

— Melting Snow —  
Studies at Soda Springs  
1942



PATENTS PENDING

# Stenographic Notes

No. 103P

LI-RITE LICENSE NO. 1

No. 1<sup>b</sup>

From APRIL 18 - - - 1942

To MAY 7 - - - 1942



Observations of Snow

at Soda Springs, Calif.

19?

April 18, 1942.

Dry fast road all the way to Soda Spgs.  
Weathered new snow upon the old.  
Study relative grain size of each.

8 pm. sundown. Sail by side of road soft,  
standing water. Snow just starting to harden  
under open sky but soft under shelter  
of porch. a radiation night.

8:15 pm.

Tests in shelter Therm. 40°F.

Thermog. 43°

Curley noticed this same 3° difference at  
minimum also.

Light breeze. Sky clear except for thin film of  
high vapor. Warm and Venus.

Crust frozen hard 3/4 in.

8:30 pm.

Test of therm. at same level in shelter.

Therm. 40.2°F 41.0 41.6

Thermog. 42.0 42.0 42.6

Correction to thermog. -1.0°F

but at lower level -3.0°F. (on floor of shelter).

Temp. of frozen crust by tube-therm. 0.0°C.

Crust frozen 3/4 in. from top down and  
lateral from sides of holes made by  
recent steps. Snow beneath compacts  
into solid snowball.

But ground and snow near wall of hotel



Notes: "Apparently April 20, 1942" to folder 1

also small pad dark yellow paper "In Shelter"  
April 19, 1942

or under shelter still soft. The snow  
across the road is now hard.

10:15 pm. Therm. 36.2°F in shelter  
Thermog. 37.8°F on jacket on snow.  
Under crust 0°C.

Crust very hard on top and on sides  
of holes. Fresh breeze.

Several inches beneath crust  
snow soft but <sup>almost</sup> dry 0°C.

10:30 pm Snow under perch still packs, but  
hard in open. Still ice on joaks.  
Mud still soft but freezing.

Temp. in shelter 36.0°F.

" of thermog. on snow 35.5°F.

" in soft snow approx. 6 in. beneath  
crust -0.20°C. Snow under crust  
still loose. But crust is now  
1 in. thick. How thick in morning?

Take temp. at various depths in snow.

April 20 - [Phone call to Blair Eddy. Survey made last  
Friday. Will survey next on May 1!]

6 am. Dawn, clear

7 am Fresh wind. Sun on valley.

Min. temp. in tower 36°F (Current temp. 40°F)

Thermog. on snow 36°F. (Sheet 1/2 pt)  
Under crust by thermog. 0°C.

Sun just over hill and touching snow  
at thermog. canopy. Tower longer in sun.

Crust 1 1/4 in deep. Temp. in crust -0.8°C.

7:40 am Therm. 42°F

Thermog. 38°F

Crust -0.3°F

? C? Sun around middle



8:30 am. Dirt and snow under porch  
firm. Snow in sun moist.  
Ice in pools almost entirely melted.

Phone call with Blair Eddy. Come  
to Soda Spgs Friday and survey  
my course. Will come next about Wagt-  
at mutual arrangement by mail.

9 am Thermoc 48°F  
Thermog 44°F  
Crust 7 in. deep +1.5°C

"Yesterday snow surface so soft that  
ski sank beneath surface and then skied  
forward. Another skier coming from the  
top of Beacon Hill came male/cut-throats."  
Companions at breakfast.

Today crust will break immediately  
under foot but will not hold ski sidewise  
unless it has metal edges

\* 9 am (cont). Snow surface now moist  
in sun and in the shade dampens the  
hands.

Temp. on surface of snow +3.8°C  
Thermog. .... 45.5°F  
Snow 7 in. deep - - - 0°C  
Thermog. soon 47.6°F

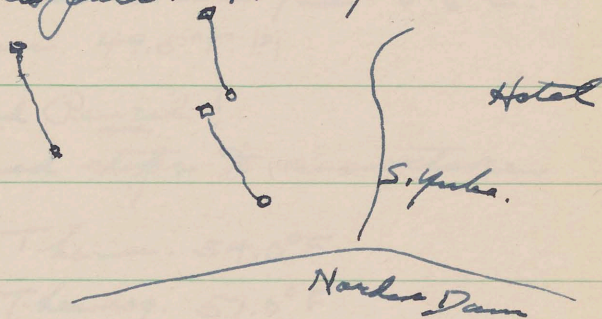
Snow crust placed in glass tray  
Temp. at bottom of sampler hole +0.2°C



Cut snow core.

\* Strata of fine and coarse crystals.  
Why not photograph cores for study and illustration?

Skiers going in long tandem up first ski pull. Three pulls:



9:45 am. Therm.  $49.2^{\circ}\text{F}$   
Thermog.  $46.0^{\circ}\text{F}$   
Fresh breeze, clear.

Bottom of sampler hole  $0.0^{\circ}\text{C}$   
Surface of snow (shaded)  $2.6^{\circ}\text{C}$   
" " " in sun  $10.2^{\circ}\text{C} = 50.4(?)^{\circ}\text{F}$ .

\* Crust now soft except top crystals slightly frozen.

Snow core moist to hard but no active capillarity visible.

\* Snow crust makes fair snowballs.

Snow Temp.  
10 am. in sun  
Surface of snow  $12.7^{\circ}\text{C} = 54.9^{\circ}\text{F}$   
Thermog.  $46.0^{\circ}$   
Therm.  $49.7^{\circ}\text{F}$

10:10 am.  
Surface of snow in sun  $14.6^{\circ}\text{C}$   
7 in. deep in sun  $+6.0^{\circ}\text{C}$   
" " " "  $+0.6^{\circ}\text{C}$   
" " " "  $+0.8^{\circ}\text{C}$



# Place glass grill in glass tray to hold snow above surface and permit natural gravity percolation.

11 am Snow stake 6 ft = 72 in.  
Snow in shade 7 in  $0.6^{\circ}\text{C}$ .  
Therm.  $49.5^{\circ}\text{F}$ . [?]

Lost. Pen and Pencil!  
Retraced steps to snow stake.

11:30 am. Therm.  $54.0^{\circ}\text{F}$   
Thermog.  $51.0^{\circ}\text{F}$   
In snow in shade 7 in  $0.4^{\circ}\text{C}$

Lost! Next resigned.  
15 years with me.

Snow in glass tray now settled to  $\frac{6}{10}$  depth.  
Water in tray. Slush, but water ran out as soon as snow was raised with scalpel from bottom of tray.

12 Noon -

Found! Pen and pencil shares from clothes after return from snow stake and while cleaning shovel on the snow behind hotel.

# Fresh snow from flat across track perched on corner of box. Part in air unmelted in half hour. Other part resting on weathered box ground melting and running water from tail. Affected by refraction from wood.



# Get scales (delicate balances) for weighing density of snow squares in melting pan. Sampler cores are rather small. Weigh rel. density at dry and dripping for (a) new snow, (b) old snow. Study grain size and rel. dens., in relation to each other.

12 Noon. Snow at 7 in. depth in sun  $+1.0^{\circ}\text{C}$

Percolation microscopic?  $+0.8^{\circ}\text{C}$

Any drip at bottom

Viewing comices by field glass.

Stable. Tiny snow rolls beneath?

Two skiers on back of next comice.

2:15 pm

7 in. deep in snow in sun  $+1.4^{\circ}\text{C}$

2:45 Thermo.  $59.0^{\circ}\text{F}$

Thermog.  $57^{\circ}\text{F}$

# Snow Cores. 44 in. long. Diam. shrank

(a) Top stratum  $3\frac{1}{2}$  in. Diam only 1 in.

Fine crystals. Not snow.

Water-soaked but not dripping.

(b) Bottom stratum 3 in. Diam  $1\frac{1}{2}$  in.

Coarse crystals. Cannot shrink readily.

Water-soaked and dripping fast when exposed to sun.

Temp. at bottom of sample hole 44 in.  $0.0^{\circ}\text{C}$   
Earth warmth?

" at 24 in.  $-0.1^{\circ}\text{C}$



Notes "Density + Melting" to folder

Temp. 15 in deep . . . 0°C,  
but thermometer case reaches  
to top of snow.

Melting - (in sun).

(a) Top stratum of core melts more  
quickly than bottom stratum but apparently  
has much less water to melt. No bursting,  
however, even when slush.

# Must cut cores and weigh them, then  
observe melting.

The 44 in core damp its entire length.  
Capillarity 3 in. high from bottom.

3:50 pm.

Thermom. 57.0°F

Thermog. 55°F

### Snow Sampling for Density

Samples taken horizontally in various strata.

To metal sheet 3 ft. distant.	D.	Core	Wt of Tube	Total Water	Net Wt.	Dens.
2 in. below surface	37.3 in.	27.8	20.4	32.0		31.1
New snow. Core shrinks badly	37.2	24.2	20.3	32.0		31.5
6 in. below surface	38.3	38.2	20.4	40.0		51.2
Old snow	37.5	37.5	20.4	39.8		
13 in. below surface	38.0	38.0	20.6	40.2	19.6	51.6
Fine crystals	36.5	36.2	20.6	39.6		
23 1/2 in below surface	38.3	37.3	20.4	38.0		46.0?
In coarse crystals	37.6	35.6	20.3	39.0		49.7



	D. Core	Wt of Tube	Total water	Net Water C.	Density	
33 in. below surface	38.5	36.5	20.4	39.2	18.8	48.8
4 in. above ground slash Drainage below?	37.5	35.8	20.4	39.0		
Vertical sampling at same spot	41.5	34.5	20.4	38.6		43.9
	39.5	37.1	20.4	37.0		42.0

Capillarity 1 in.

Note - Tender rootlet with bud brought up on bottom of core. Rootlet 1 in. long. Show to Dr. Billings.

# The middle of the cores (6 pins) compress into snowballs but only stiffly.

- Wet Temperatures -

4:20 pm.  
5 1/2 in deep. in snow in sun + 0.7°C.

4:45 pm.  
6 in deep in snow in shade + 0.0°C

Therm. 57°F

Thermog. 54°F Breeze.

5:10 pm Melting of snow cores

(a) Top core just melted. Dens 31.1%

(b) Bottom more than 3/4 gone. Dens. 48.8%

5:45 pm Temp. 2 in. deep. in shade + 1.2°C

6:40 pm. " " " " " + 0.4°C

(b) Tiny bit of bottom core survives at sundown.

Surface beginning to freeze.

Therm. 53°F.

Thermog. 47°F.



Practically no drip from bottom of vertical cores. End of percolation.

7 pm.

Temp. 2 in. beneath surface in shade  $+0.1^{\circ}\text{C}$   
Surface both in sun and shade now beginning to freeze. But film of freezing still extremely thin.

Surface just between moist and freezing. Snow near the surface can yet be made easily into snowballs.

(4) Snow core. Tiny remnant of core almost dissipated - a table spoonful of slush.

8 pm. Temp. in shelter.

Therm.  $38^{\circ}\text{F}$ .

Thermog.  $40^{\circ}\text{F}$ . on floor of shelter.

But when on same level:

Therm.  $39^{\circ}\text{F}$ .

Thermog.  $40^{\circ}\text{F}$ .

Corr. for thermog.  $-1.0^{\circ}\text{F}$ .

Crust -  $\frac{1}{4}$  in. thick

Vertical cores. A drop of water on the bottom that can be wiped off but no drip.

Length of melting day? 9 am to 8 pm.

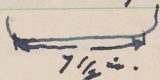
But percolation? Microscopic? Get dye to test daily movement.



8:30 pm. Snow still soft in hotel yard.  
Walk moist.

### Equipment

Inside meas. glass tray  $7\frac{1}{2} \times 9\frac{3}{4}$  in.



Need lubricant on tubular off balance  
to prevent friction between aluminum and  
aluminum surfaces. Antifreeze?

A substitute weight for 20 g. pendant to  
hang on balance to supplement lightness of  
snow sampler tubes. 30 g. better. Make  
it with hooks

Sheet iron  $10 \times 24$  in., possibly bent  
at upper edge to give it stiffness and  
flexure for driving. Bend the narrow sides  
Up.

### Weather Record

Date 1942	Max	Min	Precip.	Weather	Depth of Snow
April 11	42	28	"	Sun	63
12	62	28		"	58
13	58	39		Cldy	58
14	51	24	1.39	"	76
15	32	6	0.12	Pt. Cldy	78
16	55	14		"	75
17	42	16	0.31 (Snow) 5 in	Cldy	79
18	33	15	0.08 (Snow) 1 in	Pt. Cldy	80
19	61	36		Clear	76

[Snow stake 6 ft = 72 in.]



- Notes -

7 pm.

A cavalcade of 112<sup>+</sup> skiers coming up the path from the Sugar Bowl snow road. How many tractors or vans on tractor train?

I went over to see. 2 tractors and 2 vans each. What a sight - each person a pair of ski on shoulder.

Two carried in today in cradled arms of companions.

All off Beacon Hill at 5:30 pm except possibly two lingerers. Long home? Dormitories full last night.

Passenger train passed west. Soldier lads leaving over railings in baggage car doors and looking from coach windows. I wanted to tip my cap to them.

This then is war - the sending of our boys live pawns to the game of death. Civilization must rise above it.



Saturday April 25, 1942.

Leaving Reno 6:37 pm.

Truckee covers roots of shore trees but above Boca within hours.

Meadows at Martins Creek still discharging water a foot overbanks in pass beyond Truckee.

Damers Lake rising. Some drifts at Damers resort but grounds becoming bare.

Snow in Damers Pass mostly old.

Obtained a pocket pencil flashlight at Truckee.

Test of instruments:

8:15. Thermog, on floor of shelter 37°F

Therm. 35°F.

Surface of snow hard, even walls of holes but moist to palm of hand. Belad crust the snow compacts into <sup>hard</sup> but dry snowballs in the hands.

Small pad of pink paper "For 1 - see - 2" to folder



Friday May 1, 1942.

A stormy week on the mountains.  
Came up on bus this morning to meet  
Fred Paget and Blair Eddy and helpers.

Chains necessary at Downer Grade.  
Trees loaded with snow. New snow  
soft and knee deep.

Fred waiting. Bus quite late. Blair  
delayed even longer by tunnel trouble.

Instruments set out while snow course  
markers were being nailed up. Then I planned  
Temp.

11:20 am. In shelter at same level:

Thermog. 36.5°F. Carr. -1.0°F.

Thermom. 35.2°F.

