forming a ridge, portions of it weathering into tepee forms, roughly. Found no fossils in the ridge.

Fossil station 9, either upper Mesa Verde or lower Lewis, on the plain S.W. of the ridge, scattered on surface, Ostrea glabra with very thick shells.

Started back to Rawlins at noon.

About a mile or so west of Sta. 8, on west escarpment of Shirley Basin, there is a fault, bringing the Mancos above almost against the lower Shirley Basin

Sta. 10, about 6 mi. N.W. of Rawlins, lower Mancos Cret., about 100 yds. W. of fault line. Ostrea congesta on fragments of large Inoceramus.

Sta. 11, about 2 miles N. of Sta. 10, a fine exposure of upper Mancos, consisting of shales, sandy several hundred feet more or less sandy at the bottom but clay above. Just above the first massive ss. well toward top of bluff, a concretionary zone yielding Inoceramus sp. and large cephalopods. The sandstones above and below the invertebrate fossils contain many Halysenites mostly very small, a few

up to 1/2 inch.

Saw an antelope today. breezeless.
Bright and hot all day.
Camped on the first grassy patch we have seen on the trip. near a spring not far from Sta. 8.

N. W. of Rawlins, Colo.,
Wednesday, June 22, 1910.

Another bright, hot morning. No breeze.

Drove to Rawlins in morning, then at noon started for Wamsutter on Lincoln Highway - distant 35 miles West.

Mollusk Sta. 362, slough along roadside 13 miles West of Rawlins. Lymnaea b. cockerelli common. Another Lymnaea scarce

From Wamsutter we drove 26 miles E. of S. and camped at a creek at the Half Way Place, half way to Bagg-

very good graded road most of way.
Saw a tame young antelope on the street at Rawlins. S. E. of Wamsutter saw a wild one half grown. Cottontails abundant everywhere. White tailed jackrabbits occasional. No black-tailed ones seen.
Hot all day.

Baggs, Wyo., Thursday,
June 23, 1921

Another hot morning. Left camp on the Muddy in morning & drove to ~~Bag~~ Baggs where Muddy creek empties into Snake River. Bottomlands with lots of cottonwoods along river.
Sta. 12, top of ~~Wasatch~~ Green River test, in conglomerate ~~pull~~ several feet thick, ~~bluy~~ hill a mile or two N. W. of town. Goniobasis abundant. Seems to be Cathedral Bluffs member of Green River
Mosquitoes terrible even at top of bluff. * See U.S.G.S., Bull. 703, for map.
Drove back toward Wamsutter in afternoon and camped on the Muddy 22 miles from Baggs. There are no trees along the creek. The channel ~~cut~~

is from 6 to 10 ft. deep in mud banks, and the water is muddy. Saw no ranches along the creek except one or two deserted ones. The entire valley, so far as we travelled it, is in Wasatch Green River clays and sands, which also form the divides on both sides, making They are variegated in color, and in many places present fine badland topography.

Cool, cloudy, strong wind and a little rain afternoon.

Some mosquitoes at our evening camp but much better than at Baggs.

Meadowlarks all along Muddy creek, the first place we have seen them in Wyoming. Female bluebird at Baggs. Yellowheaded blackbirds yesterday at Mollusk sta. 362.

After supper we walked to the Wasatch "badlands" bluff about two miles S.W. of camp. The rim rock there is a white sandstone about ten feet thick similar to the Laramie at Marshall.

There are many holes in the ravines where the water percolates through the soft rocks.

Wamsutter, Wyo., Friday
June 24, 1921.

Bright morning, with cool breeze.

Drove to Wamsutter, then west toward Tipton. Gray shales along both sides of road west of Wamsutter, ~~to~~ with darker, harder beds. See U.S.G.S. Bull. 703, for map.

Sta 13 - 12 miles ~~to~~ W. of Wamsutter, about 30 ft. above R.R. grade, at foot of a hill S. of road. Viviparus, Goniobasis and Unio abundant; 4 mi. E. of Tipton.

Sta. 14, about 30 ft. higher on hill, same fauna.

