

# THE MOUNTAINEER

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## CLIMBERS NOTEBOOK

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PUBLISHED BY  
THE MOUNTAINEERS  
INCORPORATED  
SEATTLE WASHINGTON.

CLIMBERS' NOTEBOOK

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SEATTLE, WASHINGTON

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To receive the fullest benefit from the use of this climbing course we believe that it will be worth while to tell you of some of the things we were trying to accomplish, as well as discuss a few of the problems which we encountered.

It became evident that more and more people were interested in acquiring a broader knowledge of Mountaineering. However, only those fortunate enough to be able to climb in small parties with capable leaders were favored with the opportunity to learn. Even those did not necessarily acquire the fundamental principles. There is too little time or inclination on a climb to either teach or practice. It is also natural for climbers to read and attempt the more difficult techniques and slight the basic principles, which, in the end, decide whether he will be sound and efficient.

Our primary objective was to bring mountaineering knowledge to a large proportion of our membership, in fact, anyone who would take the trouble to attend the lectur and classes and make an effort to learn. In this we have been very successful. Each year the enrollment has increased. A large proportion of the new members take the course their first year. Along this line we have tried to keep the Elementary course within the ability and available time of the ordinary member. To graduate from the Intermediate Course we expect a much higher degree of ability and accomplishment.

We soon learned that you must decide at the start whether it was to be a practice climb, or a class in practice climbing. If the latter, it is best not to have an objective such as a peak as it will not leave sufficient time to practice. It is apt to result in a scramble in which little if anything is learned. Our experience also shows that much of the benefit of a lecture is lost if not followed immediately by an outdoor class practicing the subjects covered. These must be well organized and each instructor must have a check list to be sure each subject is covered.

Individual instruction is essential to progress. Best results are acquired where there is one instructor to three or four students. This also proves very beneficial to the instructors.

Here in Washington mountaineering calls for a thorough knowledge of woodcraft as well as snow, ice and rock technique, so we have tried to make the course as complete as possible. We also feel that it should bring a broader understanding and appreciation of the mountains. Hence, the allied subjects which are included. Some parts of the country may not need as much training or equipment but most of the major climbing areas call for it.

This Climbing Course Outline is an attempt to present mountaineering knowledge in an orderly manner to large numbers of people. It represents the effort and accumulated experience of members too numerous to list. It is our hope that it will prove of value to others. The Climbing Chairman will be pleased to receive any inquiries or suggestions and will make every effort to supply whatever information is desired.

- Aiguille (e- gwee, e as in met) -- Needle-shaped peak; a rocky summit.
- Alp -- A high pasture or meadow.
- Alpenstock -- Iron-pointed staff used in the mountains.
- Anchorage -- A safe place to support the next man with a rope.
- Aneroid, Aneroid Barometer -- An altitude-measuring device operated by air pressure.
- Arete (a-rate) -- An acute and rugged crest of a mountain range, or of a subsidiary ridge between two mountain gorges.
- Arrest -- Stopping one's downward motion on snow or ice with the aid of ice axe.
- Avalanche -- A slide of masses of snow, rocks, etc., down a mountain slope.
- Avalanche Bridge -- Formed across a crevasse by avalanche snow.
- Back and Foot Stemming -- Ascending chimneys by pressing the back on one side and the feet or knees on the other.
- Band -- A rock, ice or snow ledge or shelf from five to twenty feet wide; nearly horizontal.
- Belay -- An anchorage for the rope, such as rock, tree, person, ice axe; the method of running the rope around a projection for better security.
- Berg Heil -- Greetings, Mountaineers; a mountain salutation.
- Bergschrund -- The crevasse, or series of crevasses broad and to the floor of the glacier; usually occurring near its head; may either separate the glacier or separate the glacier from a rock wall.
- Bivouac -- An encampment for a short stay; may have improvised shelter.
- Blizzard Tent -- A specially constructed tent for temporary bivouacs in blizzards, usually with sleeve opening or opening in the floor.
- Cache -- A hiding place, or the thing hidden.
- Cairn -- An artificial pile of stones, usually to mark the summit.
- Carabiner (Karabiner--German; Mousqueton--French; Moschettone--Italian; Spring-hook--English) -- A detachable ring with spring opening used to attach the rope to a piton.
- Chimney -- A steep narrow rift in a rock wall wide enough to admit the body.
- Chimney-stemming -- Hoisting one's self up a rock cleft by means of the back and feet or the back and knees; bracing.
- Chock Stone -- A mass of rock wedged between the walls of a chimney.
- Cirque -- A deep steep walled amphitheater-like recess in a mountain caused by glacial erosion.
- Climbing Rope -- A loose-laid Manila rope 7/16 inch in diameter, 100 feet long.
- Col -- A depression or pass over a ridge, a saddle.
- Cornice -- An overhanging, wave-like mass of snow or ice at the crest of a steep ridge.
- Corrie -- A rocky hollow among the hills.
- Contour -- To follow terrain holding the same elevation.
- Contour Line -- An imaginary line connecting points of equal elevation.
- Couloir (ku-lwar) -- Deep gully or gorge frequently filled with snow or ice.
- Crack -- Rock rift too narrow to admit the body, less than a foot wide.
- Crampons -- A metal framework, furnished with spikes which may be securely fastened to the shoes; used climbing on ice and snow.
- Crenelated Wall -- A mountain wall with the appearance of a battlement.
- Crevasse -- A deep fissure in a glacier caused by differential movement of ice.
- Crust -- Hard surface on snow caused by alternate thawing and freezing.
- Dip -- The angle which a stratum or geological feature makes with the horizontal plane; direction is given in degrees from the horizontal.
- Dolomite -- Term applied to peaks made of marble, especially in the South Tyrol.
- Duck -- A small pile of rocks set to mark the trail; trail marker.
- Dolfersitz -- A method of roping down with a single rope.

Escarpment -- A steep slope, especially if of considerable lateral extent.  
 Eskar -- Gravel deposited between walls of ice in a glacier.

Face -- A nearly perpendicular mountain side.

Feeling -- Taking in or letting out of slack in the rope as the other man moves.

Firn Snow -- The coarse, grainy snow-ice lying on glaciers.

Fissure -- Clefts in ice smaller than crevasses; cracks in rocks.

Fohn -- Hot southerly wind in the Alps; similar to Chinook.

Free Rope -- A rope that can be retrieved after roping down.

Fumerole (few ma role) -- Small vents from which steam or sulphurous vapor escapes.

Galeanda -- Area of sport; various formations of rock or terrain through which one passes in a climbing day; trail, snow, rock.

Gendarme -- Alpine parlance for a tower or pinnacle of rock.

Gill -- Gully, rocky couloir or ravine, wider than a chimney and usually not so steep.

Gite -- A shelter for bivouac.

Glacier -- A river-like mass of perpetual ice and snow.

Glacier Table -- A boulder on a glacier raised above the general surface by a column of ice.