11:20 am. On snow.

Thermog. 42°F

On snow  
(a) in sun +8.8°C; shady +6.8°C  
(b) in shade +6.8°C

Under snow (6 in.) in sun +1.0°C

Snow packs dry.

Planted dye color.

On the Snow Courses.

Key course	D. 80.0	37.6	47% <sup>W.E.</sup> <del>W.E.</del>
	72.2	35.5	42.2
Aver.	76.1	34.1	44.6

Melting rate?



New snow † (near snow gaps) 6 ft 1 in = 73 in.  
 D. 19.0 Core 14 WE. 3 Data, 15.8%  
 18.5 14 3  
 19.0 11 3 [Fred Paget also 3 in. at Hotel]  
 Cores cut by range tubes 3.4 in (2 in. gaps)  
 † 3.9 in (8 in gaps)\*  
 Planted dye color

Tested sampler cutters :

Hansen cutter (\$5.00) cuts as well as "fang teeth." The cutters clog and must be forced by dead weight through ice crystals. If only the snow did not fill the "pleats" <sup>and smooth the face of the teeth,</sup> then cleared by hand the sampler cuts readily. Will a spiral or tilted teeth assist? Test it in a cake of ice.

→ \*Precipitation as caught during storms was only 2.28 in.  
 Lang at Lake Florence also finds the precip. only 75% of snow sampling.

Weather Record Apr. 25 - May 1.

	Max	Min	Precip	Sky	Snow on Ground
Apr 25	52	29		Clear	62
26	46	21		Pt. Cldy	61
27	48	28	0.28 4 in. <sup>sampled</sup>	"	64
28	34	20	1.14 15 in. "	Cldy	76
29	32	6	0.07 4 in. "	Pt Cldy	77
30	45	10		Pt Cldy	73
May 1	35	21	0.79 10 in. "	Cldy	80
			<u>2.28</u>		Snow board 73 in.

"Precip. for month of April 3.89 in."



Took Blair and Ed Ospley to lunch with  
Fred Paget and his assistant. Greatly appreciated  
"Blair will help any time I call."

Welcomed by Paul Norbee - now with State  
Highway Patrol from Doyle to Susanville.  
Pauline has six children. Introduced him to  
Fred, "Had it not been for his father God  
knows what would have happened to  
snowsurveying."

Fred has two views of a Ford converted  
Caterpillar - 3 wheels each side with  
metal endless belt.

2:40 pm. Therm  $34.7^{\circ}\text{F}$

Thermog  $42.0^{\circ}\text{F}$ . Calm, ventilation  
poor. Pen has been pumping much.  
Sun hardly the cause.

New snow settling - Shush beneath  
where tramped.

\* On snow in sun thru crystals  $+5.7^{\circ}\text{C}$   
but the crystals are freezing. Effect greater  
in snow? Evaporation?

~~Oye~~

— at Snow Stake —

New snow 15 in. deep.

Oye has sunk to old frozen crystals and  
has spread much. The new snow faces  
hard and moist.

In old snow at bottom <sup>open</sup> of pit but in sun  
Calor has descended in the crystals 17 in.  
but did not spread greatly.



In old snow in covered pit 15 in deep  
no descent into old crystals but there  
was a rise upward and sideward into  
new snow above it. Greater cohesiveness &  
4 pm. Crust forming in both sun and  
shade.

Therm  $33.6^{\circ}\text{F}$

Thermog  $37^{\circ}\text{F}$  (ventilation poor)

In snow in shade  $3^{\circ}\text{C}$

" " " sun  $6^{\circ}\text{C}$

In snow (6 in.) in sun  $+0.6^{\circ}\text{C}$

Pigment put on congealing snow.

4:40 pm. Temp. beneath new and old snow.

In sun 3 ft.  $+1.2^{\circ}\text{C}$

$1\frac{1}{2}$  ft  $+0.3^{\circ}\text{C}$

Put pigment on new snow where surface  
is just congealing.

Took cores of new snow in  $2\frac{1}{2}$  in and 8 in tubes  
- at Hotel - of U.S. N.B. precip. gauge.

5:26 pm. Much snow still in branches.  
but slush on ground.

Therm.  $37.2^{\circ}\text{F}$

Thermog.  $42^{\circ}\text{F}$

In snow - in sun  $+7.8^{\circ}\text{C}$ ;  $8.2^{\circ}\text{C}$ .  
in shade  $6.0^{\circ}\text{C}$ .

In snow (6 in.)  $+1.0^{\circ}\text{C}$

- at Snow Stake -

Pigment, <sup>has</sup> accelerated melting in sun.

$1\frac{3}{4}$  in. max. in new snow

$1\frac{1}{2}$  in. max. in old snow.

But sun effect is relatively small.



Depths: snow stake 6ft 1 in = 72 in.  
 New snow 14 in. Shivers  
 considerably when sampled.  
 Such seems the case frequently  
 in the Humboldt Basin.  
 Crust  $\frac{1}{2}$  in.

Temperatures in Sun:

70 in. deep	0°C
48 in	0°C
30 in	0°C
12 in	+0.2°C
6 in	+0.2°C
3 in	+0.9°C

yet crust is now  $\frac{1}{2}$  in thick.

Directly under crust Depth  $\frac{1}{4}$  in --- +1.2°C

In crust  $\frac{3}{4}$  in depth --- +1.2°C

On crust, bedded in it --- +1.0°C

but crystals frozen to glass tubes

Sun low, only 15° above horizon

Measurements end 6:45 pm

Temp. in air and on snow  
 - At Hotel -

7 pm. Therm 33.3°F

Thermog. 34.0°F

On crust in diffused sunlight -0.4°C

Under snow (6 in.) 0°C.

8:10 pm Thermog. 28°F

Therm. 27.7°F

On snow -3.0°C

Crust 1 in, thick

Canopy removed to expose thermog.  
 and therm. & fell radiation to sky.



Graphy chart for April 26, 1942 to 50 bar

Mass. of new snow:

2 1/2 in. tube 3.4 in  
8 in. case 3.85 in.

Snow survey - - - 3 in.

Precip. - - - 2.28 in. (standard gage)

" Record deficient. (Fitz recorder).  
Pen beyond range  
of record sheet.

May 2

Therm:

7 am. Min. for night 14.2°F

Strong east winds | Present time 25.8°F

Thermog.

Min for night (4 am) 10.5°F

Present time 22.5°F.

Birds singing - meadowlarks.

Slight hoar frost on snow and canvas.

Crust 1 1/2 in. thick.

Temp. on snow - 7.1°C. (shade)

" in snow (6 in.) shade 0.8°C.

" at bottom of snow 0°C.

Snow crystals dry and adhere to tube.  
No melting whatever.

Slush of yesterday frozen. Water in road  
and on stone porch frozen.

Wind soughs. Greenland.

Set more pigment.

\* Avalanche danger on south-exposed slopes  
because of soft new snow on hard crust.

Melting will detach it if any external  
weight as of skier is placed on it.

Particularly so on south side of Beacon Hill -  
Six Teachers Sch. Sch.

Snow already slipping from roofs even on shaded side.



Temp.  
and Snow Melt — At Snow Stake —  
In sun - East wind.

8 a. m.

On crust +5.0°  
Crust 1½ in. thick. Hard.  
Under crust (2 in) - 4.0°  
3½ in. ... -3.7°  
6 in ... -2.4°  
12 in ... -2.0°  
30 in ... -0.8°

Query from passby: "Can you catch any fish there?" I was on the wrong side of the dam. He thought that I was fishing thru the ice.

48 in. ... -0.6°  
68 in. ... -0.4°

→ Snow crystals dry.

8:45 a. m. Dye placed. Snow slightly melts snow

9 a. m. Crust still dry and hard.  
Dye has melted scarcely at all. Only 1/16 in. in center.  
Temp. on snow (two thermometers) 9.6° C.

9:05 a. m. — At Hotel —

Therm. 32.4° F

Thermog. 33.5°

On snow +9.8° C

Wind brisk but not so strong. East winds  
Ice on back porch and on dark path  
in front of hotel now melting.



10:45 a.m. Melting rate of new and old snow.

Cores of similar weight of old and new snow placed in glass trays.

In third tray with glass grill was placed a core of old snow of same weight. # used the postmistress' tiny beam scale for weighing.

Therm.  $37.0^{\circ}\text{F}$

Thermop.  $39.5^{\circ}\text{F}$  #

Temp. on snow  $+17.6^{\circ}\text{C}$  (fully exposed to air)

Crust softened  $\frac{1}{4}$  in.

Ice on thermometer platform melting.

11:15 a.m.

Crust still coherent (<sup>morning</sup> ~~morning~~ depth  $1\frac{1}{2}$  in) tho moist thruout.

Temp. on snow  $+19.7^{\circ}\text{C}$

Therm.  $38.2^{\circ}\text{F}$

Thermop.  $41.0^{\circ}\text{F}$

→ No melting yet in cores but new snow core is flattening.

12 Noon.

→ Core of new snow smaller; crystals coarser. Core of old snow retains its shape. Moisture from both only slight.

# Crust is now soft.



12:30 pm.

Therm 41.0° F

Thermog. 46.0° F.

On snow +22.4° C.

Must be

exposed (72.3° F)

Trains a plenty. Airplanes too.

Cores :-

New snow core broken up. Another melted.

# Old snow core melting badly on sun side. Rate of melting one half that of new snow.

Old snow core on grill now gray with water but not melting yet.

!! New snow melts faster than the old (2/3)

Same weight of snow core used to offset difference in density. Develop this idea.

- Dye -

Dye in new snow shows effects of capillarity working in many directions.

Old snow sluggish or frozen or too cold to permit any water movement.

Dye of yesterday noon still only in new snow stratum. New dyes have accelerated melting in sun. Depth of pits 2 1/2 in.

Later dyes have descended 3 in. to a stratum which has been followed 13 to 34 in. on the down slope. This stratum now has no apparent cohesion. Must have been slight even at maximum.







This morning's dye has penetrated (6 hrs) only 6 in. - to a crust ( $\frac{1}{2}$  in. <sup>thick</sup>) of fine crystals. However, dye is dense and bright above. Query: Is temperature any factor in this stoppage? It seems rather to be texture.

NB: - The discolored snow drips when compressed. The uncolored snow at the same level and adjoining merely packs moist. Determine Temp. rise caused by dye or melting factor.

A melting day from crust to slush. Acceleration may occur. How hot today? Almost sultry to overcoat and freeze on the snow.

Return soon. Study new snow under weathering and dye; also penetration rate of dye. - Melting -

Bottom of snow is moist but little moisture rubs off on the hand. How quick is the change from cold dry to cold moist? Test this and percolation. Observe diurnal melting on railway snow sheds.

Apr. - Cores -

New and old snow cores melted - lay in their own water.

Old snow core on grill only half melted. Interior of all cores seems to melt first. Because outer edge has been hardened (crusted) by contact with the cutter?



Therm.  $47.0^{\circ}\text{F}$   
Thermog.  $60.0^{\circ}\text{F}$  (has been  $68^{\circ}\text{F}$ )  
almost calm.  
An snow in sun. (Tube sunk to  
 $1\frac{1}{2}$  diameter) . . .  $24.2^{\circ}\text{C}$ .

Snow leaving tree crowns.

Train at 7 am from Bay brought  
20 skiers who took creper for Signe Bowl.  
1 hour for round trip to Signe Bowl (3 mi.)  
2:30 pm.

Therm  $47.5^{\circ}\text{F}$   
Thermog  $65.0^{\circ}\text{F}^*$   
\* ~~But~~ still in shade but under canopy  
is low and air is quiet.

3:15 pm.  
Greyhound Bus has advanced schedule.  
So must wait for Burlington at 4:00.

Cores:

Old snow core on grid completely  
melted except a teaspoonful water  
equivalent.

Query: Does the air in the new snow  
permit access of insolation and  
this accelerate melting?

New Plan:

Not fair to maintain similar  
diameters especially when thin.

\* Better cut cubes of dimensions  
corresponding to density. Thus the  
airy light snow will be larger.

\* Or better sampler the new and  
old snow strata of similar water.



NB ( equivalent and determine relative rate  
of melting. Can be done by uncovering  
old snow so as to expose it to  
same air conditions as top layer  
of new snow. Thus artificial effects  
will be avoided and only the upper  
face will be exposed to direct heat.

Return Monday to study penetration  
of dye and observe melting rates of new  
and old snow.

Face badly snow-burned.

Small pad of pink paper "May 1-2" to folder



Thermog. Apr. 4 to 11 -

Corn +2°F

Reset Noon Apr 11 To -1/2°F.

### Supplemental Trip to Soda Springs

May 5, 1942 (Tuesday)

Order from McL to Jack Ryan for 50 pair of spanner wrenches at 90¢ or less per pair. Steel must be obtained thru the university.

a semi-spiral cutter will be attempted for frozen compacted crystals and ice. Dr. Leijssen has made glass-tubing quills for glass trays. and has tugged the thermometers into position in their cork bridges in the sealed glass tubes.

Left for Soda Springs 7:30 am.

Grounds at Donner Resort nearly bare. Donner Lake risen 2/3 to maximum.

### Test of motor sleds

at Soda Springs Mc Tusker had just arrived from Los Angeles for demonstrations of sleds to Major Wedderburn, P.C. Putnam, and Ranger Hodgins. Had been at Camp Lewis. "Army had laid out a definite route and demanded a sled capable of meeting all snow conditions without adjustments."

"Major Wedderburn had met me at Edinburgh in 1936."

Both SnowCat and Spiral Drive climbed somewhat above the northern powerhouse of the scrippell, outstripping the Sugarbowl tractor.



early.

Supplemental Trip to Soda Springs  
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a semi-spiral cutter will be attempted  
for frozen compacted crystals and ice.  
Dr Leijson has made glass-tubing  
gills for glass trays. and has tugged  
the thermometers into position in their  
cork bridges in the sealed glass tubes.

Left for Soda Springs 7:30 am.

Grounds at Donner Resort nearly bare.  
Donner Lake risen  $\frac{2}{3}$  to maximum

#### Test of motor sleds

at Soda Springs Mr Tucker had just  
arrived from Los Angeles for demonstrations  
of sleds to Major Weddenburn, P.C. Putnam,  
and Ranger Hodgins. Had been at Camp  
Lewis. "Army had laid out a definite  
route and demanded a sled capable  
of meeting all snow conditions without  
adjustments."