Sta. 15, about 50 ft. higher, 30 or 40 ft. below top of formation.

Formation sandy, mostly soft. Perhaps

About 2 miles S. the variegated measures form an escarpment, mostly red above below, gray above, with bad land sculpture, all above Sta. 13 - 15.

Drove along Lincoln Highway, passing

Table Rock, Bitter Creek and Black Buttes, and camped 19 mi. W. of Tipton.
Hot afternoon; road very rough, newly graded, after leaving Tipton.
Just before camping we passed across Lewis shale with big brown concretions.

Point of Rocks, Wyo.
Saturday, June 25 1921.

Partly cloudy, hot forenoon.
Drove West.
Sta. 16, ~~Mesaverde formation~~ Black Buttes Group?, N. of Lincoln highway, loose on slope, ~~six~~ miles E. of Point of Rocks. One specimen of Halymenites low on slope. U.S.G.S. Bull. 702 map says "Laramie".
Sta. 17, about 75 to 100 ft. above the road, a 4-inch stratum filled with ~~ither~~ Corbicula ~~in immense profusion~~.
Sta. 18, about 50 or 60 ft. higher, Ostrea weathering from shales.
The formation consists of thick shale members divided by brown s.s. members ~~conta~~ impregnated with iron, which produce

numerous distinct benches. Slight dips northward. See U. S. G. S., Bull. 703, for map.

Drove on into town and camped. Got water from R. R. tank.

Coal mine 1 mi. E. of Town.

Sta. 19. Bluff N. of R. R. station at Point of Rocks. Corbula undifera in a stratum 6 inches in thickness about 70 ft. above the basal massive ss., which is coarse, crossbedded and about 100 ft. thick. Stanton says above massive ss., but beneath Fox Hills beds. Darton & Siebenthal, Bull. 703, map it as Middle Mesaverde.

Sta. 20, from 50 to 100 ft. above Sta. 19. Ostrea abundant, doubtless the one Stanton records from here as O. glabra wyomingensis. A few Halymenites. One or two Arenicola seen. A few Corbicula in same stratum. Saw Arenicola also at top of bluff, far above Sta. 20.

Partly cloudy afternoon, with breeze. Very hot out of the breeze.

Point of Rocks, Wyo., Sunday,
June 26, 1921.

Bright, hot morning.

Packed box No. 4 for shipment.

In afternoon walked a mile or so S.W. across Bitter creek, then crossed to the N. side and back.

Bitter Creek had filled its valley to a considerable depth in the past with sand and clay, and is now eroding it deeply, with cross-section thus:

Canyons 20 ft. deep with vertical walls have developed in some of the lateral gulches.

A few cedars are scattered over the sandstone ledges on both sides of the valley.

The water of Bitter Creek is quite alkaline.

Hot all day.

Fossil sta. 21, about 1½ mi. W. of

R.R. station, Mesaverde Creek (middle), near top of exposure – plant stem with numerous leaf scars arranged in vertical rows, probably same as we found in the Mecha district years ago.

Point of Rocks, Wyo., Monday.
June 27, 1921.

Bright, hot morning.

Walked to bluff about 1 mi. E. of town, S. of Lincoln Highway.

Very massive, thick s.s. at base, as N. of town. Above this, alternating shales & s.s., with a little coal, as usual.

Sta. 22, in massive white ss. about 15 ft. below top of high point, a pocket of Ostrea sp., almost top of upper Mesaverde.

Proceeded to bluff ~~N~~ North of Lincoln Highway, about 4 mi. E. of town.

On low shale hill just below foot of bluff found Ostrea glabra, possibly variety, but Earle lost specimens before they were wrapped.

Sta. 23, on shale slope well toward top of second prominent bench of the bluff, in Lewis shale. Ostrea convexa, did not find it in

place. Eight or ten feet above the highest Ostrea fragosa.

Sta. 24, - 8 or 10 ft. above highest Ostrea fragosa is a 2-3 ft. stratum composed of Unio spp. Difficult to get good specimens.