Glaciere -- An ice cave below the line of perpetual snow.

Glissade -- To slide, the act of sliding down a slope of snow or ice.

Ground Avalanche -- Snow breaking away from the ground rather than from other snow strata.

Gully -- Rocky couloir or ravine wider than a chimney.

Hand Traverse -- Traversing by means of hand holds.

Hanging Glacier -- A glacier which terminates on a precipitous mountain wall.

Hitch -- Method of attaching rope to an object (as opposed to a knot).

Hold -- Point of support for the body, hand, foot or bracing hold.

Hot Plate -- An exposed rock in a glacier or ice fall.

Ice Axe -- A climbing tool or implement which has a point at one end and a pick and shovel at the other.

Ice Fall -- Disrupted portion of a glacier flowing over a drop in its bed.

Ice Worms -- Slender dark brown worms measuring about one inch in length, found in large numbers on the lower portions of Rainier glaciers.

Kletter Schube -- Shoes with either felt or rope soles used in rock climbing.

Lee Side -- Calm or sheltered side.

Leiste -- One to six inches wide, smaller than a sill.

Lichen -- First form of life to be maintained on rock; a plant.

Line-blaze -- Blaze on tree which lines up with the trail.

Massif -- A mountain group.

Moraine -- Debris of earth and rock deposited by a glacier in ridges, heaps or flat outwash plains.

Moulin -- A nearly vertical cavity worn in a glacier by running water.

Neve (nay vay) -- Firn snow, old compact, everlasting snow-ice; the reservoirs of snow which feed the glaciers.

Pass -- A depression in a ridge or a comparatively low place at which two ridges join; a col.

Pitch -- Any steep part of a climb.

Piton (peat ah n) Rock -- Thin wedge-shaped spike with a circular hole at the driving end; made for lateral and vertical cracks.

Prusid Knot -- A small rope fastened onto a climbing rope in a prescribed method so that it takes hold when a weight is put on it but slides freely at all other times.

Rappel -- A method of making difficult descents by using a rope; free roping.

Red Snow -- An algae which grows on the surface of the snow, giving it a red stain.

Reepschnur -- A small size safety rope; one-fourth inch in diameter.

Rib -- A minor ridge on a rock face.

Ridge -- A range of hills or the upper part of such a range; any extended elevation between valleys.

Roches Moutonees - Rocks rounded and polished by glacial action.

Rockslide -- The mass of loose rock that lies at the base of a rock wall talus slope.

Roof -- Sloping sides of an arete.

Roping Down -- Making difficult descents by using a rope; a rappel.

Rucksack -- A light bag supported on the back by means of shoulder straps.

Sastrugi -- Wave-like ridges, three or four feet high, formed on a level surface by action of wind (have axis at right angles to the wind).

Scree -- A heap of stones or rocky debris.

Serac (say rack) -- Ice pinnacles formed where glaciers cascade down steep inclines.

Ski Heil -- Ski greeting.

Sill -- A small band averaging from a half to five inches in width.

Snout -- The lowest end of a glacier, the terminus.

Snow-bridge -- Bridge across a crevasse formed by snow.

Snow-finger -- A tongue-like projection of snow extending into a couloir.

Snowline -- The lowest line of permanent snow on a high mountain.

Spot Blaze -- Blaze faces the trail, tree blazed on opposite sides.

Spring Tail -- Dark colored, flea-like insect inhabiting Rainier glaciers.

Sput -- Sloping flank of a mountain.

Strike -- The direction of a horizontal line or stratum or geological feature.

Suspendersitz -- A method of roping down with a double rope.

Talus -- Sloping mass of rock fragments.

Tarn -- A small mountain lake.

Tent Coat; Tent Sack -- Similar to zeltsack.

Terrace -- A rock, ice, snow ledge or shelf from 20 to 200 feet wide.

Timberline -- The highest elevation in a region which sustains tree-life.

Tongue -- Branch or finger of the main glacier.

Traverse -- To cross over.

Verglass -- Thin film of ice on rocks.

Watershed -- The catchment area of a lake or stream.

Wall -- A very steep slope of ice, snow or rock, practically perpendicular.

Wind Slab -- A hard snow crust built up on the leeward side of a ridge by wind action, may be loosely attached to under surface.

Windboard -- A hard, slippery crust produced by wind action.

Zeltsack -- A light tent sack for bivouacking.

EQUIPMENT LISTONE DAY TRIPLIGHT WEIGHT

	Pounds	Ounces
Easy rock and snow climbing		
Rucksack -----	1	
Parka -----	1	
Wool jacket or extra, winter weight, wool shirt -----	1	
First aid kit (keep up to date) -----		
Flash light -----		8
Junk bag: small candle, waterproofed matches, lead pencil, rawhide lace, piece stove pipe wire, safety pins, needle, darning cotton, friction tape. (May all be packed in first aid kit)	1	
Sun paint (clown white) in tin box -----		2
Sun glasses and case (green preferable) -----		5
Lunch and emergency rations -----		12
Cup -----		3
Map and holder -----		2
Wool mittens -----		3
Compass -----		2
Pocket knife, Boy Scout type -----		2
Watch -----		2
Toilet tissue -----		1
Boots -----	4	8
Ice Axe -----	2	
Climbing rope (100' of 7/16") -----	5	1
Add for difficult climbs		
Leather mittens or ski overmitts -----		6
Crampons (8 or 10 points) -----	2	8
Wand markers (25 $\frac{1}{4}$ " by 3') -----	1	3
Reepschnur, safety rope (100' of $\frac{1}{4}$ ") -----	2	1
Kletterschue, felt, rope or crepe rubber soled -----	1	4
Rope slings (3 at $\frac{1}{4}$ " by 9 to 12') -----		9
Pitons, carabiners, piten hammer -----		

OVERNIGHT TRIP

Packboard or bergen -----	3	8
Sleeping bag -----	4	8
Food -----weight per day	1	12
Pot, one pot or an extra tin cup -----		6
Teaspoon and tablespoon -----		2
Extra flashlight batteries and globe -----		5
Matches and container -----		1
Socks, at least one complete change -----		8
Optionals		
Tent or tarp (2 men or more) -----	2	10
Kindelstyx or primus stove and fuel -----		
Hatchet -----	1	8
Air mattress -----	4	4
Frying pan or aluminum kit -----		7
Towel, tooth brush, soap -----		
Song book -----		

LEAVE IN AUTO Oxfords with extra socks, key concealed on car.  
(Complete change of clothes, optional.)

OTHER ESSENTIALS

Fire permit, climbing registration. Leave details of location and duration of trip with responsible person.



GENERAL REMARKS

Get the bare essentials first, getting the very best equipment you can secure. In clothing, the layer system for warmth is best; a wool shirt with light-weight wool sweater and wind break is much warmer than one heavy jacket. Prepare for extreme weather. Consider weight, the total weight of a pack should not exceed one-fourth of your body weight for best efficiency.