"Major Weddenburn had met me at  
Edinburgh in 1936."

Both Snow Cat and Spiral Drive  
climbed somewhat above the  
northern powerhouse of the screw pull,  
outstripping the Sugarbush tractor.



Small pad pink paper "May 5" to folder

\* But on the steeper slope the cat could not maintain traction either because the belt did not grip the snow or because the <sup>new</sup> snow was sufficiently soft to yield under thrust but not soft enough to permit the treads to sink to the harder snow below.

The softer snow <sup>(new)</sup> was 8 in. deep and of 40% density, the old snow had a density of 52.3%.

Unfortunately the cleats used for traction in the January test in very light snow had been discarded and left behind. They might have solved the problem.

\* "Snow conditions worse than in January" - Tucker. If this sled cannot be made to work, the autogiro is the only substitute. Transport must be above, not on the snow.

New and old snow cohere slightly but a motor sled on steep slope might start the upper layer to descend. On east side of Donner Pass many snow rollers had started down the slopes but had stuck midway.

Query: Did the snow slide beneath the belt or did the belt slip in the snow? Ask Tucker or Hodgins. I viewed the sleds mostly from the Snow Stave where I was kept by snow observations.



New Snow and Snow Cover

9:45 am

Therm. 41.0°F } hid in shelter  
 Thermog. 41 3/4°F } Wind - pulled my hat off.

Min. of thermog. last night 32°F

Snow before hotel slush, but shell ice on trail to traces. Only scantiest trace of crust appeared.

Dye: - all traces of color in the snow at the tower <sup>here</sup> was gone. Snow mushy.

- at Snow Stake -

Dye: In old snow <sup>pit</sup> traces of color only 14 in. deep, and even less in new snow and old beneath it. Is new snow detergent? Capillarity?

Snow stake 5ft 3in = 63 in. (May 1 - 73 in)  
 Shrinkage 10 in.

New snow:

D. 8	66.2	69.5	Water gain	3.2 in.	} 3.1 in
8	66.2	69.1	"	2.9 in.	

May 1 - 3 in (2 in brass tube 3.4 in)  
 May 5 - 3.1 (2 in " " 2.2 in)

On snow Course (Key Course)

May 5	{	No. 5	D. 60	Core 57	66.2	95.8	W.E.	30.4	} av. 29.9
		" 6	62	56	67	98		31.0	
		" 7	59	58	67	95.4		28.4	

Sunraying +0.1 in.  
 Tubb -1.2 in.

May 1 - average of Nos 5-7 - 32.2 in

Earth moist but not dripping loss 2.3 in.  
 NB: Dirt on snow from sampling May 1 has sunk 8 in into snow.  
 NB: New snow tho exposed to the sun has apparently melted less than old snow beneath it and so sheltered. Capillary water at bottom of all snow 1/2 inch.



# Test: Expose the old snow to the sun so as to give both old and new equal or similar insolation.

- Density of Snow -

{	New snow	May 1	...	16.0%	
	"	"	May 5	...	40.0%
{	Old snow	May 1		51.5%	
	"	"	May 5	52.3%	
	Both new & old	May 1		42.2%	
	"	"	May 5	50.7 (Nos. 5 only).	
	"	"	"	49.6 (Nos. 5, 6, 7).	

# New snow just losing its water in upper 1 in. When the new snow was undercut and exposed to insolation, melting started visibly and water started to drip. The new snow at 40% is evidently ripe.

Temp.

12:15 pm. - 12:45 pm.

Temp. at bottom of new snow (7 1/2 in.)	+0.8°C
" on surface (exposed)	+23.9°C
" " " (covered by film of snow)	= 75°F
	+14.6°C
	= 58.3°F
" 24 in. deep	+0.2°C
" 48 in.	+0.4, 0.6°C
" 61 1/2 in.	0.0°C

→ Dye placed on new and old snow,  
 12:50 pm. Therm., 49.0°F } both in shelter.  
 Thermog. 49.5°F }  
 Min. thermog. last night 32.0°F

2 pm. Cores in Trays.

- (a) New snow gone (except a tiny fragment).
- (b) Old snow fully 1/2 gone.

all on glass grids in glass trays on snow.

→ # No evidence today of outer shells that resisted melting.



— Dye —

In approx. 2 hours dye sank  $2\frac{1}{2}$  in in new snow, but in old snow 6 in.

Is water descent faster in old snow?

But May 2, the dye spread faster in new snow - Very "fluffy" then. Dens. 16%.

— Temperatures —

2 pm. In snow.		12:30 pm
61 in. deep	0°C	0°C
48 in.	+0.1°C	+0.4°, 0.16°C
24 in.	0°C	+0.2°C

Query: Has melt water filled the voids and reduced the temp. to 0°C, then temp. of ice-saturated water?

Bus due 2:35 pm. Arms loaded with little repacking. Call aboard as I reached the storeroom.

— Should Have Done —

Exposed the old snow to insulation and made preliminary measurements of (a) new snow, (b) old snow, and (c) both, as basis for meas. on Thursday.

Have done so with the dye - somewhat thicker than before.

Must find thinner oil than castor oil for spring grease. Too sluggish.

Burn an <sup>low</sup> burner. Must get a sugar sack to place over my head.



Notes from April 11-12 in folder

Trip to Soda Springs Thurs. May 5, 1942 7?

Read 7:30 am.

Truckee River roily as far up as Broncho and Joe Gray Creeks, Horstons Greygreen farther up. Only small discharge from Boca Reservoir. Fish can see readily above Boca. River semi-clear

avalanches small but several on northeast face of peak south of Donner Pass. Some pebble-shaped, many ribbons. Stopped half way down. Started just below the cornices. New snow on hard crust, now 40% heavy with water.

\* Have Ernie Mack take views from below and above the Bridges

a View:

Down on Donner Lake framed in east by Mount Rose ridge and <sup>long</sup> saddle. My best memorial.

Soda Springs:

Truckee and Mullen still here. Major Wedderburn now joined by a British brigadier general and others. Fifteen at lunch, the quiet interim between winter and summer season was expected.

Our waitress has gone. Disliked the secretary. Mini and husband have gone to Lassen Peak before seeing



employment elsewhere. The Evans have gone until summer. Ollie is sick in Arizona and will go to California to recuperate. The party left after quarreling with the chef.

So George Stiles, <sup>Steph</sup> Bricker, and the secretary and "Curley" and Emile remain. The secretary is waiting table and joined me at snow-stake to learn the snow-studies.

9:15 am. Instruments are left in the shelter.

Thermom.  $50.6^{\circ}\text{F}$

Thermog.  $49.5^{\circ}\text{F}$

Min  $29.5^{\circ}\text{F}$  last night by thermog.; but  $27.0^{\circ}\text{F}$  by thermom.

Snow now soft.

- Snow Stake -

Depth at stake 4ft 7in = 55 in.

Dye from May 5:

In hard snow 15 in.

In soft + hard snow 15 in.

Soft snow possibly  $1\frac{1}{2}$  in. deep but blends with old. No marked cleavages.

Temperature:

2 in. deep  $+2.2^{\circ}\text{C}$  (under melting snow)

37 in  $0.0^{\circ}\text{C}$

56 in (bottom)  $0.0^{\circ}\text{C}$

Snow saturated. So all temps.  $0^{\circ}\text{C}$  except at 2 in. depth where dry air penetrates.



- Motor Sleds -

Sleds still here and joined by a double spiral.

Yesterday morning sleds climbed on crust to top of Beacon Hill but could not in the afternoon when snow was soft.

On crust the spirals pulled better than the cat for the fin was sharp and wide, and so cut into and gripped the snow. <sup>Twice the width of the spats. on the felt of the Cat.</sup>

This morning snow is soft practically thruout but all climbed as on Tuesday above the first powerhouse.

The double-spiral sled can turn in its own length by reversing one drum like a caterpillar tractor. The Sigebond cat climbed up again.

at 10:45 all sleds returned jauntily - the Sno-Cat leading fast with trailer and crew of six. All climbed the roadside snow cut.

Total weights:

1. Sno-Cat 1445 lbs.

Motor 575 lbs; 24 horsepower  
[Willys-Continental 1936]

2. Single Spiral 650 lbs; 14 horsepower

Sno-Cat and Spiral Drive both climbed to cornice yesterday. Cat climbed Norden Dam. In present soft snow 2 in. deep the spiral sleds work well.

But Sno-Cat thaws snow out without getting sufficient grip. Wider, sharper, and heavier cleats ~~will~~ will help.

Motor does not stall. Extra load of 2 men



and the Cat itself gave increased grip.

11:15 am - Temperature -

On surface in sun 16.5°C

Under 1/2 in. snow . . . 13.0°C

2 in. deep . . . 3.2°C

Caused by air in snow?

Sleds: The Ford Cat is a flit on more level roads. Fast and flings the snow, but climbed yesterday only to power house.

- Temperature -

11:30 am

On surface in sun 18.6°C.

Under 1/4 in. film of snow 11.7°C

2 in. deep . . . 3.2°C

- Snow Sampling -

Nos. 6, 7, 8 (Remembered Same as May 5, Nos. 5, 6, 7)

No. 6	52.5 D.	48.5 C.	<sup>wt of</sup> <del>total</del> sampler	66.2	Total 94.5	W.C. 28.3 in.
No. 7	54.0	53.5		66.2	96.1	29.9
No. 8	54.7	53.8		66.2	95.4	29.2
av.	53.7 in.				Dens. 54.2%	29.1 in.
					Snow Survey May 5	29.9
					Less	0.8 in.

NB. Sampling easy for practically no cohesion between the crystals. Snow is dripping now.

New snow in hole:

6.0 in.	5.3	66.2	68.0	1.8 in.
Capillarity 2 1/2 in.			Density 30%	
		66.2	68.7	2.5
			Density 40%	



12:30 pm. - Temperature -

On snow (exposed)

2 thermos . . . 19.3°C; 19.1°C.

2 in. under snow 5.1°C.

→ Compare with thermog. in shelter.

Lunch and Friends

1:30 pm. Sat with Tucker and Mullen.

Army officers occupied a table.

Quiet human and reminiscences.

Met Major E. A. M. Wedderburn

Care British Embassy

Washington, D.C.

He has been in Switzerland and recently in Iceland. Scotland can do little now in study of snow. Saw Seligman recently. His home was blasted by bombs. Will remain some time in America.

Invited him to speak before the AGU at Washington next April. He was pleased but feared that his knowledge of snow problems might be military secrets. But something may be available. An idea here.

Army snow news after war is over and as preliminary for civilian problems.

He appreciated the News Letter and would be glad to receive AGU Snow Reports. Has read the Human Side of Snow. Hurried away to follow the General.\*

Sally Robinson's mother introduced herself and Mr Robinson. Sally still happy

\* Met him was Calver Putnam, Technical Expert for the Army. Any relation to George Calver Putnam?



graph chart for May 2, 1942 and notes, May 7  
to folder

that I came to Nevada City to her wedding.  
Mrs. Fulton did not have an examination  
until after she came to Nevada City.  
This explains her cheerfulness.  
The doctor fears greatly for her recovery.  
A hard hit family.

Ed Seeper! Thought he was dead.  
Left Reno 1920. Been in hotel business.  
Now at Donner Summit lodge down  
the guba at the old Fox farm.

2 pm. Rode with Tucker on Sas-Cat.  
a powerful acrobat but needs to have  
toe and heel spikes to avoid slipping.  
Lenders also to keep down the snow  
spray. It even beat down heavy  
willows and pulled itself out of a  
stream even with exhaust under water.

- New Snow Residue -

The snow cover has settled from  
(May 5) - 5 ft 3 in (63 in.) to (May 7) 4 ft 7 in  
(55 in.) - total sinking 8 in.

Difficult to identify new snow except  
in depressions or in forest. The  
snow under footstep releases water  
slightly. Shows grey.

Total snow cover { May 5 - density 49.5%  
                          { May 7 -     "     54.2%



Snow known  
to be old - in 52.0 (51.8) 50.5 66.2 95.0 28.8  
bottom of shallow  
pit. Dens. 55.4%

Old + new . . . . .  $\frac{54.2\%}{1.2\%}$

\* Water dripping from snow.

Query: How much new snow to dilute  
density 1.2%?

How old old snow 53.7 in. deep  
Old snow . . .  $\frac{52.0}{1.7}$  " "

- Shrinkage of New Snow -

May 1. . . . 14 in. ?  
" 5 . . . . 8 in  
" 7 . . . . 1.7 ?

Meas. of Top Snow (New?) in pit.

2 1/2 in. 66.2 67.2 1 in. = 40%

Orig. depth of pit May 5. 8 in.

Present depth " 7 -  $\frac{5 1/2 \text{ in.}}{\text{Loss } 2 1/2 \text{ in.}}$

Same shrinkage in both new and old  
snow.

New: 8 in. shrank to 2 1/2 in.

Old: 52.4 in " to 51.2 in.

New: 3 in. water content shrank to 1 in. = -2 in.

Old: 26.9 in. " " " " 28.1 in. = +1.2 in.

Has old snow taken up 2 in. of new  
snow water and now holds 1.2 in. of it?

Is new snow incapable of holding water



beyond 40% density. It does not seem to get denser. Has late new snow a limit? Does it ripen too fast? Is it too shallow? It can hardly compete in water retention with deeper snow.

- Witness -

Top of snow - first 2 in. - wet.

Middle of snow moist.

Bottom of snow - last 5 1/2 in. - wet.

Moistness at top and bottom. Color has not gone thru.

Dye has descended 14 in. in new and old snow but only 8 in. in old, i.e. the same distance from orig. surface or to the same stratum.

→ Crystals below are coarse and wet but do not carry dye.

- Cores -

Cores on canvas are melting rapidly.

- Measuring Snow Courses -

Points "NO 5-7" marked by double stakes. All courses are zigzag nearer the beam at beginning. Will measure all next Tuesday (May 12)

Pigment placed on surface south of Snow Stakes.

4:30 pm. Therm. 56.6° F

Thermog. 57.0° F (rect)

Wind strong

Stevens log still running. Shall leave winding until Pupp comes up.



Sno. Cat Towed down the hill by the double spiral sled. The Cat had taken in too much water when it broke thru the snow into the stream and "froze" far from home. The rescue was a fine act from a rival. "If the successful snow sled is built, Truck will build it" - Mullen.

Summation:

The new snow has high capillarity 3 in. (water content) cannot survive 30 in. old snow, and the latter lies deep snow lying quiet.