Sta. 25; Earle went back to low shale hill and got the fossil oysters he lost from the low shale hill, as mentioned above.

There is a great deal of cross bedding and in places ripple marks.

A blistering hot day, without cloud or breeze.

Point of Rocks, Wyo., Tuesday, June 28, 1921.

Another very hot morning.

Black Butte cannot be reached by auto from here now, so far as we have learned. No R.R. agent there - merely a care-taker. No agent at Table Rock and Butte Creek.

The Black Butte section is discussed by Stanton, Proc. Wash. Acad. Sci., XI, 1909, pp. 270-272, and by Stanton & Hamilton, Bull. Geol

Soc. Amer., VIII, 1897, pp. 143-145.

all about Point of Rocks and down Bitter Creek toward Black Buttes the cliffs of the valley walls have at their base a massive ss. 100 ft. thick or so - ~~perhaps less~~. Above this shales and sandstones alternate, these forming many benches, with occasional thin coal seams.

Went to Black Buttes on train at 9:44.

Usual massive ss. at base N.E. of R.R., over 100 ft. thick.

Sta. 26, perhaps 30 ft. or so above massive s.s., between 2 old coal tunnels about 1/4 mi. E. of R.R. station, a 1 ft. stratum composed largely of Corbula, Corbicula and various gastropods, weathered out in quantity on the slope.

Sta. 27, near #26, but 4 ft. above massive basal ss., Ostrea abundant in one stratum, but badly weathered.

Sta. 28, about 20 ft. above basal ss., Ostrea ~~bivalves~~ badly weathered.

Sta. 29, about a mile S. of Sta. 28, about 30 ft. above massive basal ss., Corbicula abundant, poorly preserved.

A few strata just above the massive lower ss. of the Mesaverde in

this whole region are filled with fossils in usually in exposures of small extent. Have found only the oysters in exposures that can be traced for considerable distances. Have seen very few fragments of leaves.

Very hot day, little breeze.

Point of Rocks, Wyo, Wednesday
June 29, 1921.

Another hot bright morning.
Shipped boxes No. 4 and 5.
Drove to Rock Springs in forenoon.
Put on ~~saw~~ new Pennsylvania Vacuum Cup ~~fo~~ right front tire, guarantee 6000 miles, speedometer 703.
Hot all day.

Rock Springs, Wyo., Thursday
June 30, 1921.

Cool night. Much cooler most of today, because of partial cloudiness and breeze.

We worked over the cliffs and

hills E. of town, examining good exposures of almost the entire section, but saw no fossils except one fragment of an oyster.

Rock Springs, Wyo.,
Friday, July 1, 1921.

Partly cloudy breezy morning.

Broke camp and drove west, along Lincoln Highway.

Sta. 30, five miles W. of town, N. side of road, about 150 ft. above base of Green River ~~Wasatch~~ cliff, ~~Gon~~ Goniobasis abundant well preserved, in a thin stratum, with a few Viviparus and fragments of Unio.
(oolitic Green River beds, according to map.

Sta. 31, about 150 ft. higher, plant remains?

Sta. 32, about 15 ft. higher, clay balls? in thin stratum

The cliffs are probably 600 to 1000 ft. high. Near the base is a very massive ss. about 20 ft. thick. Most of the formation is shale and thin bedded ss., chiefly whitish, some pink at base.

The rim rock is a 50 ft. (or more) brown ss., with a low bench of similar ss. back from the rim and above it. According to map the rim rock is Tower ss., which forms the tower N. of Green River (town) and other towers near by. The white shales, etc., beneath it is the Laney shale member. Below this, forming a narrow fringe at base of cliff, is Tipton shale. Fossils of Sta. 30 are from either lower Laney or upper Tipton. The Tower is the top of the Green River formation and the Tipton the bottom. The Cathedral Bluffs member is not found here above the Tipton.

Drove on to Green River and camped in a windy spot on bank of river.

Took pictures of beautiful, minute wave ripples in fine sand on banks of Bitter Creek Green at Rock Springs. Found similar ripples in Green River.