CLOTHING

## Boots

## General characteristics

Height 8" boots probably best.

Covers ankle, leaves calf of leg free.

Some six-inch boots satisfactory.

Soles--heavy enough to take nails, not less than 13mm

Should project from the uppers only enough to give secure anchorage to the nail.

Toes--hard toe recommended when possible to secure it, though an ordinary toe is satisfactory.

Nail job--is most important

For climbing in Washington

Edge triconis for edge of sole and heel.

Small triconis for sole.

Nails should be arranged so that bottom surface of boot is flat.

(Some authorities prefer to leave ball of boot free of nails.)

Installation of the nails should be done by an expert.

Make sure he will soak the soles before putting in nails.

Care of boots

Grease uppers thoroughly but do not over-grease. (Every third trip or so).

Linseed oil for the soles.

Apply 3 to 5 coats when boots are new. Apply one coat at the end of each season thereafter. (This treatment hardens sole leather, helps hold nails.)

After each trip

Scrape soles free of dirt, wash off whole boot.

Stuff with newspapers, or dry grass (maintains shape, promotes drying).

Dry slowly but thoroughly in a cool, dry place.

Around the campfire take great care not to get boots too close to the fire. Nails absorb heat, cooks soles.

Lengthen life of laces by shifting occasionally.

## Socks

Two or three pairs best.

Acts as cushion for foot.

Light weight sweat sock next to foot, preferably white.

Wool for warmth, one or two pairs over sweat sock.

## Trousers

Should be strong, durable, woolen material.

Rather close fitting so as not to catch in crampons, but should allow plenty of room over the knees.

Pockets should be closed.

Reinforcement on knees and seat adds greatly to wear.

## Parka

Light weight, water repellent and windproof.  
Should have skirt if available.

## Jacket

Material of durable wool, should give warmth without bulkiness.

## Underclothing

Except in extreme temperature wear the same as in town.  
Outside clothing will adjust to changes in temperature.

## Mittens

A combination of wool for warmth and leather for waterproofing is excellent.

OTHER EQUIPMENTIce Axe

## Handle

Wood of good grain.  
Average length, 33 to 38 inches.

## Head

Should make a 90 degree angle to the shaft.  
Shovel, wide and about  $4\frac{1}{2}$ " long.  
Pick, fairly straight and about 7" long.

Ferrule and spike should be two pieces

## Glide ring

Should slide easily and rotate around the shaft.

## Care of the axe

Shaft should be treated periodically with boiled linseed oil.  
Head and spike may be smeared with clear vaseline to prevent rust.  
Store in a dry place.

## Sleeping bags

## Kinds

Down--a permanent investment

Most warmth per unit of weight.

## Specifications

One or two piece bag depending on individual's desire.

Tapered foot

Two pounds of down

Tubular construction for the down quilt

Draw string at neck opening, or shoulder pad

No side opening

Total weight, 4 to  $5\frac{1}{2}$  pounds.

Wool--will have shorter period of life in the bag.

Will require 4 to 5 pounds of wool for equal warmth.

Should also have tapered foot, closed shoulders.

Total weight, 8 to 10 pounds.

Kapok--entirely unsatisfactory, disintegrates with use.

## Care of bag

Be sure to dry thoroughly before storing.

Should always be stored rolled loosely.

Allows down to fluff and maintain its life and helps to prevent wool from matting.

### Packs

Bergen--steel or rattan frame

Fine ski pack, good all around pack provided load not too heavy.

Trapper Nelson

Good for heavy loads.

Causes sweating where pack rests on back.

String board

Similar to Trapper Nelson, avoids the sweating but the strings need tightening often.

### Rucksacks

Frame packs are all unsuited to rock climbing, therefore need rucksack in addition.

Large, roomy, partially filled bag better than a small stuffed bag.

Fits back better.

Pack should fit close to the back, carried high with the weight well distributed.

Pockets should be well covered and fastened.

### Tent or tarp

Many kinds available--most essential characteristics are water-proofness and light weight.

### Crampons

Must fit the shoe snugly.

10 point Eckenstein model considered the best. Some 8 point models also satisfactory.

Forged crampons are best.

Points should be at least 1 to  $1\frac{1}{2}$ " long.

Care of crampons

Strap to a board or heavy cardboard when not in use.

Keep straps lightly oiled if made of leather.

### Glasses

Unbreakable glass, optically correct in a green shade is best.

Amber or smoke shades may be used.

(Never use blue as it lets in all the harmful rays.)

If a lense is broken cover with adhesive tape, leaving a tiny slit.

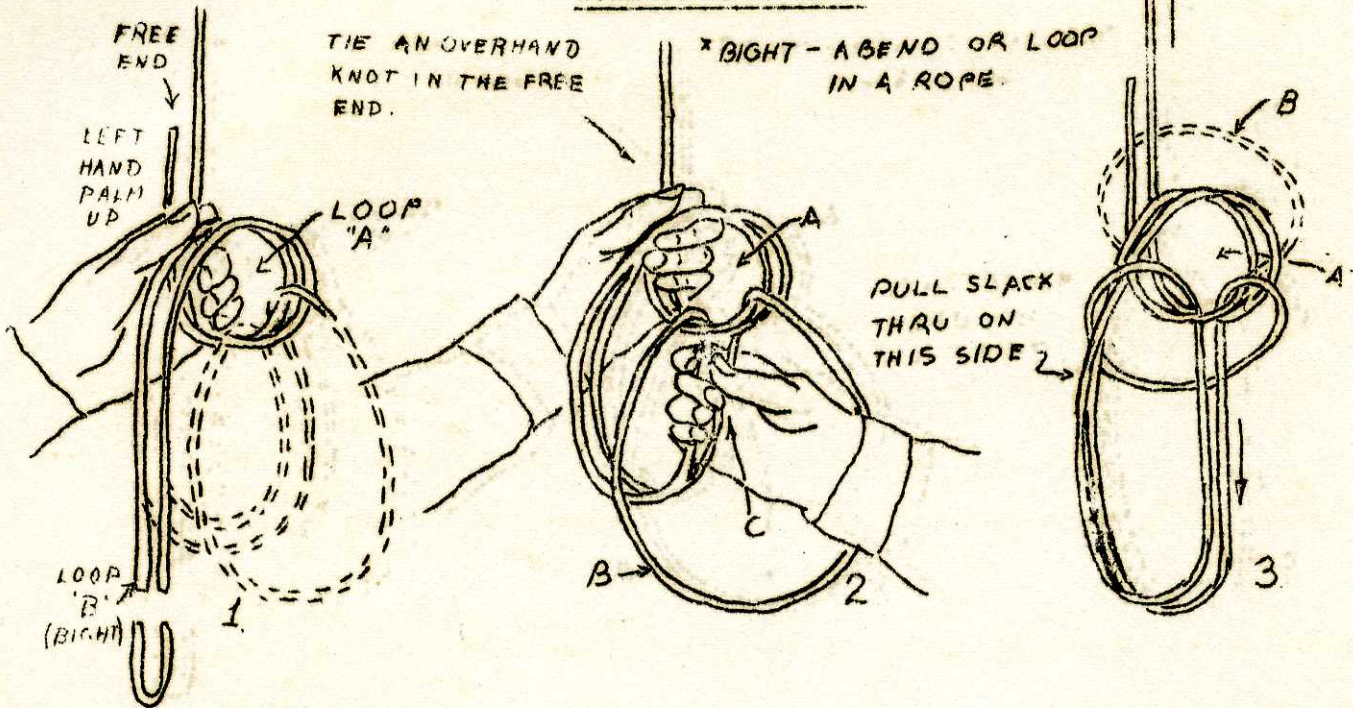
### Rope

A good grade manila rope proves very satisfactory since the expense is small and a new rope can be purchased each season.