The April melting seems to have been slow. The recent increase in temperature to the 50° F seems to have started activity. Take another survey May 12 and perhaps still again to determine effect of temperature.

Waited until 8:40 pm bus to return Reno. At dinner talked about motor sleds. How about a single tread with balancing ski or a broad tread? How attach the motor? How steer?



Sno. Cat Towed down the hill by the double spiral sled. The cat had taken in too much water when it broke thru the snow into the stream and "froze" far from home. The rescue was a fine act from a rival. "If the successful snow sled is built, they will build it" - Mullen.

Summation:

The new snow has high capillarity 3 in. (water content) cannot survive 30 in. old snow and the latter low quality.

May 1, 1942  
 U.S. N. B. at Code of...

	<del>35</del>	<del>21</del>		
1.	35°	21°	.79	100mwd 80
				cldy
2.	45	14		clear 74
3.	54	30		cldy 71
4.	45	25	.04	cldy 68
5.	48	29		clear 66
6.	58	23		clear 64
7.	59	27		clear 62

Sum Snow 4 ft 7 in = 55 in

seems to have been increase in temperature to have started another survey May 12 again to determine...  
 pin bus to return Pers...  
 about motor sleds...  
 sled tread with balancing head? How attach...  
 ...?



- Queries -

How does moisture occur daily through snow cover? Hand at night. Does the air carry fractional temperature then? i.e. tenths of a degree above  $32^{\circ}\text{F}$   $\approx 0^{\circ}\text{C}$ ? just enough to turn dry frozen crystals to unfrozen soft?

Does moisture, when just perceptible to hand or touch, percolate? Doubtful. at least the dye descended only a fixed distance. These crystals were soft and moist but not wet. In new snow the dye may lower melting point and create its own passage by melting crystals in its capillary path.

\* Study action of dye in warm weather or in shallow snow.

Wet snow above and wet below. Any melting midway? No pigment passed there. Next time insert pigment on the wet lower stratum. Covered from insolation but percolating.

Does snow melt top and bottom separately and not midway? Is midway melting, when it occurs due to percolation from upper stratum? Midway is frozen when top and bottom are soft as shown by sticking of sampler midway, as May 7. The soft snow yields readily to sampler.



\* Study differences in old snow of similar density. Use camera to record the textures. Is the capillarity different? The melting point? The water equivalent is nearly identical.

\* Photos of avalanches (possibly telephoto) and tracks (close up and far) of meteor sleds on Beacon Hill.



charts for April 5, 12, and 26, 1942 in folder



apparently April 20, 1942. Compare with  
reflector, <sup>192</sup>refraction, Field Transmittance  
radiation, as in book

Sealed Therm. Meas.

7 am. - Thermog. at snow surface 35°F.  
7 in. deep. Under crust 0°C.  
Crust 1 1/4 in. thick

Include 0°C

9:00 am.  
Bottom of pond 44 in +0.2°C  
9:45 am 0.0°C

Surface of snow (shaded) 2.6°C  
(in sun) 10.2°C = 50.4°F

10 am.

Surface of snow (in sun) 12.7°C = 54.9°F

10:10 am. <sup>Surface</sup> in sun 14.6

7 in deep. <sup>4 am</sup>  
+1.0°C  
+0.6°C  
+0.5°C

11 am. Surface in shade 0.6°C  
7 in. deep

11:30 am .. " shade 0.4°C

12 noon 7 in. deep. sun +1.0°C  
+0.8°C

2:15 .. " " +1.4°C

2:45 pm

Bottom samples hole 44 in. ... 0.8°C  
In snow at 24 in -0.1°C  
reaches to surface. " " " 15 in\* 0.0°C



6:40. Thermog.  $46^{\circ}\text{F}$ . at snow surface  
7 pm. 2 in. below snow surface  
in shade  $+0.1^{\circ}\text{C}$

Surface both in sun and shade now  
beginning to freeze, but film still  
extremely thin. Between moist  
and freezing.

8 pm. Crust  $\frac{1}{4}$  in. thick Temp.  $39^{\circ}\text{F}$ .  
in shelter.

Glass Tray. Inside meas. at bottom  
 $7\frac{1}{2} \times 9\frac{3}{4}$  in.  
Sides 1 in. high.

30 oz. pendant

Shut iron  $10 \times 24$  in. }

(3)

35-

28

37







16, April 19, 1942

Mud under by road  
snowdrift. Snow just starting  
to harden.

In shelter

Apr 19 - Therm. 40°  
8:15pm Thermog. 43

Light breeze  
Crust - frozen  
heads frozen  
Sky clear, except  
for light film of  
high clouds  
Moon

at same level	Therm. 40.2°	41.0	41.6
	Thermog. 42.0	42.0	42.6

Car to thermog - 1° F.  
at same level.  
But when on floor of  
shelter - 3° F.  
Car frozen  $\frac{3}{4}$  in. 8:30pm  
Thermog. 0°



10 pm 36.7°  
Therm.

37.8 thermog  
in coat  
on snow

under crust  
0°C.

Snow under patch  
still packed.  
Hard in open  
Shell ice on pool  
Mud still soft tho  
freezing

under snow -0.2°

thermog 35.5  
30



Sunday

Apr 19 -

7 am fresh wind

Min. tower  $36^{\circ}$

Current temp,  $40^{\circ}$

Thermog.  $36^{\circ}$

1 hr. fast (Sun  
const by chart)

Under snow  $10^{\circ} C$

Sun just over hill  
and touching snow at  
instrument. Tower  
longer in sun

Const  $1\frac{1}{4}$  in deep,

In const  $-0.8^{\circ} C$

7:40 Tower 42

Sun around Thermog 38

under const  $-10.3^{\circ} C$



9 am. Therm.  $48^{\circ}\text{F}$   
Thermog.  $44^{\circ}\text{F}$   
Crust 1 in deep  
 $+11.5^{\circ}\text{C}$

---

Yesterday surface so soft that ski sunk beneath surface and then skied forward. Another working faster made cartwheels.

Today crust will break immediately under foot but will not hold ski unless with metal edges.

Snow surface now moist in sun, and damp on hands in shade.



Temp. on surf. of snow  
+ 3.8°C

Thermog 45.5°F

1 ft. deep 0°C

~~crust~~ Thermog. 47.6°F

Snow placed in glass tray.

Temp. bottom of hole

+ 0.2°C

---

Cut core -

Strata of fine & coarse  
crystals. Why not  
photog. cores for study  
and illustration?

---

Skiers going in long  
line up pull to second  
ascend.



9:45 a.m.

Therm. 49.2°F

Thermog. 46°F.

Fresh breeze - Clear

Bottom of hole 0°C

Surface of snow (shaded) 2.6°C

" " " in sun 10.2°C

Crust now soft ~~50.4~~ 50.4°C

~~plus~~ except top crystals  
still slightly frozen.

Snow core moist  
to hand but no  
active capillarity  
visible.

Snow crust makes  
~~good~~ snowballs.  
fair



10 am,

Surface of snow  $12.7^{\circ}\text{C}$   
 $= 54.9^{\circ}\text{F}$

Thermoj,  $46.0^{\circ}\text{F}$

Therm,  $49.7^{\circ}\text{F}$

10:10 am, Surface of snow <sup>in sun</sup>  $14.6^{\circ}\text{C}$   
1 ft deep in sun  $+1.0^{\circ}\text{C}$   
 $+0.6^{\circ}\text{C}$   
 $+0.8^{\circ}\text{C}$

# Place glass grid on  
glass tray to hold snow  
above surface.

11 am,

Depth 6 ft  
Snow in shade

1 ft  $0.6^{\circ}\text{C}$   
Therm,  $49.5^{\circ}$

perpendicular



11:30 Thermom 54° F  
Thermom 51°  
In snow, 1 ft 0.4° C  
in shade

---

Lost pen pencil  
15 yrs. Resigned

Snow in tray in sun  
settled to  $\frac{1}{10}$  <sup>glass</sup> Water  
in tray. Slush, but water  
ran out as soon as snow  
was lifted from bottom  
of tray.

12 Noon -  
Found pen pencil  
where I cleaned shovel  
behind hotel.

---

Snow on box - Part  
in air unmelted in  
half hour. Other part  
resting on weathered  
wooden box melting &  
running from tail.



Get scales for ~~getting~~  
weighing density of snow  
squares in melting pan.

# Cores are rather small.

Weigh rel. dens. at  
~~drifting~~ dry and dripping -  
for (a) new snow (b) old snow.

Study grain size and  
rel. density -

at  
12 noon. Snow, 1 ft depth  
in sun  $+1.0^{\circ}\text{C}$   
 $+0.8^{\circ}\text{C}$

Percolation microscopic?

Any drip at bottom

6 in not 1 ft.



2:15 pm

7 in in snow in

room +1.4°C

2:45 pm

59.0

Thermos ~~58.0~~ °F

57.0

Thermop ~~56.0~~ °F

55

Cut snow core 44 in

Top stratum 3 1/2 in

Diam. 1 1/2 in. Water soaked but  
fine crystals not dripping. (near)

Shrink Bottom stratum 3 in.

~~3 in~~  
water soaked and

diam 1 1/2 in dripping just when  
exposed to sun.

coarse  
crystals  
cannot  
shrink readily

Temp at bottom 44 in  
0.0°C

" at 24 in -0.1°C



15 in -  $0^{\circ}\text{C}$

(but thermometer  
reaches to top of  
snow.)

---

Top stratum of core  
melts more quickly  
than bottom stratum  
but apparently has  
much less water to  
melt. No bursting  
however even when  
slush.

Must cut cores  
and weigh them, then  
observe melting.  
44 in. core damp entire  
length.

Capillary 3 in. high from  
bottom?



3:50 pm

Therm 57.0° F

Thermog 55° F

Sampler - 20.4 in

2 in below surf. ( 37.3 in Core 27.8 32.4<sup>0.</sup>  
 Samp. 20.3  
 37.2 Core 24.2 32.0  
 Memo - off. 32.4%

6 in below ( 38.3 38.2 40.0  
 Samp. 20.4  
 37.5 37.5 39.8  
 Samp. 20.6

13 in ( 38.0 Core 38.0 40.2  
 36.5 36.2 39.6  
 Finer crystals

\*  
 23 1/2 in ( Samp 20.4 = 46.0  
 38.3 37.3 38.0  
 below ( Samp 20.3  
 39.6 35.6 39.0



4:20 Temp. in snow + 0.7°C  
in sun. 5 1/2 in. deep,

4:45. Temp in shade  
6 in deep + 0.0°C

\*

Snow cores -

Top one ~~melted~~

Thermog 54°F

Therm! 57°F.

Bridge

5:10 pm

Snow cores

Top just melted

Bottom more than

3/4 gone >

Dens. of top. 32%

" " bottom 50%?



2 Carried in today  
All off the hill at  
5:30 pm Home,

5:45 - Temp. beneath  
surface of snow in  
shade + 1.2°C

37) 12.0 ( ~~2~~ 2.4

---

46

90

74

---

160

148

---



# Sampling

23 1/2 in. deep in coarse  
crystals

33*	(	38.5	36.5	S 20.4	
		37.5	35.8	20.4	39.2
					39.0

\* 4 in above slush

Vertical		S, 20.4	capillary
	41.5	34.5	38.6
	39.5	37.1	37.0

crystals 1 in  
bottom end of core 1 in long

Snow cores midway compact  
in snowballs stiffly.



6:40 pm

Tiny bit of bottom  
core still sunnier at  
bottom.

Temp in surface of snow  
 $+0.4^{\circ}\text{C}$

38.3 } 17.60 { 45 9 5  
1532

2280

1915

3650

3447

2030

1915

Surface beginning to  
freeze.

Thermog  $47^{\circ}$

Thermom.  $53^{\circ}$

Obs. no drip from bottom of  
vertical cores. End of speculation.



Size of glass tray.  
 $7\frac{1}{2} \times 9\frac{3}{4}$  inside

Robin on snow

Need lubricant on  
spg balance to prevent  
friction of aluminum  
on aluminum.

Antifreeze?

a substitute 20 oz  
pendent for balance  
or preferably a 30 g wt.  
with hooks.

a piece of sheet iron  
 $10 \times 24$  in. Bent at top.



A cavalcade  
of 112<sup>+</sup> coming  
up path from  
Sugar Bowl.  
How many tractors  
or cars on tractor  
team?

2 tractors & 2 vans  
each

7 pm (2 in deep)  
Temp. in surface  
of snow +0.1°C.  
Surface both in  
sun and shade  
now beginning to  
freeze. Frost film  
all extremely thin.



Just between  
moist and freezing  
Snow <sup>near surface</sup> can yet be  
made easily into  
snow balls.

Very Remnant of snow  
almost dissipated -  
a table upon of slush



8 apr

Thermog 40

Therm. 38

~~On same level 39~~

Therm. 40-

Correct for thermog - 1.0<sup>o</sup>F

Crust  $\frac{1}{4}$  in thick.