Green River, Wyo., Saturday,

~~July 2, 1921~~ July 2, 1921.

Climbed Castle Rock (Green River Butte) in morning. The rim rock forming the actual butte and other similar topographic features here is the Tower ss., underlaid by thin bedded Lanes shales to base of cliff. Found no fossils. Drove three miles up river ~~to~~ same formation. No chance for recent mollusks. No permanent pools and river high, though not out of banks. No cover for land snails.

In afternoon visited Fish Cut two miles west on R. R., in Lanes shale, ~~underlaid by~~ overlaid by Tower ss.

Cold west wind increasing to great violence in afternoon, subsiding in evening.

At Fish Cut collected some very small ripple marks. Only fragments of fish remains seen.

Green River, Wyo., Sunday.
July 3, 1921.

Bright cold morning. Ice on water in wash basin at 8 a.m., after sun had been on it for a couple of hours. Warmed up some during the day, wind not so strong as yesterday.

Green River, Wyo., Monday.
July 4, 1921

Another cold morning - did not freeze. Started West again

Sta. 33 Bridger Eocene, about 50 ft. above valley, half mile S. of Lincoln Highway bridge over Black's Fork, 1½ mi. W. of Bryan (about 16 mi. W. of Green River. Plant remains and 2 or 3 mollusks, possibly Planorbis. The basal portion of the formation is mostly greenish gray soft clays, with one iron concretion band. The upper part is largely yellowish

hard days.

Camped on a tributary of Black's Fork, 7 mi. E. of Lyman.

Calm, warm evening.

Church Buttes, Wyo., Tuesday
July 5, 1921.

Bright, warm morning.

Ran back 8 or 10 miles to the buttes (not the R. R. station).

Sta. 34, Church Buttes, Bridger Eocene. Greenish volcanic ash? and brown ~~volcanic ash~~ sandstone (?); little lime. No fossils except bone fragments. The brown ss. contains fragments of the green with which it alternates.

Sta. 35, about 1½ mi. S. of #34, about half way up the cliff. Part of a mammal skull. Brown ss. when broken, is greenish inside, mostly.

Mollusk sta. 363, small irrigating ditch 3 mi. E. of Lyman, Wyo. Lymnaea common in algae, a few Physa and 2 or 3 Aplexa.

Moll. sta. 364, roadside pool 4 mi. W. of Lyman, Wyo. Physa & Lymn. abundant.

Lyman and vicinity is the only place we have seen in Wyoming except Baggs where there are green irrigated fields. It is the home of ~~the~~ a State Experiment station.

Camped on Big Muddy 23 mi. E. of Evanston.

Sta. 365 (Mollusk), Slough cut off from creek at camp. Lymnaea and Aplexa abundant.

Spring Valley, ~~Colo.~~, Wyo.,
~~Wednesday~~ Tuesday, July 6, 1920.

Cold night, bright, warm morning. Started for Evanston, through Spring Valley.

Mollusk Sta. 366, large spring by roadside about 15 mi. E. of Evanston. Physa and Pisidium abundant.

Moll. Sta 367, small aspen grove, north facing slope in gulch, 11 mi. E. of Evanston, Wyo. Pupilla, Vitrina, Succinea and Vallonia, not abundant.

Wyo.
Evanston, ~~Colo.~~, Wednesday,
July 6, 1921

Reached Evanston ~~at~~ in afternoon, & drove S. along W. side of Bear River, crossed river about 10 or 12 mi. S of town and camped at Fossil Cut, on a small stream — Sulphur Creek.

Fossil Sta. 36, Bear River Cret., at Fossil Cut.

Mosquitoes terrible here.

Sta. 36 is a cut along the old grade of the U. P. Ry., now used as a wagon road.

Sta 37, Colorado Cret., about 2 mi. S. E. of #36, N. of road, at old coal mine near old Bear River city & Inoceramus sp., common.

Mollusk Sta. 368, Fossil cut. Oreohelix cooperi, dead shells under sage brush.

Moll. Sta. 369, hill N. of Knight. Oreohelix, dead shells & 2 live ones under sandstone.