100 to 120 feet is the usual length.

$\frac{7}{16}$ th is the recommended diameter.

BOWLINE ON A BIGHT



By carefully gaging the exact length of bight you need (to form the knot and loops), you will avoid having to make excessive adjustments.

Begin by passing loop B thru loop A, from rear to front.

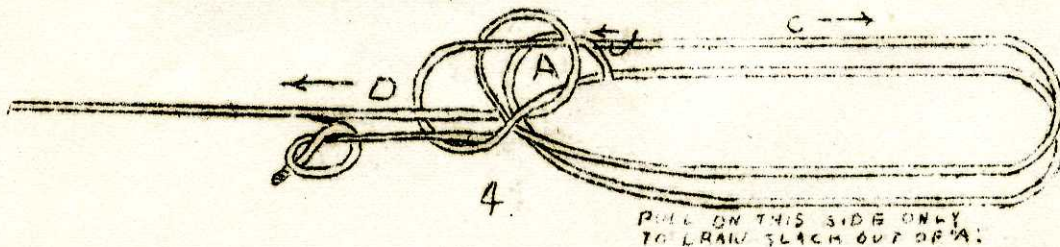
After passing loop B thru loop A, let the bight of B hang down. Pass R.H. thru B, seize both ropes at C and pull out thru the bight or loop B.

This will cause B to draw tight, but before it is completely drawn, throw loop B up under the lead line,

As shown by the dotted line, Fig. 3.

Now draw tight by pulling in the direction of the arrows.

Keep fingers in loop A until loop B closes, to keep the knot from slipping out of place.



Note that all pulling is done by gripping at C and D and pulling in opposite directions.

Changing hands is unnecessary.

One of the loops is worn over the shoulder to support the other loop at the waist, the shoulder loop also provides support for the back and eases shock.

This knot has to be adjusted in place on the body, as the shoulder loop will be longer than the other. Take hold of the rope which is to be shortened, at J, and push it back thru loop A (to left in diagram), then pull back on the other loop. The same result can more quickly be achieved by gathering the loop B (Fig.1) uneven, i.e. one side longer than the other.

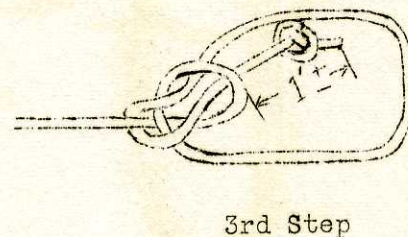
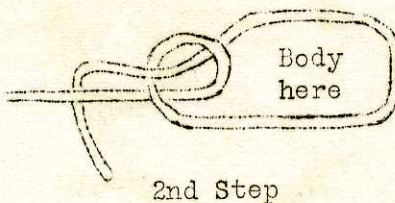
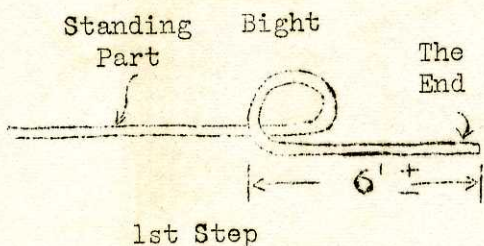
Be sure that the waist loop fits: snug enough not to pull off over your shoulders on an upward pull, yet loose enough to slide around freely.

Be sure that the free end is knotted.

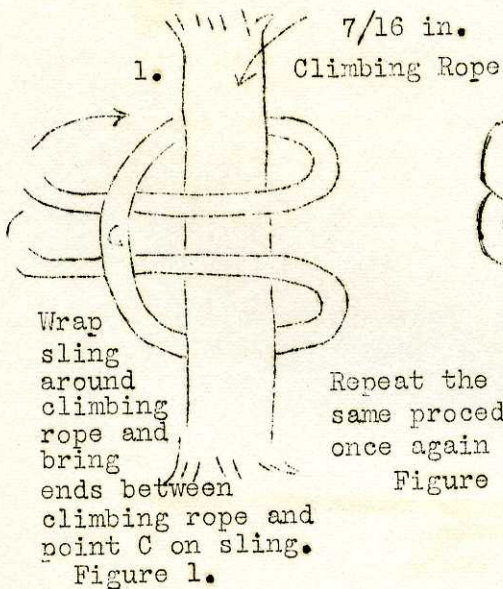
THE BOWLINE

Overhand knot  
to prevent slippage

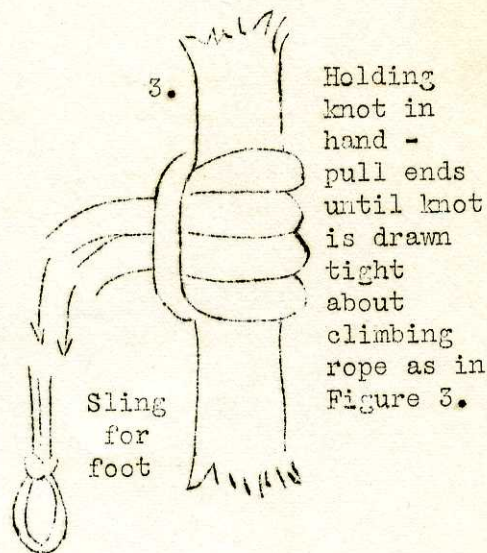
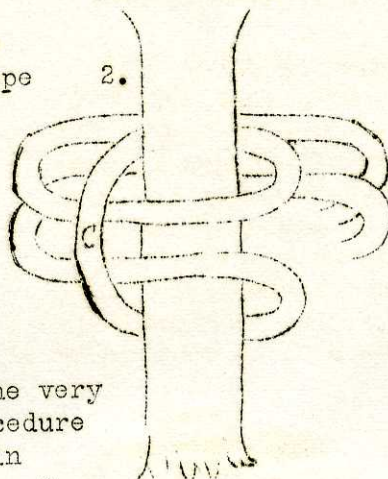
(Tie around body)