Drop on balance

by vertical scale

but no drips -

Length of day? to 8 pm



Apr 11/42

11	42	28	Snow 63
			Clear
12	62	28	S 58
			Clear
13	58	39	58
			cldy
14	51	24	1.39 in
			cldy 76
15	32	6	0.12 78
			pt cldy
16	55	14	pt cldy 75
17	42	16	0.31 (5 in snow)
			cldy 79
18	33	15	1.08 (snow 1)
			pt cldy 80



19 61 36 76  
Clear

20 —



Apparently April 20, 1952

SEALED THERMOMETER MEASUREMENTS

7 a.m.	Thermometer at snow surface 7 in. deep under crust 0°C. crust $1\frac{1}{4}$ in. thick	35°F.
	In shade 0°C	
9 a.m.	Bottom of snow $4\frac{1}{4}$ in	+0.2°C
9:45 a.m.		0.0°C
	Surface of snow (shaded) (in sun)	2.6°C 10.2°C = 50.4°F
10 a.m.	Surface of snow (in sun)	12.7°C = 54.9°F
10:10 a.m.	Surface in sun 7 in. deep in sun	14.6 +1.0°C +0.6°C +0.8°C
10 a.m.	Surface in shade 7 in deep	0.6°C
11:30 a.m.	" " " 7 in. deep	0.4°C
12 noon	7 in. deep in sun	+1.0°C; +0.8°C
2:15	" " " " "	+1.4°C
2:45 p.m.	Bottom sampler hole $4\frac{1}{4}$ in.	0.0°C
	In snow at 24 in.	-0.1°C
	In snow at 15 in.*	0.0°C

\* Tube reaches to surface

6.40 Thermog. 46°F at snow surface  
7 p.m. 2 in. below snow surface in shade +0.1°C

Surface both in sun and shade now beginning to freeze, but film still extremely thin. Between moist and freezing

8 p.m. Crust  $\frac{1}{4}$  in thick Temp. 39° F in shelter



apparently April 20, 1942

SEALED THERMOMETER MEASUREMENTS

7 a.m.	Thermograph at snow surface 7 in. deep under crust 0°C. crust $1\frac{1}{4}$ in. thick	35°F.
	In shade 0°C	
9 a.m. 9:45 a.m.	Bottom of snow $4\frac{1}{4}$ in	+0.2°C 0.0°C
	Surface of snow (shaded) (in sun)	2.6°C 10.2°C = 50.4°F
10 a.m.	Surface of snow (in sun)	12.7°C = 54.9°F
10:10 a.m.	Surface in sun 7 in. deep in sun	14.6 +1.0°C +0.6°C +0.8°C
10 a.m.	Surface in shade 7 in deep	0.6°C
11:30 a.m.	" " " 7 in. deep	0.4°C
12 noon	7 in. deep in sun	+1.0°C; +0.8°C
2:15	" " " " "	+1.4°C
2:45 p.m.	Bottom sampler hole $4\frac{1}{4}$ in.	0.0°C
	In snow at 24 in.	-0.1°C
	In snow at 15 in.*	0.0°C

\* Tube reaches to surface

6.40 Thermog. 46°F at snow surface  
7 p.m. 2 in. below snow surface in shade +0.1°C

Surface both in sun and shade now beginning to freeze, but film still extremely thin. Between moist and freezing

8 p.m. Crust  $\frac{3}{4}$  in thick Temp. 39° F in shelter



Temp. 15 in. deep.....0°C  
 but thermometer case reaches  
 to top of snow

Melting (in sun)

(a) Top stratum of core melts more quickly than bottom stratum but apparently has much less water to melt. No bursting, however, even when slush.

Must cut cores and weigh them, then observe melting.

The  $\frac{1}{4}$  in. core damp its entire length.  
 Capillarity 3 in. high from bottom?

3:50 p.m.

Therm. 57.0°F  
 Thermog. 55°F.

Snow Sampling for Density

Samples taken horizontally in various strata  
 2 samples at each point

To metal sheet 3 ft. distant	D	Core	Wt. of tube	Total Water	Net W.C.	Dens.
2 in below surface	37.3 in.	27.8	20.4	32.0	11.6	31.1
New snow core shrinks badly		24.2	20.3	32.0	11.7	31.5
6 in below surface	38.3	38.2	20.4	40.0	19.6	51.2
Old snow		37.5	20.4	39.8	19.4	
13 in. below surface	38.0	38.0	20.6	40.2	19.6	51.6
Finer Crystals		36.5	20.6	39.6	19.0	
23 $\frac{1}{2}$ in. below surface	38.3	37.3	20.4	38.0	17.6	46.0
In coarse crystals		37.6	20.3	39.0	18.7	49.7
33 in. below sur.	38.5	36.5	20.4	39.2	18.8	48.8
4 in. above gr. slush drg.* below?		37.5	20.4	39.0	18.6	
Vertical sampling at same spot	41.5	34.5	20.4	38.6	18.2	43.9
	(39.5)	37.1	20.4	37.0	16.6	42.0

\*Drainage



Temp. 15 in. deep.....0°C  
 but thermometer case reaches  
 to top of snow

Melting (in sun)

(a) Top stratum of core melts more quickly than bottom stratum but apparently has much less water to melt. No bursting, however, even when slush.

Must cut cores and weigh them, then observe melting.

The 44 in. core damp its entire length.  
 Capillarity 3 in. high from bottom?

3:50 p.m.

Therm. 57.0°F  
 Thermog. 55°F.

Snow Sampling for Density

Samples taken horizontally in various strata  
 2 samples at each point

To metal sheet 3 ft. <u>distant</u>	D	Core	Wt. of tube	Total Water	<u>Net W.C.</u>	Dens. 31.1
2 in below surface	37.3 in.	27.8	20.4	32.0	11.6	31.5
New snow core shrinks badly		24.2	20.3	32.0	11.7	
6 in below surface	38.3	38.2	20.4	40.0	19.6	51.2
Old snow		37.5	20.4	39.8	19.4	
13 in. below surface	38.0	38.0	20.6	40.2	19.6	51.6
Finer Crystals		36.5	20.6	39.6	19.0	
23½ in. below surface	38.3	37.3	20.4	38.0	17.6	46.0
In coarse crystals		37.6	20.3	39.0	18.7	
33 in. below sur.	38.5	36.5	20.4	39.2	18.8	48.8
4 in. above gr. slush drg.* below?	37.5	35.8	20.4	39.0	18.6	
Vertical sampling at same spot	41.5	34.5	20.4	38.6	18.2	43.9
	(39.5)	37.1	20.4	37.0	16.6	42.0
		capillarity 1½ in.				
		capillarity 1 in.				

\*Drainage



Snow survey book 1b, "Density & Melting"  
April 20, 1942

Station

8.22

8.11

8.05

8.01

7.91

7.80

7.71

7.61

7.51

7.41

7.31

7.21

7.11

1.15 31.4 30.5 30.2  
1.15 31.4 30.5 30.2  
1.15 31.4 30.5 30.2



For 1 - see - 2 - [Dye]  
base of p. 6.

Surface of snow and  
even hills crested -  
but consist too far  
of hard. Snow blown  
compact into hard  
but dry snow ball  
in hands.

At 8:30 thermog set  
on stakes in snow  
No cloth beneath nor  
any above. Exposed  
to full effect of radiation.  
Sky truly overcast  
moon casts faint light

9:30 pm  
thermog.

(a) therm. exposed  
on snow

(b) therm. - 2 in. beneath

9:40 - therm. in shelter  $30^{\circ}$   
Thermog  $29.5^{\circ}\text{F}$

On surface  $-3^{\circ}\text{C}$

Under snow  $-0.1^{\circ}\text{C}$

from Notebook 1b, April 25, 1942



10:20 pm

Therm 28.2°

Thermog 28.0°F = 27°C

Surface -4.0°C = 24.8°F

Air 0.3°C = 31.5°F

Sounds of night.

Caterpillar in flat.

Stream ~~Katydid~~ ~~drum~~ ~~valley?~~

Dancing at bar.

Apr 26 -

5:50 am

Therm 23°

Thermog 23.5°

On Snow -8.4°C

In snow -5.0°C

5) 3 Crust 4<sup>r</sup> ice

7.2

5) 2.7

6:20 am Under crust 5.04 0°C - dry

7.2

24.8

Thermog 22

Therm 21.6

loose crystals



4

6:25 Thermog 31.5

On snow -8.6°C

In " -5.4°C

Under crust 0°C

Dimnet on bush by  
my side

7:50 am.

Tim took straightening  
1 inches off their necks

Thermog 28°F

Thermog 23.5°F

Surface -7.6°C

Under " -5.3°C

7m Under Crust -0.8°C

1st Crystals in snow mist -1.0°C

Cat coming from Pond Exposed?



- 5 -

Therm. replaced under  
crust - new mass -  $-1.0^{\circ}\text{C}$

8:20 am

In shade Therm.  $33.5^{\circ}\text{F}$

Thermog  $28^{\circ}\text{F}$

On snow  $-6.6^{\circ}\text{C}$

In snow  $-5.0^{\circ}\text{C}$

10 in. under crust

9 am. upper 1/4 in soft.  
Good spring today -  
will not break thru.

Therm.  $37^{\circ}\text{F}$

Thermog  $35^{\circ}\text{F}$

On snow  $-4.6^{\circ}\text{C}$  (shade)

In "  $-4.6$  (" )

On snow  $+3^{\circ}\text{C}$  (Sun)

Covered by film of  
loose crystals



- 6 -

## Dyes.

Placed on snow 9 am  
9:30 am Penetration

Methyl Orange 2 in, } To  
yellow O.B. 1 3/4 in, } solid  
Therm 38.2 °F } crust

Thermog 36.2 °F

In snow -3.0 °C (shade)

" " +4.0 °C (sun)

In " -3.7 °C (shade)

Dye spreads at angle of 45°

Snow Stake 4 ft - 10 in<sup>+</sup> = 58 in

Skiers starting up snow slope.

## Equipment -

Bring series of cutters  
for test.

10:10 am

Methyl orange 4 in

yellow O.B. 3 in

Crust softened 2 1/2 in.



Off for Soda Spgs

6:37 pm

Frog at flashlight -

Get a fountain pen variety  
at Traverce

Could have ridden to S, F.

Traverse up above tree  
rocks to Kiesel or beyond  
but not so close. Good  
Wadows at Traverce water  
falls -

Donner Basin has  
same snowbanks -

Staying around S, Spgs  
Hotel. Experimental area  
shining -

8:15 - Therm 35°F

Thermog. 37°

But at canal level

Therm. 34.9°

Thermos. - 36.5°



Note - took on surface. Then  
in shade far into morning.

Therm 38.5°F }  
Thermog 39.5°F } Buzg

In snow - 0.3°C (shade)

" " +7.0°C (sun)

In snow - 2.3°C (shade)

9:20 - Other pigments tried

9:30 -

Methyl Orange

Yellow O.B. tried on  
frozen stratum in shade.

11:15 -

Grill in glass pan -  
Crust set on it. with M.O.  
and yellow O.B.

Snow still  
below 0°C  
Methyl Orange 4 1/2 in deep  
Yellow O.B. 10 in - !  
Crust 3 in below surface.  
Cutter stopped by it



11:30 -

Therm 40° F

Thermog. 40° F

In snow = +1.6° C (shade)

" +14.8° C (sun)

but snow films melted off. When snow films

In snow - 0.4° C  
Temperature = +11.5° C

Query: Methyl Orange 4 1/2 in deep. S. 49.7° C  
yellow O.B. - 10 in.  
Dry air temp - 0.4° C.  
Crust at 3 in.

Has yellow O.B. power of penetration? Crust is evidently porous. Moist film of water around crystals evidently above freezing.

But why not Methyl Orange which is soluble?

Other two pigments merely make paste and do not follow water



Galvanized iron ~~sheet~~ <sup>channel</sup>  
has sunk  $\frac{1}{2}$  to 1 in. flat into  
snow surface. Radiation

12:15

Thermom 41.6° F

Thermom 43.0° F

Air surface + 5° C (shade)

" " + 12.1° (sun)

In snow\* + 1.0° C

$\frac{1}{2}$  in deep. Can't still  
very hard tho' <sup>slightly</sup> moist.

at bottom of snow + 0.15° C

1:25. Fresh breeze

Thermom 41.9° F

46.0° F.

Air surface 7.1° C (shade)

" " 17.0° C (sun)

no covering of snow.

Bottoms of snow 0° C

31 (11)

21 in. <sup>thick</sup>  
5 soft



Sampling now easy.

Pigments -

Must have confused them  
Only Methyl orange descended  
yellow O.B. descends  
slightly, but others  
not at all,

For example yellow O.B.  $2\frac{1}{2}$  in  
Methyl orange 4 in, to  
crust and slightly  
thru it.

Again Methyl orange in  
shade descended 4 in to  
clear ice crust, and  
another pinch descended  
4 in farther thru granular  
stratum now merely moist.

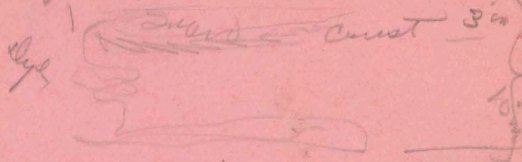
\* Note - The dye, called  
yellow O.B., earlier was  
Methyl orange.

Water percolates microscopically.

But water still moist  
at 4 in



Bypasses round crusts



But this more water poured on the snow, not melt water.

Below surface	D. Cap	Total wt of tubes	Total	Dens
2 1/2	25	2415	31	42.2
				44.8

$$\begin{array}{r}
 25 \ ) \ 11.20 \ (44.8 \\
 \underline{100} \\
 120 \\
 \underline{100} \\
 200 \\
 \underline{200} \\
 0
 \end{array}$$

8 in	25.8	26.7	31.0	43.0	46.5
------	------	------	------	------	------

below surface

$$\begin{array}{r}
 25.8 \ ) \ 12.00 \ (46.5\% \\
 \underline{1032} \\
 1680 \\
 \underline{1548} \\
 1320 \\
 \underline{1290} \\
 30
 \end{array}$$



Vertical - 12 -

14.8  
2.5  
1.2 + 3

Core 31  
13.5

37.2 6.2

slut  $2\frac{1}{2}$  in.

16.0  
.5  
15.5

16.6 31 39 6

15.5 | 6.00 | 3

22.5  
1.0  
21.5

21 31 42.0 11

21.5 | 11.00 | 5.15  
10.75

= 51.2%

250  
215  
350  
215  
135



3:30 pm. Wind rather fresh

Thermom. 42°F

Thermog. 46°F

	air surface	+6.6°C. (shade)
Base	-	-
Film	"	"
in snow	"	"
	in sun	+20.0°C = 68°F
	" "	+9.1°

Query:

which heats more  
quartz glass or silica glass?

Melting

Core from top stratum  
seems to melt a bit  
more rapidly than  
the core from lower

# Need a new yard stick

Pigment

1/2 Methyl orange

No penetration when  
placed on ~~dry~~ moist but  
non melting stratum  
at 9 in. depth and cov-  
ered with snow & coat



14

yellow O, B. fails utterly  
to penetrate when even  
in sun. But the  
Methyl Orange entirely  
(8 in) to bottom.

\* Need a fair amount  
or will fade out.

4:15 pm reset thermog.

Therm 41.8°

Thermog, 46°F\*

\* less exposed to wind

On snow in shade

7.4°C

" " in sun

6.8°C\*\*

\*\* Covered by film of snow

Bottom of snow in sun - <sup>act</sup>c

Hole 2 1/2 in deep

" Not 20% of axens on hill may  
must close up. Left  
costs too much.



4:50 pm - 15 -

Dye has penetrated today (since noon) 12 in very visibly and a probable total of 16 in; snow moist deeper. Packs mat, In sun all day

---

<sup>covered</sup>  
In hole where methyl orange did not penetrate penetration is now active in the sun.