~~Fossil Sta. 38 N.E. side Stowe Creek.~~

about 2 mi. E. of Knight, Wyo.
Bear River & set. Exposure poor.
For this whole region see
Stanton's paper on the Bear River
formation, Am. Jour. Sci. XLIII, 1892, and
Veatch's paper on S.W. Wyo., U.S.G.S.,
Prof. Paper 56.

Fossil Cut, Thursday,
July 7, 1921.
The above records from Sta. 38
on should be under this date.
A hot day in the sun, but breeze
part of time and some floating clouds.

Fossil Cut, Wyo. Friday,
July 8, 1921
Bright, hot morning.
Drove E. along old R.R. grade.
Fossil Sta. 39, Bear River & set, about
1 mi. N. of old Bear River City, just N. of
Sta. 37; Sorbula, Unio, Pyrgulifera, etc.
This is not more than 50 or 100

feet below the coal, which at Sta. 37 is just below the Inoceramus bed.

Sta. 40, Rock cut, on old R. R. grade S. E. of Hilliard. Ostrea soleniscus forming a two foot stratum in massive ss. Obtained no good specimens.

Mollusk Sta. 370, Rock cut, under sagebrush, 3 dead Oreohelix cooperi.

~~No~~ Foss. Sta. 41, E. side of gulch N. of Sulphur Creek, about 1 or 1½ mi. N. of ~~old Bear River city~~ Hilliard, near a bridge. Ostrea abundant in shale dipping steeply westward on dip slope just above a thin coal bed exposed by an ~~tunnel or~~ open cut.

Sta. 42, bluff of Hilliard shale W. of Sta. 41, along N. side of creek. Found fragments of Inoceramus, probably exogyroides, which is reported as abundant by Veatch, with Ostrea congesta on some. Certainly not abundant here.

Mosquitoes very bad again this evening.

Fossil cut, Saturday
July 9, 1921

~~Warm night, bright hot morning~~

Moll. Sta. 371, searched creek for two or three miles above camp and a slough on S. side. Lymnaea and Physa common in creek, Lymnaea abundant in slough. Only one live Sphaerium, under a rock in a riffle, though dead shells common in the water. Dead shells of Pisidium, but no live ones.

Moll. Sta. 372, banks of creek where it has cut from 5 to 10 feet into the alluvium. Sphaerium abundant, Pisidium common with some Planorbis, Succinea, Oreohelix, etc. This may be the source of the dead Sphaerium shells in the water. It may also indicate former more favorable conditions for both land and freshwater mollusks.

Earle went to Evanston to ship fossil box #6.

Fossil Sta. 43, fish scales in shales W. of Bear River Cret., about 1½ mi. N. of Fossil cut, at locality mentioned on p. 10 of Stanton's paper on Bear River formation.

Fossil Sta. 44, Bear River Cret., S. W. of Fossil cut, on divide between Sulphur Creek and Bear

River.

Hot forenoon, cooler, partly cloudy, breezy afternoon.

Earle followed the Bear River formation over the divide from Fossil Cut to the Bear River, and found at the river a good exposure, where he obtained a good series of Campeloma. These are under sta. # 44.

Fossil Cut, Sunday,
July 10, 1921.

Partly cloudy morning. Rained at noon and at intervals during afternoon.

~~Fossil~~ Shell Hollow, Wyo.
Monday July 11, 1921.

Broke camp and drove north through Evanston and Almy. Bright morning, partly cloudy afternoon. Camped at Shell Hollow.

Foss. sta. 45, W. slope of hill N. of Almy, mentioned by Stanton in his paper on the formation. Bear River crd.

Rained in evening.

Cedars too wood here, or Lilla. Willows

in bottomlands.
Calm evening & mosquitoes terrible.

Shell Hollow, Tuesday,
July 12, 1921

Mosquitoes in swarms all last night. First time they have troubled us after 9 p. m. Night warm and calm. Today they were bad out on the hills a mile from water & very little breeze until 5 p. m. when it sprinkled a little. Finished collecting fossils and packed box #7 for shipment. Will ship at Evanston tomorrow on our way through.
Cooler evening, breezy, mosquitoes not so bad.