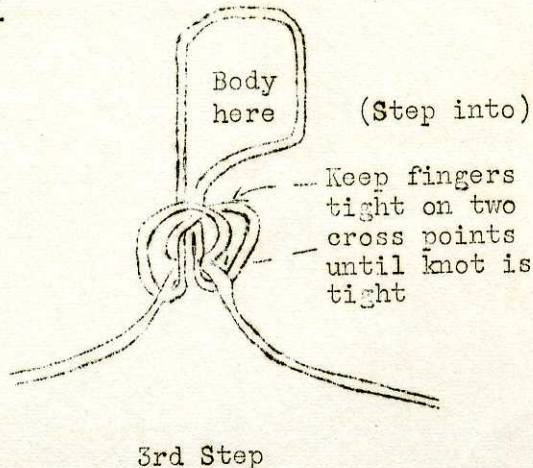
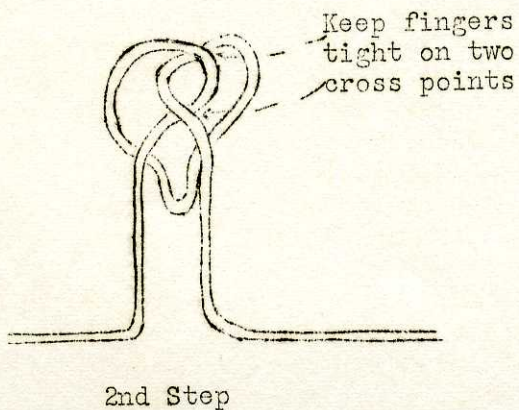
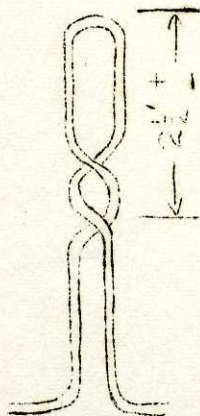
PRUSIK KNOT



Repeat the very same procedure once again



MIDDLEMAN'S KNOT



TRAIL TECHNIQUESTARTING:

Lace shoes tight around instep; loose around ankle. Can use square knot halfway up shoe.  
 Use extra clothing for first half hour.  
 Loosen belt, collar; keep arms free from carrying.  
 Start slowly, adjust pack after 10 minutes walking if necessary.

WALKING:

Use a steady rhythmic pace.  
 When going up an incline shorten length of steps but not rhythm.  
 When going down an incline, lengthen steps.  
 Adjust your breathing so it is in rhythm with your walking.  
 Pace should not be so fast that it becomes necessary to breathe thru mouth.  
 Talk only on easy stretches if you are in poor condition.  
 Do not step upon objects such as stones or logs but try to swing legs over without raising body.  
 If foot slips when making step, let it slip so as not to lose rhythm and do not try to step twice as far with the next foot in order to make up lost ground.  
 Watch country, blazes, position of sun and look back to rear occasionally so you will recognize territory on return.  
 Do not short cut on switch backs.  
 When going downhill, set feet firmly to prevent tiring of knees.  
 Approximate travel times on:  
   Good trail ascend 1000 feet per hour.  
   Good trail descend  $2/3$  of ascending time.  
   Good trail ascend on skis about 600 feet per hour.  
   Good trail descent on skis  $1/4$  to  $1/10$  of ascending time.  
   Steeper travel proportional to difficulty of trip.

RESTING:

Rest only long enough to adjust equipment or regain breath; about 2 minutes for most rests.  
 The body should never get chilled by resting, or all the benefit of building up the body to a rhythmic pace will be lost.  
 Relax as much as possible. On standing rests plant both feet firmly and level on the ground with the knees straight.  
 Don't conceal panting - breathe deeply to build up oxygen supply.  
 Take off pack on longer rests.  
 Put feet in cold water at noon if possible. (dry socks)  
 On rests of 5 to 15 minutes for eating or separating the party, extra clothes should be put on to avoid chilling the body.

GENERAL:

With rhythmic breathing and pace, with constant exertion on each step, the lungs and heart are supplying your body with its required needs. You move along without any conscious effort on your part. A short rest of a minute or two does not give your body time to cool off and disturb this stability. A long rest will upset this condition and you will have to put on extra clothing, start off slowly again and build your body up to functioning uniformly again.

Slow moving is not less effort than moving reasonably fast.

The maximum movement is that pace which your system will carry on without demanding direct impulses from the brain and in which you do not feel the symptoms of exhaustion.

The pace should be such that very few rests are required. One or two an hour should be sufficient except on steep inclines or high altitudes. Make the rest points at a stream for drinking or for camera shots, so as to avoid making additional stops for these things later.

The "rest step" is used where the route is steep and laborious and in high altitudes. On each step you pause for one beat with the lower leg extended straight and the foot flat on the step. This rhythmic pause gives each leg in turn a moment of rest on each step. The upper leg gets very little rest on the pause because the muscles are not relaxed as they are in the lower leg.

Mountain sickness is caused by lack of sufficient oxygen at high altitudes; its cure is deep rhythmic breathing, one, two, or three breaths on each step, depending on your condition and the altitude.

## References:

"Mountain Craft" -- Young

TWO OBJECTIVES: SAFETY EFFICIENCY.

The three principal epochs in the history of climbing.

The first period:

Walking Rhythm; the use of large flat footholds, forcing the climber to follow gullies and couloirs which have basically bad rock and are natural chutes for falling rock.

The second period:

Grip Climbing; broken rhythm, requiring the use of sharp edged hand holds, too much work was done by the arms and hands.

The third period:

Balanced Climbing--the use of small holds; there are 10 small holds to 1 large flat one. Climber stands erect, and is forced to climb with his feet. Being away from the wall his vision is improved, his field of sight is enlarged, and he is at the safest possible angle to the slope.

This allows you to climb in rhythm, the basis of efficiency.

CLIMBING WITH THE EYES:

Start to study it as soon as the mountain is visible from the car or trail.

See it from as many angles as possible, fog or other mountains may obscure it later.

Plan your route many feet ahead, noting holds, etc.

Soon get to know whether a place is climbable or not; only way rhythmic progress can be maintained.

Keep general route in mind and check on other mountains or land marks whenever possible.

BODY VERTICAL TO SLOPE:

Tendency to cling and lean in must be overcome because it obscures vision, puts weight on hands, breaks rhythm, makes small holds unusable, knees have no room to work.

THREE POINT SUSPENSION:

Move one member at a time.

Possible to return if position is bad.

Always two holds left if one gives away.

FOOT HOLDS:

Better footholds are slightly to right or left of the body so knee can be flexed sideways and not throw the body outward out of balance.

Use small holds close together.

Place foot--don't jump or spring; be sure new foothold is sound before abandoning old one.

Nailed boots, take advantage of edges.

Soft-soled shoes, bend the ankles and keep the sole flat on slab of rock.  
KEEP OFF KNEES.

HAND HOLDS:

Chiefly used to keep you in balance; most effective at shoulder height or lower.