The dye has already penetrated 11 in ~~at~~ bottom of snow cover.

The snow packs readily and moist.

No drip noticeable from bottom but moisture is easily wiped from it.

Capillarity still abundant. The core is water grey.



Sun (insolation) is plainly effective.

How much water lost during the week —

---

Next time

≡ ≡

Try cutters

Observe passage of dye —

If snow dripped, would melting be exceedingly rapid?

---

5 pm. Last skiers leaving  
Cannon Hill.

7:30 pm Sugar Bowl just  
came up the trail.



- 17 -

Therm.  $+41^{\circ}\text{F}$  fresh wind

Therm.  $44^{\circ}$

On snow (shade)  $+5.2^{\circ}\text{C}$

" " (sun)  $+4.2^{\circ}\text{C}$

But under  
film of snow  
+ in lee of tiny bump  
of snow)

But now in sun  $+6.0^{\circ}\text{C}$   
with partial film

Bottom of snow  $-0.2^{\circ}\text{C}$

Diam. of other <sup>2</sup> Pyrex pans  
5 x 9 - inside bottom  
Depth  $1\frac{3}{4}$  in

Seaming, Snatching  
traces.



— 198 —

6:20pm

### Soda Spgs

18 Ptclay	Max	Min	Reptd 7 Snow	Precip
	33	15	80	.08
19 cl.	61	36	76	
20 cl.	63	26	73	
21 Ptclay	56	27	70	
22 "	63	27	68	
23 "	48	20	66	
24 cl.	46	21	64	
25 "	52	29	62	
26 Ptclay	46	21	61	

Snow stakes 58 in  
5 ft 10 in.

~~5/2~~



-19-

Therm  
6:30 pm 38.5°F.

Wind fresh

Thermog 40°F

In snow (shade) +2.0°C

In snow (sun) +3.1°C

\* At bottom  
of snow cover -0.2°C

Put cork pulled out  
and damp snow  
packed around bulb  
of thermometer!

\* Make cork more  
secure.

Snow hardening even  
in the sun

The upper core has  
melted 50% more rapidly  
the lower the density  
almost equal.

Both are congealing now



\* Next year - Compare melting rates of old and new snow.

but on basis of water content.

Use samples to cut cores and weigh them. Melt in dishes.

---

Air snow (shade)  $1.6^{\circ}\text{C}$

" " (in faint sun)  $2.1^{\circ}\text{C}$

Thermog.  $40^{\circ}\text{F}$

---

Temp. Therm.  $37.2^{\circ}\text{F}$

Thermog.  $38.1^{\circ}\text{F}$

Air snow (shade)  $+1.6^{\circ}\text{C}$

" " (faint sun)  $+2^{\circ}\text{C}$



- 21 -

Snow surface

(a) in shade  
dry & frozen

(b) in faint sun  
moist & frozen

7:10 pm

Thermog  $38^{\circ}$

On snow

(shade)  $1.0^{\circ}\text{C}$

(faint sun)  $1.2^{\circ}\text{F}$

Care of thermog in shelter  
on level with therm  $-1.0^{\circ}\text{F}$

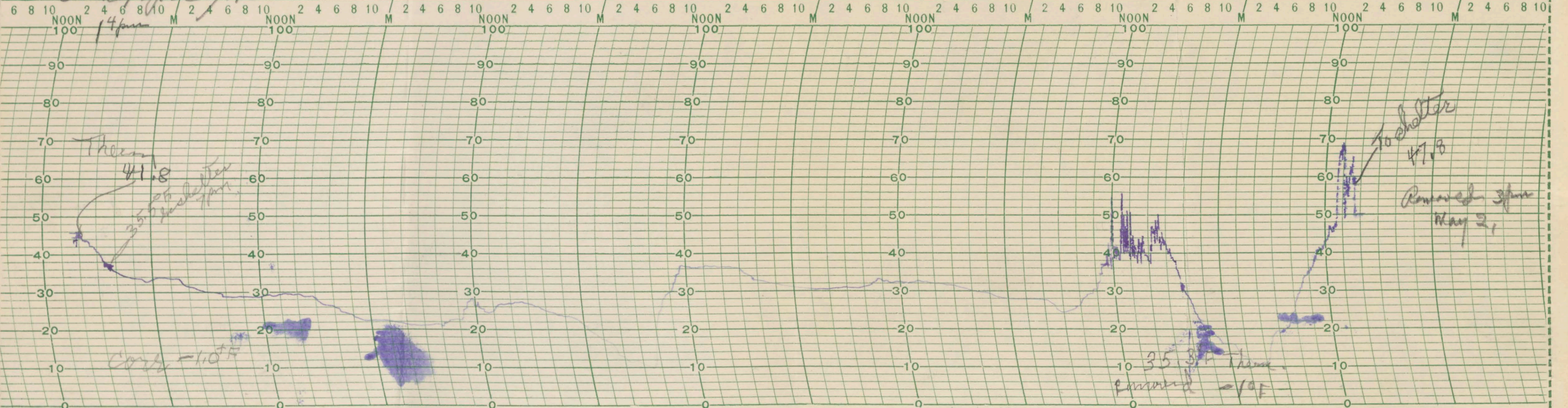
# Dry temp at bottom  
of snow  $0^{\circ}\text{C}$

Dry temp. on snow  $-0.1^{\circ}\text{C}$   
(shade) sun  
on horizon



MONDAY      TUESDAY      WEDNESDAY      THURSDAY      FRIDAY      SATURDAY      SUNDAY

*Sunday Apr 26/42*



*From Notebook 16, May 2, 1942*

*Taylor Instrument Companies ROCHESTER, N. Y.*



May 1-2

Blair Eddy

19      14      1+2

18.5      14      3

19.0      11      3

$3 \overline{) 56.5}$   
18.8

3 =

Fred Paget also 3 9

18.8 ) 3.00 1595  
188  
1120  
940  
1800  
1692  
1080  
940

Notebook 16,  
May 2, 1942  
"NB"



2:40 pm

Therm 34.7° F

Thermog, 42° \*

On snow (sun 1 in) open to sky  
in sun, +14° C  
in shade +9.8° C

In snow in sun +1° C

---

\* Temp since 11 am  
badly affected by sun or  
lack of ventilation. Needle  
has jumped much.

Snow pitting. (See core) -  
Shut beneath

---

On snow in sun therm

Crystals +5.7° C.

Crystals are freezing.

Effect of water in snow?



At stake - 15" deep  
In new snow - sank to  
old frozen crystals - spread  
much - snow packs hard  
& moist.

At stake

In sun - bottom of open pit  
descent  
color in old snow 17 in  
did not spread greatly.

In covered pit on old snow  
15 in deep. No descent  
into old snow crystals  
but rise upward & sideward into  
new snow. Greater  
capillarity.

Crust forming in sun & shade

4 pm

Therm. 33.6° F

Thermog 37° F (ventilation poor)

On snow in shade 3°C

" " " sun 6°C

In snow " " approx 7" 40-6°C

Relevant part  
sun not melting  
snow



4:40 pm

4 -

at snow stake beneath new + old snow

at 3 ft deep + 1.2°C  
in sun.

at 1 1/2 ft deep beneath new + old snow + 0.3°C

Pat pigment on new snow  
where surface is just  
congealing

5:25 pm

Much snow still in  
branches - slush on ground

Therm. 37.2°F

Thermog. 42°F

at snow - in sun + 9.8°C

in shade... 8.2°C

In snow + 1.0°C

---

Pigment

ascended

1 3/4 in new snow

1 1/2 in old



6:10pm

- 5 -

Snow stake 6 ft 1 in.

Next snow 14 in. = 73 in.

Crust  $\frac{1}{2}$  in.

20  
20  
20

70 in deep  $0^{\circ}\text{C}$

48 in "  $0^{\circ}\text{C}$

30 in "  $0^{\circ}\text{C}$

12 in "  $+0.2^{\circ}\text{C}$

6 in "  $+0.2^{\circ}\text{C}$

3 in "  $+0.4^{\circ}\text{C}$

Yet crust  $\frac{1}{2}$  in.

Directly under crust

$\frac{1}{4}$  deep  $+1.2^{\circ}\text{C}$

In crust

$\frac{3}{4}$  in deep  $+1.2^{\circ}\text{C}$

On crust

and balled  $+1.0^{\circ}\text{C}$

6:45 $\frac{1}{2}$  crystals freezing together

Sun shining  $15^{\circ}$  at

above horizon



- 6 -

7 pm Therm 33.3°F

Thermog 34°F,

On crust -  $-0.4^{\circ}\text{C}$   
dispensed setting  
sunlight.

Under snow  $0^{\circ}\text{C}$   
6 in deep.

---

8:10 pm,

Thermog 28°F

Therm 27.7°F

On snow,  $-3.0^{\circ}\text{C}$

Crust 1 in. thick

Canopy removed - Exposed to  
full radiation

New snow melted

3.4 in.



May 2 - 1 -

Water melted

In 8 in can,

16.5  
18.88  
3.1

---

38.48

= 3.85 in.  
(2 1/2 in)

In small can 3.4  
Survey 3.0

7 am.

Min 14.2

Therm 25.8 Strong wind  
Thermog.

Min Hum 10.5 - 7 am

22.5

Birds  
Meadow larks



Light hoar on snow  
and canvas.

Crust  $1\frac{1}{2}$  in.

On snow  $-7.1^{\circ}\text{C}$   
(shade)

6 in deep (shade)  $-0.8^{\circ}\text{C}$

at bottom  $0^{\circ}\text{C}$

Dry crystals  
adhere to tube

Slush of yesterday frozen,  
water in road & on stone  
porch frozen.

Wind rough. Greenland.

Sit more pigment,

avalanche danger on  
south slope and  
lower crust.



at S. Store - 3 -

8 am. In sun. East wind

On crust + 5.0 C

Crust 1 1/2 in deep, Hand  
under crust 2 in.

3 1/2 in - 3.7 - 4.0 C

6 in - 2.4 C.

12 - 2.0 C

30 - 0.8 C

Query: Can you catch  
any fish there?  
Ice fishing.

44 - 0.6 C

58 = 0.4 C

Very crystals

8:45 am  
Nye placed.

Sins slightly.  
Melts snow.



4

9 am. Crust still  
dry + hard  
Dye has melted scarcely  
at all.  $\frac{1}{16}$  in in center  
Temp in sun  
 $9.6^{\circ}\text{C}$  by two  
therms -

---

9:05 am  
at Hotel -

On snow  $+9.8^{\circ}\text{C}$   
Thermog  $33.5^{\circ}\text{F}$   
Therm.  $32.4^{\circ}$

Wind brisk but not  
so strong. East  
Ice on back porch and  
dense patch in front  
now melting.



Paul N.  
Photos

$$\begin{array}{r} 152.2 \\ \hline 76.1 \end{array}$$

$$\begin{array}{r} 68.1 \\ \hline 34.1 \end{array}$$

$$\begin{array}{r} 89.2 \\ \hline 44.6 \end{array}$$

3.89 in precip. for  
April

11:15 am

Coast main line

+ ~~at~~ ~~where~~ ~~the~~ ~~main~~  
+ ready to break up  
An snow in air + 19.7

Thermostat 41°F

No melting yet. 38.2  
by faces - but new cars  
flattening.



-5-

10:45-

Soft + old cores  
of snow - melting being  
compared.

Temp on snow +17.6°C

Fully exposed to sun  
Crust softened 1/4 in

Thermog 39.5°F

Therm. 37.0°

Ice on platform melting

11:15 am

Crust moist but still  
coheres. Ready to break  
up.

Thermog. 41°F

Therm. 38.2°F

On snow in sun +19.7°C

No melting yet in cores,  
but new snow flattening



12 - New case  
Septals <sup>corner</sup>  
small, Old

returns shape.  
Slight marks from  
back.

Must soft



-6-7

12:30 pm

Therm 41

Thermog 46

On snow  $22.4^{\circ}\text{C}$

---

Trains a plenty

---

Cores

New snow on floor of dish broken up - one-third melted.

Old core on floor of dish melting badly on sun side. One-half as much melting as of new snow.

Old core on grill - greasy with water but no melting yet.

New snow melts faster than old ?  
=



Cores of same weight <sup>^</sup>  
being compared to offset  
diff. in density.

Used a postal scale.

# Develop this idea.

12 noon

New core shrinking,  
its crystals becoming  
coarser.

Old core retains its  
shape. Slight moisture  
from bath.

Crust now soft

Alge in new snow  
shows effect of capillarity  
working in every direction.  
All snow sluggish or  
frozen or <sup>too</sup> cold to permit  
any water movement.



7-

Dyes -

Dye of yesterday noon  
still only in new snow  
stratum

Later dyes -

have accelerated  
melting melting in  
W 2 1/2 in deep in snow

Both have descended  
3 in to a stratum  
which it has followed  
13. to 34 in on the  
down slope -

This stratum now has  
no apparent cohesion.  
Must have been slight  
even at maximum

In one case 3 strata  
1 to 1 3/4 in beneath  
each other have been followed

12:50 - new snow almost  
entirely melted.

Old snow 3/4 melted.

All snow on guide has lost only a  
drop.



Snow stake -

1:05 pm

Dye has penetrated  
14 in in old  
snow in open pit

In new snow -

penetrated to 22 in +  
shows traces in  
stratum 2 ft above bottom

Enclosed? Another

core has no stain  
below top 7 in

acceleration depth 4 in -

Side ~~cut~~ cut shows no

stain in old snow stratum

to 14 in. However, dye

has spread laterally 22 in.



-9-

Dye placed last night  
and this morning  
has accelerated melting  
in sun 3 in and 5 1/2  
respectively.

Evening penetrated 12 in  
practically to all snow.  
Snow shows hard but  
is only slightly moist.  
However, dye has to  
melt snow below  
almost wet. Looks  
like a marble cake  
of white varnishes.

This morning's dye has  
penetrated (6 hrs) only  
6 in - to a crust (1/2 in) of  
fine crystals - However  
dye is thick & bright above.  
~~The~~ temp any factor in  
this stoppage. It seems



To be texture -

NB - The discolored snow  
drips when compressed.  
The uncolored snow at the  
same level and adjoining  
more passive moist.

Acceleration may occur.  
Warmer today - almost sultry  
for overcoat and face on  
the snow.

---

Return soon -

Study new snow under  
weathering + dye -  
also penetration of latter.