Oyster Ridge, Wyo., Wednesday,
July 13, 1921.

Bright, hot morning, partly cloudy afternoon. Drove to Evanston, then 23 mi. E. on Lincoln Highway, then about

10 mi. N. on Kemmerer road to Bridger Basin over Oyster Ridge, where we camped.

~~Frontier ss.~~

Fossil Sta. 46, Frontier ss., just E. of the highest part of the Ridge; N. of old road over the ridge. Halymenites, Lucina and other mollusks common, poorly preserved.

Sta. 47, about 100 ft. above (dipping west) #46, massive ss. containing many poorly preserved Ostrea soleniscus. They are abundant at various horizons in the sandstone, but cannot be gotten out successively. The shells weather more than the matrix.

Warm, calm night, without mosquitoes.

Cumberland, Wyo., Thursday, July 14, 1921.

Partly cloudy morning. Set to Cumberland at 11:30, & camped. Shipped parcel box No. 8.

Furious rain at noon, old rain continued for 2 hours.

At 3 p.m. we walked down Little

Muddy Creek 2 miles or more below town. As the whole region is occupied by Cretaceous, the record of 1 mi. east of Cumberland in the south bank of the creek ~~is an error~~ as the type locality of Goniobasis nodulifera, Viviparus paludinaeformis and Unio tellenoides must be an error, or the specimens were not found in place.

Cumberland, Wyo., Friday.
July 15, 1921

Bright morning.

Drove down an untravelled road on S. side of Little Muddy creek, east.

Sta. 48, a hard, dark stratum of ss. about 2 mi. E. of Cumberland, S. side of Little Muddy creek, on top of a low ridge ~~cut~~ through which creek cuts a rather narrow valley. Filled with casts of mollusk shells, mostly bivalves. Dip easterly, whereas to the West dip is westerly. This is overlaid just S. by Eocene.

Sta. 49, about 1 mi. S.E. of #48, near S. point of a low terrace

Eocene, a thin layer rich in large Physas and land snails etc.

Sta. 50, 1½ or 2 mi. E. of Sta. 49, about halfway up bluff below where the Tertiary bluffs begin to narrow the valley of the Little Kentucky, Goniobasis modulifera, Viviparus etc., abundant in a 2 foot limestone. At the point half a mile or so to the westward we found the same horizon, walk & collected a few of the same species and one cast of Unio. This station is about 4½ mi. S. of E. from Cumberland. We found nowhere an exposure of Tertiary in or very near the bank of the creek on the S. side, hence do not know what the record of one mile E. of Cumberland on the S. bank of the creek can mean. Furthermore, no Tertiary is exposed within less than 2 miles of town.

Hot in middle of day. Partly cloudy with cool breeze after 2 p. m. and sprinkled a little.

Sta. 50 is considerably higher than # 49, - probably at least 50 to 100 ft.

Cumberland, Wyo., Saturday
July 16, 1921.

Bright hot forenoon.
Drove to Oakley, then down Hams Fork past Waterfall Station on Ore. Short Line.
Sta. 371, half mile S. of Oakley. Hilliard shale. Liopistha ventricosa with Inoceramus sp. fragments in concretion.
Sta. 372, about 1 mi. E. of Waterfall station, white & greenish marl (?), dipping about 10° West, with Physa, Lymnaea, Bampelona, etc. - mapped as Knight formation.
Moll. Sta. 373, at Fossil Sta. 372, in slough along creek, Lymnaea abundant, Physa scarce.
Rained afternoon. We drove on through Diamondville and Kemmerer, turned west along the Oregon Short Line, and camped not far west of Kemmerer. Rained or sprinkled all afternoon & evening.

Kemmerer, Wyo., Sunday,
July 17, 1921.

Bright and hot most of day. Partly cloudy with cool breeze late in afternoon. Stayed in camp all afternoon.

Kemmerer, Wyo., Monday,
July 18, 1921.

Cool, partly cloudy morning.