Test holds, if possible keep pull in same direction all the way.

Hard to test sideways and out pull from above.

Small holds safer, less chance for erosion.

Pressure holds valuable, do not dislodge rocks.

Down pressure - "Press holds",



Outward pressure (stemming) - "Push holds" between level of waist and neck.

Cross pressure.

"Cling under" holds valuable in keeping body erect.

Combination press hold with arm and cling hold with fingers used over smooth rock slabs where either one alone would be insecure.

Don't get "spread eagled".

#### DOWN CLIMBING:

Face out.

Use down pressure holds, hands low to keep from pushing yourself out too far.

Move smoothly, don't jump or jerk.

Work right and left (facing sideways for steeper slopes).

Always full side of foot to rest on hold.

Easier on hands and knees.

Easier to see the route as well as holds ahead.

Facing inward should never be used if possible to face outward; used only on nearly vertical slopes.

#### UN SOUND ROCK:

Test very carefully, especially for direction of pull.

Watch snow fingers and couloirs for new rock falls.

Keep party close together.

On unfrequented routes, big detached blocks are assumed unsafe.

If they are to be tested let last man do it after entire party is above.

On very rotten rock keep body close; in case of break, sink against rock for friction.

#### CARRYING THE ICE AXE:

On the trail: As a cane, with the pick to the front.

Under arm, with pick up along should blade. (Avoid endangering followers)

Balance weight in hand with spike end to front.

In rucksack, with spike end projecting vertically upward.

In rucksack, with spike end projecting vertically upward.

On rock: when using hands, fasten to sling around waist or to wrist.

On steep grass or heather, as a claw hand.

Traversing slopes, hold on high side for balancing.

#### GENERAL:

Don't roll rocks; place loose rocks where they will not be dislodged.

Know types of rock in each mountain.

Use all of body for friction holds, knees, shoulders, etc.

Don't underestimate the dangers of climbing and get careless.

Be as careful coming down the easier places as going up the hard ones.

Accidents happen anywhere.

#### STANDARDS OF ROCK CLIMBING ABILITY DIFFER:

Don't go beyond your ability.

A strong leader does not make a strong party.

Type of shoes affect efficiency.

Cold, wet, or icy rocks reduce climbing possibilities.

Your own efficiency varies, over-exertion, state of health (physical and

Practice. mental)

#### CHIEF PURPOSES:

A greater enjoyment of the mountains, depends on good physical condition.

Study everything about nature you have time for.

Associate with Mountaineers.

Enjoy the valleys as well as the heights.

Visit the mountains at all times of the year.

WOODCRAFT AND CAMPING

## WHAT YOU CAN CARRY IN YOUR HEAD WILL SAVE WEIGHT IN YOUR PACK

PREPARATION FOR TRIP

Organize personal equipment for emergency use in pockets, in pack, in camp.  
 Determine efficient lines in absorbing landmarks, adopting habitual answers to conditions of country so that you can always definitely say "Here, I would have done so and so"; of noting alternative routes; other people and their usefulness.  
 Practice "forced landings" mentally.  
 Study all maps and printed matter beforehand and make notebook enroute. Add to safety by logging the route for sake of giving directions to others later.

CHOOSING CAMPSITESMAKE SURE DRINKING WATER IS PURE

"Running water" below habitations is dangerous unboiled.  
 Murky water can be settled with corn meal or condensed milk.  
 Stagnant water can be cleared by boiling with charcoal and decanting.  
 Filters are probably untrustworthy.  
 Wet wrappings outside canteens cool contents.

LEARN WHAT KINDS OF WOOD BURN WELL and where to find them.

For kindling, squaw wood, dead twigs on standing conifers, inside of cedar stumps, fat pitch pine or pitch pockets from stumps. (If absolutely necessary, under side of leaning trees hacked out.)  
 Tough high altitude woods have exceptional heating value.  
 Dogwood only western wood that makes good coals.  
 Do not hesitate to carry kindling in pack or to start fire with alcohol paste or candle if no primus stove or acetylene lamp is at hand.  
 Whittle five times enough match-sized kindling and break up more than enough finger size.  
 Plan to burn poles to save axe work.  
 Save stub fagots for cookfires.

CAMP IN SAFE, OPEN SPOT

Safe billet involves no danger from rising water, including distant cloudbursts, flooding ravines or islands in ravines; slides and falling rock or ice; widow-makers in trees; spreading fires; undue exposure; pests.  
 It includes a marked way to your back trail, usable in fog.  
 Consider slopes and drainage.  
 Avoid ravines when possible as fog pours down them with cold from above.  
 Sandy points have midges; clay makes mud; gravel is best and holds tent pegs best.  
 Sweep trash to center of fireplace and burn.  
 Clear trash that might get into cooking under nailed-boot traffic.  
 Avoid lightning rod trees.  
 Choose sun exposure, usually E or SE to dry out camp. Remember leather mildews most easily, then woolens, then cotton.  
 In summer seek breezes; in winter, shelter.  
 Rocks absorb heat and retain it, grassy glades are cold.  
 Air on a knoll is warmer than below on the flat.  
 On practically bare hillside get below thicket or rock so cold air will jump over you.

**EMERGENCY BIVOUACS** may be under poles laid against down tree or root, under rock overhang.

Unless it is raining, first choice is beside a vertical boulder. Build early fires against rock, after leveling ground in front. After supper, sweep fire five feet away, sweep place clean browse.

Maintain reflector fire and sleep on warm spot with reflecting rock behind.

Good sleep may be had between two fires by rotating on guard duty.

### CAMPMAKING

Follow a definite routine in all campwork. Depending on menu, possibly start food soaking first, otherwise:

**GET WOOD** by daylight, much more than you expect to need.

Note landmarks and resources while dragging in wood.

Pile wood convenient to fire but not so close that sparks may cause it to burn.

Axe and pots and unused equipment should be kept near woodpile.

**PREPARE SLEEPING PLACE** thoroughly; with axe head or ice axe and boots get out roots and stones; make comfortable and ready with hip hollows.

If using tent do NOT put it up now unless it is starting to rain and ground needs covering.

**MAKE FIREPLACE:** one cook fire later to be campfire for small party, and camp or comfort fire for larger party to avoid kitchen confusion.

Fireplace may be stones, pit or crane.

Have fireplace away from sleeping place as food attracts mice.

**CACHE FOOD** in or between trees; if on ground, then on sticks or stones. Place things requiring cold storage in stream or snowback or at least in pit.

Consider axe-handle, leather, composition and bone buttons etc., if porcupines and squirrels are on prowl for salty things.

(It is a sin to drive nails into trees that may ever be sawed as broken millsaws kill men. Wooden pegs can be driven into vertical slits if absolutely necessary, but a GOOD CAMPER will leave NO TRACE except his signed fireplace.)