---

\* Bottom of snow is  
moist but little of it  
rubs off on the hand.  
How quick the change  
from cold dry to cold  
moist? Try this



-11-

2 pm  
Cakes on floor of trays  
melted L

Old core on grill  
one-half melted - Interior  
of cores seems to melt  
first. Because edges  
has been hardened  
by the cutting contact  
of the cutter.

On snow in sun.  
Sun's its  $1\frac{1}{2}$  diams,  
 $24.2^{\circ}\text{C}$

Thermog.  $60^{\circ}\text{F}$ . (has  
been  $68^{\circ}\text{F}$ ).

Therm 47.0 $^{\circ}\text{F}$ .

Almost calm

Snow leaving the account  
to come on train this  
morning to Cooper  
for paper barrels



2:30 -

1 hr for round trip  
to Sugarbowl.

On snow  $19.8^{\circ}\text{C}$

Thermog.  $65.0^{\circ}\text{C}$  \*

Thermus. 47.5

\* Still in shade but  
canopy is low & air  
is still.

3:15 pm.

Old core on grid completely  
melted except a teaspoonful  
of water equiv.

(Snow on roof)



Snow ralkers on east  
face of Donner Pass but

May 5 - 9:45 - snow before  
bottom was reached

Therm 41° F

Thermog 41<sup>3</sup>/<sub>4</sub>° F.

Wind

all trace of color in  
snow at lower zone.

Only 32° F. last night.

Snow mushy.\*

— at Snow Stake —

Color only 14 in. in old snow  
and even less in new.

\* But shell ice on trail

Snow Stake 5 ft 3 in.

8 cc 66.2 69.5 3.2

8 66.2 69.1 2.9

Sample No 5 May 1 -

38 in.

60 57 66.2 95.8 30.4

Vertical text on right margin: Notebook 16, May 5, 1942



Density new snow	40%
" old snow	52.3
Both at No. 5	50.7
New snow just losing its water - in lapped 1 in. <del>in</del> **	

Testing:

Spical } all get to  
Cat } punch house  
Tractor }  
but tractor much slower  
Cat cannot not climb  
steeper slope above  
for new snow 8 in. yields  
under iron treads as  
badly as in January.  
Tractor failed to bring his  
2 in. blocks,

\*\* When new snow is undercut  
water starts melting ~~it~~ ~~and~~ ~~is~~ ~~very~~ ~~visibly~~  
and starts to drip



- 3 -

Temp. 12:15 - 12:45

$7\frac{1}{2}$  in. in bottom of  
new snow  $+0.8^{\circ}\text{C}$   
(Exposed)

On surface  $+23.9^{\circ}\text{C}$

" " (covered  
by film of snow)  $+14.6$

24 in deep  $+0.2^{\circ}\text{C}$

48 in  $+0.4^{\circ}\text{C}$   ~~$+0.2$~~   
 $0.16$

61.5  ~~$+0.1^{\circ}\text{C}$~~   
 $0.0$

12:50 -

Therm  $49.0^{\circ}\text{F}$

Thermog  $49.5^{\circ}\text{F}$

Min last night (Thermog  $32^{\circ}\text{F}$ )

Major Wedderburn

P.C. Putnam

Melted core 2.2 in



—4—

No 6 -

62 56+ 67 98 3,

lint sank 8 in.

60

59 58 67 95.4

Capillary water  $\frac{1}{2}$  in at bottom. 28.4

Dirt wet but  
not dripping

---

Cores in trays.

New gone almost

old fully  $\frac{1}{2}$  gone.

All on grid

2 pm

Dye 2  $\frac{1}{2}$  in sank in

new snow

In old snow 6 in,

Water movement faster

Some dye in old snow



- 5 -

61 in - 0°C

48 in + 0.1°C

24 in 0°C



Gode Springs

Apr. 11, 1942

Mr. Rose  
in  
Canyon.  
to Truckee.

covered  
less snow.  
Insulation

or shaded  
as Truckee.

TELEPHONES:

CRESTVIEW 6-3034  
BRADSHAW 2-2853

R. M. MULLEN

PRESIDENT  
FOUR WAY ENGINEERING CORP.  
626 NO. ROBERTSON BLVD.  
LOS ANGELES, CALIF.

No

Warmth increasing.

Overcast at Summit, at 8 pm  
entrance at hotel wet and  
sloppy. Temp. in shelter

Apr. 40° F. (Therm. - )  
Snow still makes  
soft snowballs. Melting



Sat. Apr. 11, 1942

View toward Reno, Mt. Rose  
is very impressive in  
the throat of the canyon.  
from Donner Pass to Truckee.  
Get picture.

Left Reno 6:30 pm.

Snow when dirt covered  
on shaded slopes shows  
very little pitting. Insulation  
slight.

Snow on north or shaded  
slopes as low as Truckee.  
Warmth increasing.

Overcast at Summit, at 8 pm  
entrance at hotel wet and  
sloppy. Temp. in shelter

40° F. (Therm. - )  
Snow still makes  
soft snowballs. Melting

Water on snow in center of Lake Howland



probably has ceased at surface but runoff unimpeded. Put soft snow on canopy to test night melting.

Thermog. set on snow 8 pm

Max. today  $52^{\circ}\text{F}$ . (thermog.)

Must observe amount of overcast as well as temperature.

8:50 pm

Thermog.  $36^{\circ}\text{F}$

Therm.  $38^{\circ}\text{F}$

Snow becoming firmer. Placed 1 in. top snow on muslin to test melting. Believe there is none.

10:40 pm. Stars bright, sky clear.

Thermog.  $34^{\circ}\text{F}$

Therm.  $36.5^{\circ}$

Top surface  $\frac{1}{16}$  in. approx. frozen. Its feels slippery dry. Crystals below still moist and pliable.



1 in. sample of snow on  
 muslin wet cloth somewhat  
 from draining, not melting.  
 Likewise the snowballs  
 have wet a surface of  
 cloth 3 times their diameter  
 mostly below. apparently  
 drainage. Now almost hard.

Sunday Apr. 12

6 am fog forming. Vapor  
 haze in air.

6:30 Thermog 30°F

Therm. 30°F

Snow frozen hard 1 in. deep.

Below that snow moist and  
 greasy but no melting. On  
 warm hand, however, crystals  
 break down quickly into water.

Sample snow on muslin  
 in fragments - melted & frozen  
 again. \* Snow balls are  
 frozen. White jacket on  
 snow frozen down.

Ice in front of hotel frozen  
 but mud under porch still  
 soft. Evidently freezing is  
 caused by radiation.

Iron pipe handrail frosty.

\* Made pool, but froze.  
 Pipe handrail frosty.



Snow under eaves has become ice. in strata of 1 foot but drained out above.

8 am. - <sup>7 am</sup> frost on glass of thermograph on snow.

Thermog.  $34^{\circ}$  but forced to  $36^{\circ}$  by being touched by rising sun. Shaded now and fell to  $34^{\circ}$  and falling Therm.  $31^{\circ}$ .

\* Frost on muslin tho put out dry, but frost scarcely noticeable.

Paper frosty

Surface of snow actually wet leaves hand wet.

Danger - crust may melt unevenly. Danger. Breaks easily under feet, not ski.

9:30 am. Crust softening.

Pool on muslin. Ice hard on top but melted from cloth.

Thermog  $36.5^{\circ} F$

Therm 38

Muslin partially wet from melting frost. Jacket still partially frozen to snow.

Ski grates on distant hillside

Need bar under crust to determine actual melting and percolation from crust.



9 am, Melting very noticeable.

Thermog 46°F.

Therm. 46.5

at 6:30 snow beneath crust  
mealy, could be packed  
slightly. at 9 snow beneath  
crust makes snow balls.

Water from crust making  
downward.

Need magnifying glass.

10:15 am.

Crust on snowcourse melting  
soft  $\frac{1}{2}$  in below surface.

Bottom of crust sets hands.

Query: Does not water flow  
microscopically rather than  
by drops?

\* Place tray at bottom of strata  
or bottom of snow cover to  
determine amount.

Ice on muslin has become  
coarse crystals and not solid  
the thin ice! Started as melt  
water.



# Soda Springs - Weather

April 1	48°F	21	Depth Snow	76 1/4
2	54	20	P.C. C	73
3	58	25	Stormy	73 3/4
4	56	25	Prec.? 6 in.	80
5	55	28	0.50 in. cldy	83
6	54	21	Prec? <del>clear</del> 1 1/2 in. clear	84
7	53	18	clear	80
8	55	20	P. cldy	74
9	56	30	P. cldy	68
10	57	32	0.36 in.	66
11	42	28	clear	63
12	62	28	clear	58

Snow stake 5ft 10 in.

Grad. 1/10 grad. / used at 1 in.

Seems O.K.

Reset Recording Precip. gage. 11 am.

Records down! This is Apr 12  
why Andy screwed the setting  
nut off and set pen at bottom!  
Window too small.

Standard precip. gage 0.36 in.

Apr. 6 - 12 ... 0.36\*

Apr 1 - 5 ... 0.50 in.

\* Recorder Apr 5-12 ... 0.66 1/4

Snowing on Sunday.



10:50 <sup>am.</sup> pm.

Thermog. 46°F.

Therm. 48° Light breeze.

Snowballs almost entirely melted.  
Snowcrust on handkerchief partially  
melted. Had not met.

Crust soft 3/4 of its depth  
in sun.

11 am. With andy reset record.  
precip. gage.

11:15 snowcrust in sun  
soft throug.

Need a magnifying glass to  
see water movement. Can  
see crystals burst.

12:30 noon.

Chat with bright engineering  
girl who grasped and  
exclaimed her quick  
comprehension and delight  
and saw ahead. Saeculae?  
She suggested a space between  
platters under the snow and  
snow ceiling. Quite right.

Weniger's S.F.

Melting crystals. Breakdown and  
survival like the crests  
in "snow spray" last Sunday.  
Water clings to crystals and  
water part bursting crystals



was immediately merged  
in other clinging water.

Platters placed beneath crust  
in sun and shade to  
catch ~~not~~ melt water.

Crust in sun uncohered  
throughout; in shade still  
some cohesions among  
crystals. But moisture  
permeates crust.

Still 46°F.

Jacket still adheres to  
some crystals of ice.  
Poor conductor of heat.

Th: 50°pm.

Record sheet changed.

\*

and compared in shelter.  
An old sheet correction +2°F.  
but due to sheet being above flange.  
Now within -1/2°F. No resetting  
desirable. Replaced on snow.

2pm.

Thermog. 58°F.

Therm. 50°F.

Percolation.

Yes from exposed face of  
snow, fast down where  
conducted by ice.

Pan should be placed far  
within overhanging snow.



To determine loss.

No water in buried  
flatters the snow is wet  
beneath. Gravity has not yet  
overcome capillarity. Try  
to hold snow in suspension  
over receptacle to avoid  
obstructing the pull of gravity.

The crust on handkerchief  
now finally melted. Throw  
snowball on muslin slowly  
melting away.

But in breeze, the snow is  
becoming firm. Will active  
melting soon cease for day?

Melting by month and day.

Will an average do?

In April, ripening first week  
or two, then release of water?

Thus final average should be  
much larger than for first  
part of month?

# Ask Blair Eddy to make the  
survey this half month too.

3:20 pm Thermog. 49°F  
Therm. 50.5°F.

3:25 Thermog. 48°F.  
Therm. 50°F



Drip from edge of exposed snow. Bottom crystals coarser than top crystals. Cavens in the structure like microscopic cavens.

No drip from crown of snow cap. Water flows vertically but will follow bottom of snow to lowest point.  
→ Dripping in shade has ceased.

No water in <sup>the</sup> two platters but capillarity very visible in bottom of snow in them, more visible in sun platter than shade-platter.

No capillary height seems to exceed one inch.

Cut cross-section of snow cover. Snow coarse throughout and some capillarity at bottom but no dripping. Ground where not bog or stream does not appear to melt the snow much by earth warmth, but cavens



where logs or running water is.

Water in center of face *Hardman*

Photograph new snow - from stars to floor.

also clinging to trees

- (a) when adheres closely
- (b) when loosened and retracting from twigs and needles because of insulation

4:15 pm. strong breeze, overcast

Thermog. 46.5°F

Therm. 47.5°F.

No drip, but snow makes good snowballs.

Melting hours 9 to 4 = 7 hours?

Hours of soft snow 8 to ?

Jacket freezing completely to snow again.

To Rainbow Tavern. Snow still deep. hilled snow pits.

5:30 pm.

Sun out again. Fresh breeze.

Thermog. 46°F

Therm. 47°F

Snow quite soft.



No danger spring. No  
crusts. Snow density  
uniform.

No drip even on points  
except one affected by tiny  
streams. Only increasing capillarity  
shows in flatters.

Water does follow vertical.

Took piece of saturated  
snow whose capillarity  
resisted drip. Held it up  
to light. As quickly as turned,  
the capillary water fell  
to lowest side quickly, like  
water in a globe of crystals.

When lower side is reached  
the water concentrates in  
the lowest portion. If too  
abundant, it then drips.

Photograph this, possibly  
in laboratory.

6:15 pm Onset, clouds settling on  
ridges.

Thermog. 42°F.

Therm. 45°F.

Snow still very soft. Jacket sticks.

Water dripping from lowest point  
of exposed bars north of tower. But  
light. No drip from snow in  
either flatter nor is capillarity  
sufficient heavy to permit water  
to slip in snow to reach vertical.

Pools of water at edge of snowbanks  
in front of hotel.

Bearers Hill behind hotel



Pits at Rainbow.

I. Pebbles only (no funnels)

Diam.  $1\frac{1}{4}$  in. x Depth 3 in.

"  $1\frac{1}{4}$  in. x "  $1\frac{3}{4}$  in.

" 1 in. x "  $1\frac{1}{2}$  in.

Such holes are few.

Th. Gobs or larger stones and dust

Most diam. 10-14 in. x Depth  $3\frac{1}{2}$ - $4\frac{1}{2}$

One " 17x20 in. x " 6 in.  
oval

" " 20x20 in. x " 5 in.  
(gob of dirt)

Gobs numerous, pebbles few.

Pebbles have limited depth.

Does the snow settle more rapidly than gobs?

Snow soft and has melted at least over the granite ledges.

One trout in speeding water.

Sanguila - Trout farms and paradise.



8:05 pm

Thermog 39.5

Therm. 42.5

Diff. 3° F.

Snow soft.

Query: Will it remain soft all night? See new record sheet.

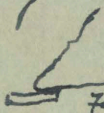
Thermograph returned to tower.