Drove to old Adaville coal mine, S. W. of town, then walked one mile S. to a draw & up ridge S. of draw.

Moll. Sta. 374, grove of small aspens at head of draw. Pyramidula & Vallonia abundant. Pupilla & Zonitoides (?) rare.

Sta. 5-3, baked clay 1/4 mi. S. of ~~coal~~ Adaville mine, impressions of mollusks and plant fragments numerous. The clay has been baked by the burning out of coal veins. See Prof. Paper 56, p. 74. [Adaville Coal]

~~Sta~~ Mollusk Sta. 375, artificial reservoir just East of old Adaville

mine: Lymnaea abundant. [illegible]
or two dead Physas.

Fossil Sta. 54. shale just S. of Hodge's Pass Tunnel, between West portal and auto road, several fragments of big, thick Ostrea soleniscus. See under Hilliard formation in Prof. Paper 56.

Raised a little about 3 p.m.

Kemmerer, Wyo., Tuesday,
July 19, 1921.

Bright, hot forenoon.

Drove northwest from Kemmerer to a point about 2 mi. N. of Hams Fork (creek), at ridge mentioned as a clay continuation of ss. lentile in Hilliard formation (Prof. Paper 56). ~~Only~~

Sta. 55, on above mentioned, covered with fragments of Ostrea places, we found also Cardium, etc.

Mollusk Sta. ~~56~~ 375, sloughs along Hams Fork just N. of Kemmerer. Physa & Lymnaea abundant.

Moll. Sta. 376, spring at Hams Fork

Village. Small Lymnaea abundant.

Fossil Sta. 57, Green River beds, overlying red Knight beds, cliff opposite Fossil Fish cliff, about 2 mi. W. of Hodges Pass Tunnel. Fish fragments at base of Green River beds. Unio, Physa, Goniobasis and ~~Campeloma~~? Vivipara about 10 ft. above the red material. Fishes found at same horizon, but probably not in place and material totally different, being like the fish material from about 50 ft. or more higher.

Bright hot day.

Nugget, Wyo., Wednesday,
Wednesday, July 20, 1921.

Bright hot morning.

Drove through Fossil, visited quarry of R. L. Craig and bought 2 fossil fish slabs.

Camped at Nugget station, near Foster ranch. Twin creek water above Fossil clear and good. Very muddy here. Wort Creek from the north clear and good water from R. R. water tank.

Fossil 58, Thaynes (?) ss., hill just N. E. of R. R. station. Pelecypoda [illegible]

Limestone so ~~I~~ crystallized could get more from it.

Mollusk Sta. 377, under shrubbery in fine talus at foot of Thaynes limestone cliff. N.E. of Nugget R.R. station. Oreohelix cooperi common, mostly immature.

Rained hard from 5 to 6 P.M.

Nugget, Wyo., Thursday.
July 21, 1921

Partly cloudy forenoon, occasionally sprinkling, sultry. West wind afternoon.

Climbed hill west of Porter Ranch. The fresh water shells in white limestone mentioned in Prof. Paper 56 are in such condition that we could get no identifiable material.

Moved camp to Sage at noon.

Sta. 59, Tertiary, hill ~~on~~ about 1/4 or 3/4 mi. nearly S. of Sage. Viviparus (?) and moulds of Goniobasis

Sta. 60, same horizon, white l.s., about 3/4 to ~~1/2~~ 1 mi. west of # 59, same species. Goniobasis nodulifera has

been, I believe, recorded from Hill ~~1/2 mi~~ 3/4 mi. W. of S. from Sage, which I believe is Sta. 59 or possibly 60, but our material does not appear to be that species.

Mollusk Sta. 378, dry north exposure at Foss. Sta. 60. Dead shells of Succinea.

Strong west wind toward evening, dying at sundown, as usual. Warm evening, with mosquitoes.

Sage, Wyo., Friday,
July 22, 1921

Partly cloudy morning, cool.

Visited the Bear River Bait. outcrop S. W. of Sage, shown on the map, but found no fossils.