**SANITATION** can be provided by pits, or on bivouacs by upturned boulders. We all want clean campsites therefore should leave campsites thoroughly clean.

**BRING DISH WATER** in any idle utensils or usable tin cans.

**ARRANGE YOUR EQUIPMENT** Put up tent if you have one.

Do Not Unroll your sleeping bag so it will not be damp at bedtime.

Arrange packs, cameras etc., conveniently and safely.

**LIGHT A FIRE**

Have everything ready at hand before striking a match.

Match should be held near head, head down, facing into wind, hands cupped with backs to wind.

Strike on match safe, knife handle, button or inside broken stone when wet.

Flame goes UP, so match may be laid against one or two small andiron sticks, and handful of fine splinters or fuzz sticks put above it.

**LIGHT A FIRE (CONTINUED)**

Finger-sized fuel bridging the andirons permits fire to do its own blowing, which is the secret of firemaking-natural draft.

Cookfires should be lighted and built up; campfires may be built and then lighted.

While pots are heating put away kindling for morning.

**KEEP UP WITH DISHWASHING** by having immediate hot water and washing mixing cups at once.

Horsetail grass, moss pads along streams (unless the roots carry too coarse sand), snowballs, all make good scouring pads.

Punk chips or fagots make scrapers that do not ruin aluminum.

Wood ashes and grease make soap so ashes clean frying pans when rubbed into the grease.

Before moving camp, sooty pots may be scrubbed on the ground; no harm scratching the outside a little.

**THE COOKING**

The main dish has the best place on the fire.

Dried fruits must barely stew not boil.

Biscuit and cornbread may be made in frying pans between hot rocks and fire.

Meat is better grilled on forked sticks or hot stones than in pans.

Stews are better if meat is braised in pans before going into pot.

A good cook for a party will insist on no interference in the kitchen but will expect cooperation if he asks for help.

**TO PUT OUT A FIRE**, water should be used at any cost of work, if available; then snow, at least dirt.

Tins will first have been burned to eliminate future odors, punctured unless suitable for future utensils, and buried in pits.

A fire is out when one can walk on his bare hands in its place, when there are no underground peat bog leads afire because the place was cleared to mineral earth, not just to the humus layer.

If it is out, put two unburned crossed sticks to sign that you knew it was out. Any woodsman will commend you.

**THE ACME OF ONE MAN COOKING** is to choose a banksite, get all materials and pack, sit down, light fire, cook, eat, wash dishes, put out fire with dishwater, pack up and THEN and only then, rise from your seat. Until you can do this you are still just a customer, not a woodsman. There is nothing superfluous or affected about system, promptness, maintenance of one's own morale, and preparedness---they are the only kinds of insurance against serious grief during weariness, storm, accident.

**References:** Camping and Woodcraft - Horace Kephart.  
 The Forest, The Cabin, The Pass - Stewart Edward White.  
 Scouting on Two Continents - Major Burhan.  
 Jack Knife Cookery - James A. Wilder.  
 Gentle Art of Tramping - Stephan Graham.

## ORIENTATION INSTRUCTION OUTLINE

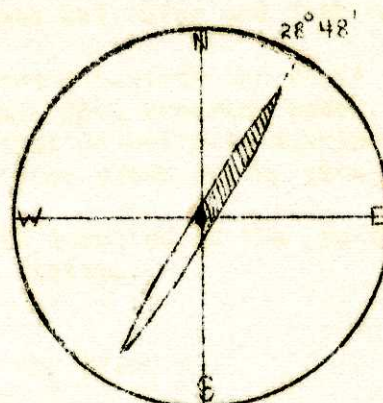
### THE COMPASS

The circle of direction is divided into 360 equal parts, called degrees, numbered in clockwise direction starting at North.

The needle of the magnet points to the magnetic north.

Magnetic declination is the number of degrees between magnetic North and true North.

Magnetic declination is nearly 24 degrees East of North at Seattle.



### THE MAP:

Forest Service maps indicate rivers, mountains, roads, buildings, trails, lookouts and some elevations. They are generally accurate and up to date.

U.S.G.S. Topographical Maps show these features and also elevations at all points but they are often less accurate than Forest Service maps as modern trails, roads and buildings are not well represented.

Conventional signs are explained on the back of Topog. maps.

Scale: Square miles are laid out in places on the contour maps.

Use these to measure horizontal distances.

Contour: Contour lines in the North West usually represent 100' vertical intervals on U.S.G.S. maps with heavier lines for 500' intervals.

Magnetic declination for the region is given at the bottom of the map.

### USE OF COMPASS AND MAP

Turn the compass so that the needle points 24 degrees East of North on the compass. Then N points to true North.

Orient the map so the vertical lines are parallel to N-S line of the compass.

Extend a straight line from your position, as shown on the map, through any other point on the map. Extension should point to the object of interest.

Extend a straight line from any reference object through its representation on the map. Extend a second line from another reference object through its representation on the map. The intersection of the two lines is your position.

For identification of reference points, the shapes of peaks, ridges or gullies can be recognized from contours on the map.

### SIX METHODS OF DETERMINING DIRECTION

1. Compass: as described above.
2. Time piece: with the hour hand pointing to the sun, South is halfway between the hour hand and twelve.
3. Sun: sun is in E at 6 AM; S at 12 AM; W at 6 PM.

4. Moon: Full moon is in E at 6 PM; S at 12 PM; W at 6 AM.  
     First quarter is in S at 6 PM; W at 12PM.  
     Last quarter is in E at 12 PM; S at 6 AM.
5. Stars: The North Star is closely due North, the end star in the handle  
     of the Little Dipper.  
     The two stars opposite the handle of the Big Dipper point  
     approximately toward the North Star.
6. Map: Orient the map as described above from two known points of  
     reference, preferably including your own position, and their  
     representation on the map.

#### SOME SUGGESTIONS

Plan the trip with the map before you go, so you will know the country.  
 Check the distance to be travelled, elevation changes, drainage systems, etc.  
 In new country pass from one reference point to the next, establishing each  
 on the map as you go. In fog or dark make these closer together.  
 Orient self before vision is obscured by a fog or night. Fix  
 landmarks on ascent, trees, rocks, other peaks, check map often.  
 Use your compass continually, especially in fog or bad weather.  
 Use your map continually, especially in new territory.  
 Use your eyes continually.

References: Mountain Craft: Young, G.W.  
 Technique of Alpine pp56-64, 370-373.  
 Mountaineering: B.A. of S.A.C, pp63-74.  
 On back of U.S.G.S. Topographical Maps.

## FOOD AND OUTDOOR COOKING

### Kettles and Eating Utensils.

Look over the menu before packing the kettles to make sure what you will need. Take only the essentials.

Use kettles that "nest" and pack the smallest kettle full of small articles, pot hooks, soap, scraper, dish rag, etc.

Pack kettles in cloth bag. (Scrape sooty kettles on ground before packing)

Essential eating utensils:

Cup... should be enamel.

Spoon.