Jacket wet.

~~Snowball entirely melted.~~

Some dripping? Slight.

Only from snowbank 2 1/2 ft high and normal to sun

Snow  fair catch.

Try this some more.

} Snowball on muslin melted entirely.



## Explosive Snow

New snow holds more water than old but therefore will require more heat for temp. will not rise along freezing or approx.  $32^{\circ}$  F. until all of the snow is melted.

Melting cannot build up any large reserve for oversaturation or slush is never deep.

How high must temp. be to accelerate melting to maximum?

How warm must rain be or how much warmer rain?

In course, old snow water goes thru immediately. In rain or does not build up much.



The deeper the  
snow, the slower

---



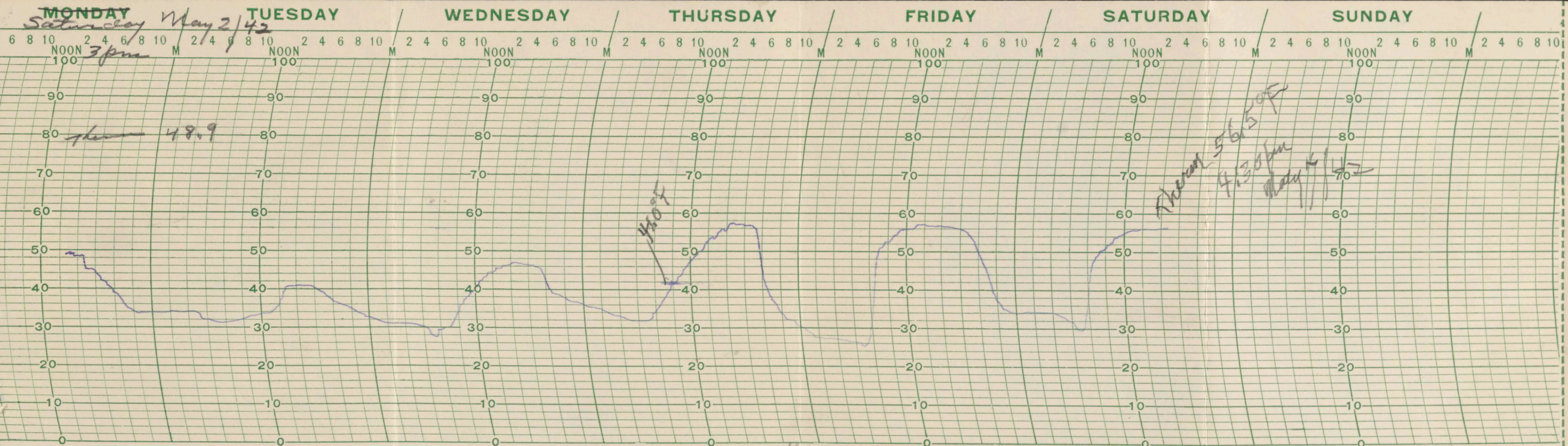
How long  
moist surface  
all night tonight?  
Melting several feet, by 5 pm?  
See record of day

From Notebook 1 b, May 5, 1942

April 11-12, 1942



22





• May 7 - (Thurs.)

• Tuxee R. fairly  
as far up as  
Broncho & Joe Grey  
Cross, Hariston

Grey runs further  
up. Only small  
discharge from  
Boca R.

Fish can see  
readily above Boca.  
Semi clear

avalanches small  
but several on  
NE face of Pilot Peak  
Views from below  
& above bridges

---

a view:

Down on Downer  
Lake framed in  
east by Mount Rose  
ridge and long  
saddle: My best  
memorial -

Ask Ernie Macie to  
come Sunday.



9:15 AM - 3 -

Therm. 50.6°F

Thermog 49.5°F

Min 29.5°F last night

---

Snow Stake - 4ft 7in  
Clear

in hard snow 7.5 in

in soft-hand snow 15 in

Soft snow pens. 1 1/2 deep base  
567 Bent

Temp. 37 in

56 in 0.0°C

Temp. 37 in 0.0°C

2 in 2.2°C

2 in under melting snow  
\*

---

Sleds still here.

Yesterday morning climbed  
on crest to top of Beacon  
Hill but could not in the  
afternoon.

This morning a ~~great~~  
 soft but all climbed  
 as on Tuesday above  
 powerhouse.

a double spiral here.  
 can turn in its own  
 length by reversing one  
 beam, like a caterpillar.  
 Sugarbowl did climb  
 up again.

at 10:45 - all sleds  
 returned jauntily -  
 the SnoCat leading fast,  
 all climbed the roadside  
 snow cut,

Total wt of SnoCat  
 1445 lbs

Motor 575 lbs  
 24 hrs. -

1936 Kelly's Contract



\* Snow saturated -  
so all temps 0°C  
except at 2 in deep  
where ~~air~~ dry air  
penetrates.

---

Little Spinal 650 lbs -  
14 horse power.

Snowcat & spinal both  
climbed to cornice.  
Cat climbed Nordan Dam.  
In present snow soft  
2 in deep, spicals  
work well.

But Snowcat throws snow  
out without getting suffic.  
grip. New wider, sharper  
& fewer cleats

|| || ||

Engine does not stall.  
Extra load of 2 men  
gave increased grip.

11:15 am - 6 -

Temp on surface  
in sun  $16.5^{\circ}\text{C}$   
under  $\frac{1}{2}$  in snow  $13.0^{\circ}\text{C}$

2 in deep,  $3.2^{\circ}\text{C}$

Caused by air

Spiral is now double  
the width of the seats.

The Ford is a flint  
on more level roads,  
Went only to farmer house

Temps

11:30 am

On snow face  $18.6^{\circ}\text{C}$   
 $\frac{1}{4}$  in film  $11.7^{\circ}\text{C}$   
2 in  $3.2^{\circ}\text{C}$



- 7 -

# Sampling

Nos 6<sup>2</sup> - 8<sup>2</sup> (Remember  
May 5. 6 - 8)

Estapler 66.2

No 6. 52.5 48.5 94.5

28.3

No. 7 54.0 53.5 96.1

66.2

No 8 54.7 53.5 95.4

66.2

29.9

3) 161.2  
53.7

29.2

Sampling easy for 3) 87.4

practically no cohesion

29.1

May 5 29.9

Keep snow whipping now.  
Capillarity 2 1/2 in, 6 in

Loss 0.84.

66.2 68.0 1.8

= 30%

6.0 5.330 66.2 68.9 2.5

= 40%

- 8 -

12:30 on Snow

Exposed 19.3 °C

19.1 °C

By 2 thermos.

2' in under snow 5.1 °C

---

7:30pm, Met Maj. Wedderburn  
invited him to take  
at Wash. D.C. meeting  
on his snow experiences.  
Address fine case  
of British Embassy.  
Sgt. Seligman recently  
Hanson was bombed  
out.

Met Harry & Mrs. Robinson  
going home from  
Nevada City to Lovelock

---

Ed Leeper: left Reno  
1970 - on hotel business.

Now at Donner Summit  
Lodge (old fox farm below)



- 9 -

Toad with Tucker  
on Snow Cat. a  
powerful acrobat but  
must keep its feeting!

New Snow -

All snow settled  
from 5ft 3<sup>in</sup> ~~to~~ May 5 to  
4ft 8<sup>in</sup> May 7. <sup>7<sup>in</sup> saw</sup> ~~46 7<sup>in</sup> ~~in~~~~  
difficult to identify  
new snow except in  
holes. Snow under  
faststep ~~becomes~~ releases  
water slightly. Shows  
grey -  
May 7. lens. 54.2%  
May 5. " 49.5%

• Snow known to be old  
bottom of shallow pit  
66.2

52 - (51.8 in) 50.5 95.0

28.9

Dens 55.4%

# ~~Water dripping from snow~~  
Of new + old, 54.2

How much new snow  
to diminish dens. 1.2%?  
New + old 53.7 in deep.  
Old

52.0

New snow May 1 14 in (?)

May 5 - 8 in

May 7 - 1.7 in?

Meas. top (new snow?)

2 1/2 in

66.2 67.2 1 1/4

= 40%

Orig. depth of pit <sup>May 5</sup> 18 in

Pres. depth May 5 5 1/2 in

Orig new snow " 8 in

Loss 2 1/2 in.



-11-

Some shrinkage in  
old snow

and some in new

8 in new snow to 2 1/2

52.4 old snow to 51.2

~~52.4~~ 6

3 in. water content to 1 in,  
26.9 in " " to 28.1

Has old snow taken  
up the 3 in. of new snow  
water and holds 1.2 in  
of it? New snow incapable  
of holding water beyond  
40% density? Does not  
seem to get denser.

- 12 - ~~7~~

Top of snow <sup>net</sup> 7 in.

Bottom of snow <sup>net</sup> 5 1/2'

Middle of snow  
moist

Calor has not gone  
there -

4 pm -

Nos 5-7 marked by  
two sticks -

~~Various~~ Various courses by  
Blair make a zigzag  
never born at beginning  
Measure all next time  
May 12.

Caves on canvas  
melting rapidly.

Pigment placed south  
of snow slat



- 13 -

Eye <sup>has</sup> descended 1/4 in  
in next 4 old

but only 8 in old -

Crystals below are  
coarse and wet

but do not carry dye

---

Snow cat towed  
down by double  
spiral. Accident

4:30 Thermom. 56.6° F.

Thermog 57° (reset)

Wind strong - cleaning  
Hotel yards

— 14 —

Streams still running—  
leave winding alone  
until Ruff comes up.

---



MONDAY

TUESDAY

WEDNESDAY

THURSDAY

FRIDAY

SATURDAY

SUNDAY

Sunday Apr 5

Monday

Tues

Weds

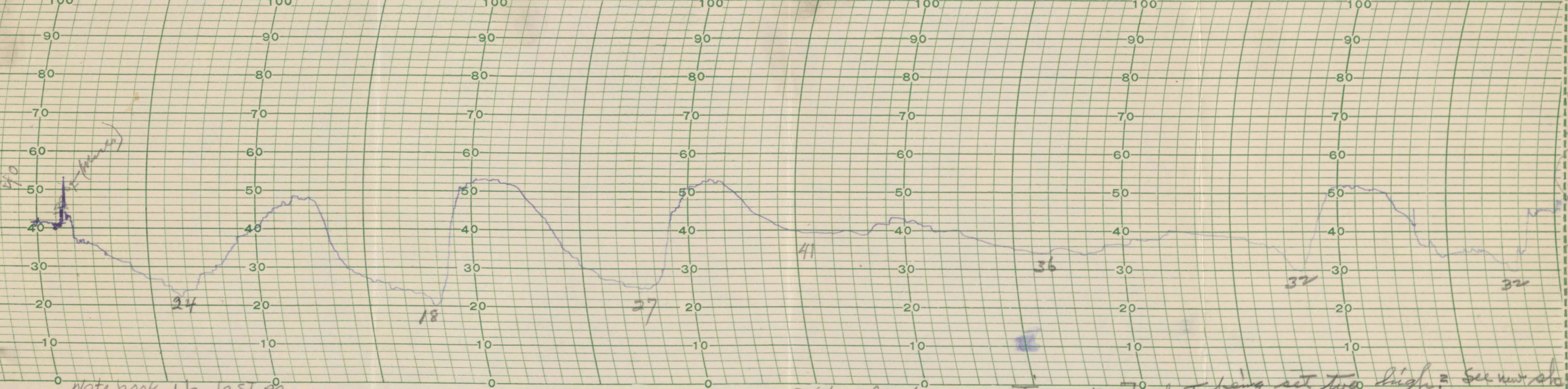
Thurs

Fri

Sat

Sunday Apr 12

6 8 10 NOON 2 4 6 8 10 M 2 4 6 8 10 M 2 4 6 8 10 M 2 4 6 8 10 M 2 4 6 8 10 M 2 4 6 8 10 M 2 4 6 8 10 M 2 4 6 8 10 M



IN REORDERING ASK FOR FAHRENHEIT CHART NO. 84 PRINTED IN U.S.A. COPYRIGHT 1936

Notebook 16 last pg

Add 2° F for correction. Due to sheet being set too high. See next sheet

Taylor Instrument Companies ROCHESTER, N. Y.

12:30  
 49°  
 57°  
 to shelter







Apr 26

MONDAY

TUESDAY

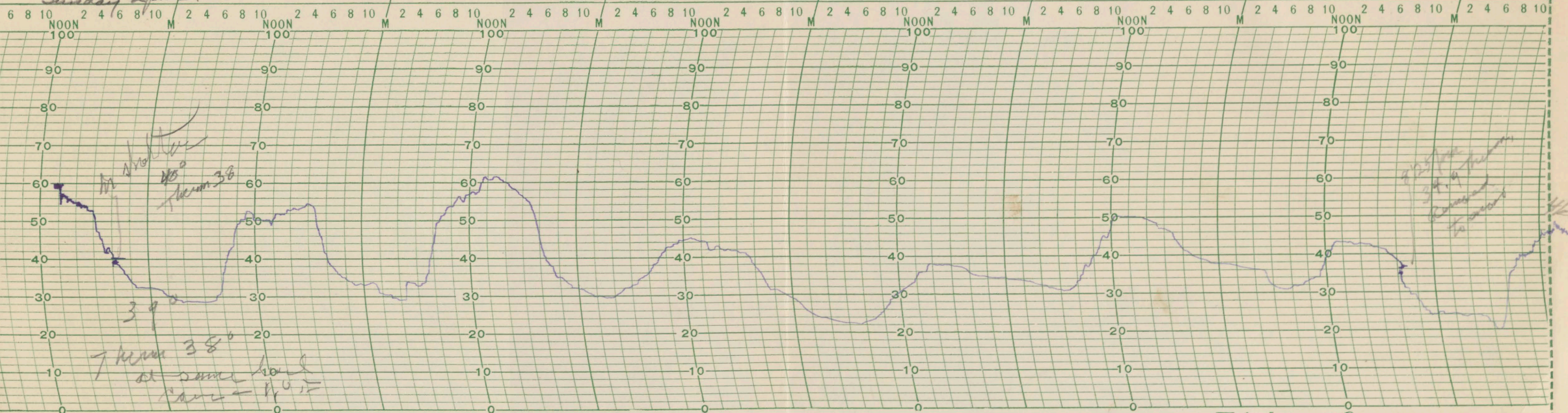
WEDNESDAY

THURSDAY

FRIDAY

SATURDAY

SUNDAY



April 19

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