Sta. 61, a few feet below (E.) of coal at old mine & coke ovens just W. of Sage, Modiola, etc., same as reported by Stanton in his Bear River paper.

This is at the S. end of Boulder Ridge. The ridge is largely covered with quartzite and basic limestone. In the latter we found [illegible]

cup corals, crinoid stems, Aguamulina perplexa (Reticularia perplexa) etc.

Shipped Fossil Box No. 9.

Drove to Cokeville, a thriving town, and camped on Smith's Fork, above town.

Cokeville, Wyo., Saturday, July 23, 1921.

Cool night, bright morning.

Sta. 62, Carboniferous (?), N. side Smith's Fork, a few hundred feet E. of some sort of mine, probably the place marked "X" for Carb. fossils in Stanton's section.

Sta. 63, Bear River Cret., about 2 mi. N.E. of town, E. of #62, at Stanton's more easterly "X".

Mollusk Sta. 378, roadside slough at east edge of town. Lymnaea and Physa abundant, immature.

In afternoon we drove 10 or 12 miles north and camped at a sheep-shearing corral on high, wide river terrace, cut deeply by small creeks.

Hot day, hard wind toward evening.

Smith's Fork, Wyo., Sunday,
July 24, 1921.
Bright, warm morning.

Smith's Fork, Wyo., Monday,
July 25, 1921.
Partly cloudy morning, sprinkling at intervals.
Walked about 1½ mi. N. of camp to Coal Creek, Stanton's Sec. 5, in his Bear River beds, but found no fossils.
Mollusk Sta. 379, sage-covered slope of Bear River beds, N. side of Coal Creek.
Dead Oreohelix cooperi common.
Excessive sheep grazing had destroyed all cover under sage & so found no live ones.
Mostly clear and windy in afternoon.
Drove back to sage and camped there again.

Rawlins - Johnston Motor Co., gas.	1.55
" Pierce & Ryan - flashlight batteries &c	.60
" H.J. Rogers, groundglass	.30
" Grill Cafe dinner for 2	1.10
Wamsutter, Cullen Commercial Co. gas	.70
" " " " " + groceries	3.45
Baggs Mercantile Co., lemons	.30
Ft. of Rocks, 2 jars to Black Buttes	1.68
Rock Springs Garage - 21.15 1.68	22.83
" " dinner for two	1.00
Swisher's account to date (Folio 3)	17.89
Green River - Sweetwater Auto Co., spring	3.00
Lyman - Olson Garage, gas	1.75
Evanston, gas, oil + batteries	2.30
" " " "	1.40
Diamondville 7 gal. gas. @ 30¢	2.10
" baked goods	.70
Cora Cokeville, Woodward + North, repairs	.75
" " " " gas	2.10
" Geo. Larson, team hire	3.00
Swishers expense to date	53.01

June 3, 1921. Recd. $400.00

Pl. Wilson Hdw. Co., Spoons	2.80
Freeman's, toilet Paper, menthol atum	.87
Nat. St. Bank, fee on traveller's checks	1.50
Hisley (Howard Gro. Co) groceries	4.90
" " " "	3.10
Wolf - meat	6.65
Withers - filters & Valve cores	1.00
" repairs	2.18
Hisley - eggs	.90
Boulder Rubber Tire Works oil & gas	1.60
Baird's Bakery bread, etc.	.60
L.P. Curtis, Berthoud dinner	1.50
H. Hale " repairs & gas	1.30
E.E. Sayre, Fryeburg gas	.60
Ebahart, Laramie, cake	.50
Laramie Auto Co., gas	.81
Medicine Bow - Peterson, gas	1.80
" " Bow River supply Co. - Groceries	2.20
" " Virginia Hotel, dinner	1.50
" " " rooms & meals 2 pers.	9.45
" " Lincoln Highway Lodge 17.00 less 10%	19.45
Fort Steele, fruit Mercantile Co., fruit	.40
" " " " gas & oil	2.80
Rawlins - Johnston Motor Co. repairs	.75
" " " " gas & repairs	1.65
June 20. Swishers account to date	15.22