Spoon for cooking...may be long handled wooden spoon.

(Plate and fork are optional)

(One scout kit will do for two people)

Dishwashing accessories:

Dish towel (tin dishes rust easily)

Soap.

Steel wool, small piece, may be burned at trip's end.

(Moss and chips may be substituted)

### Hints on packing food.

At home, weigh out or measure all food for each meal, pack it together in a paper bag and label each bag.

Place all condiments (sugar, salt, tea, coffee, etc.) in containers and put in one sack, labeled.

Suggestions for good, light weight containers:

Paper milk cartons.

Brehms cartons, have tight lids for jam, etc. (2 for 5¢)

Coffee tins.

Dixie cups (for butter)

Old spice tins (for salt, etc.)

1/4 pound tea cans.

Place two dry beans in the salt container to prevent caking.

Place lunches to be carried in the pack in a waterproof bag.

(Oil silk bag with zipper, or waterproofed material)

### Cooking in camp

Two people is the recommended number for a cooking squad, never more than four. This saves time and assures a more convenient use of kettles.

Always carry a written menu to save confusion and to help plan ahead.

Procedure upon arriving at camp:

Divide work to be done among your cooking group.

The cook should consult the menu and soak any foods needing it.

(Sometimes it is possible to soak foods overnight at the previous camp, pour off the surplus water and carry the damp vegetables. This is not recommended in very hot weather.)

The second person gathers wood, makes camp, etc. (Cook may help after the fire is started and the cooking begun.)

Characteristics of a cooking fire:

Small.

Is built in a fire place. (when on snow, place fire on green logs unless only a small quick fire is desired.)

Has some kind of a pot holder.

(Kindlestix or primus stove are useful adjuncts to the cooking fire.)

### Suggestions for cooking.

Develop a system. Get all materials together on a flat rock, log or newspaper and keep them together.

Dried fruits should soak and simmer, not boil all juice away.

Cook fruit tender before adding sugar...prevents burning.

Noodles: Start in a large amount of salted boiling water and boil rapidly, about 20 minutes.

Rice: Start in large amount of boiled salted water, keep stirring, place on hot rocks and cook not too rapidly.

Tea balls are easier to handle than bulk tea.

### Dish washing.

Keep up with the dish washing as you cook.

Put kettles to soak as soon as empty.

Keep hot water, or put some in first empty kettle for dishes.

"THE ACME OF ONE MAN COOKING is to choose a banksite, get all materials and pack, sit down, light fire, cook, eat, wash dishes, put out fire with dish water, pack up and THEN and only then rise from your seat. Until you can do this readily you are still just a customer, not a woodsman."

### Suggested food.

The main purpose of food is for energy, therefore carry the least weight for the necessary food value. Appetite appeal cannot be entirely ignored, therefore some hot food is desirable during the day and there should be some variety.

#### Food composition:

Carbohydrates--fruit, cereal, sugar, candy.

Protein--milk, meat, nuts, cheese.

Fat--nuts, meat, butter, cheese.

The body needs a balance, but the meals at home, weeks before the trip affect your stamina more than what you take. Climbing diets are apt to be high in carbohydrates, for quick energy, but there is also a need for some protein for that "satisfied feeling".

#### Adjust menu to type of trip.

For overnight trip where evening meal is eaten at the car or after a short back pack the food is more elaborate, less attention to weight, canned rather than dried vegetables, fresh fruit and meat, fresh milk in cartons, etc.

For a long back pack where every 1/4 pound counts the food is very simple and weight is conserved in every possible fashion.

#### SAMPLE MENU FOR OVERNIGHT. (Quantities are for one person.)

##### Dinner

1 can soup  
2 hard rolls  
6-oz steak  
small can veg.  
small can fruit  
cookies  
tea, coffee

##### Breakfast

2-oz oatmeal  
8-Oz can fruit  
2-oz rye krisp  
coffee, tea or  
cocca

##### Lunch

1-oz chocolate  
2-oz oak-tak  
2-oz dates  
2-oz figs  
8-oz grapefruit or other  
juice  
2-Oz fruit drops  
2 small oranges



SAMPLE MENU FOR BACK PACKING TRIP

(Quantities for one person for three days)

- |  |  |   |
|--|--|---|
| <p>1. <u>Breakfast at camp</u><br/>           1 fresh grapefruit<br/>           3 shredded wheat<br/>           1-oz powdered milk<br/>           1 butterhorn or pecan roll</p>   | <p>2. <u>Breakfast (base camp)</u><br/>           2-oz prunes<br/>           1-oz rolled oats<br/>           1-oz powdered milk<br/>           2-oz zwiebach unsweetened<br/>           1-oz raspberry jam</p>   | <p>3. <u>Breakfast</u><br/>           2-oz apricots<br/>           1-oz wheat flakes<br/>           1-oz pow. milk<br/>           2-oz bacon<br/>           2-oz zwiebach<br/>           1-oz rasp. jam</p>   |
| <p>1. <u>Lunch (on trail)</u><br/>           2-oz candy bar<br/>           1<math>\frac{1}{2}</math>-oz figs<br/>           1<math>\frac{1}{2}</math>-oz prunes<br/>           2-oz rye krisp<br/>           1<math>\frac{1}{2}</math>-oz shelled walnuts<br/>           2-oz brick cheese</p> | <p>2. <u>Lunch (climb)</u><br/>           2-oz lemon drops<br/>           2-oz fruit candy bar<br/>           3-oz pitted dates<br/>           2-oz oak-tak<br/>           2-oz raisins<br/>           2-oz raw cashews<br/>           2-oz cheese</p>   | <p>3. <u>Lunch (on trail)</u><br/>           1<math>\frac{1}{2}</math>-oz fruit drops<br/>           2-oz pears<br/>           1<math>\frac{1}{2}</math>-oz raisins<br/>           1<math>\frac{1}{2}</math>-oz filberts<br/>           2-oz Wisc. cheese<br/>           1<math>\frac{1}{2}</math>-oz pilot bread</p> |
| <p>1. <u>Dinner (base camp)</u><br/>           1-oz dehy. veg.<br/>           2-oz macaroni<br/>           6-oz steak<br/>           1<math>\frac{1}{2}</math>-oz rye krisp<br/>           2-oz dried peaches<br/>           1<math>\frac{1}{2}</math>-oz fig bars</p>                         | <p>2. <u>Dinner (base camp)</u><br/>           2-oz chinese noodles<br/>           2-oz roast beef<br/>           1<math>\frac{1}{2}</math>-oz dehy veg.<br/>           1<math>\frac{1}{2}</math>-oz pilot bread<br/>           1-oz raspberry jam<br/>           1<math>\frac{1}{2}</math>-oz dried apple (apple-sauce)<br/>           1<math>\frac{1}{2}</math>-oz fruit cookies</p> | <p>3. There is usually no need to arrange a third dinner, but it nice to have something to munch in the car on the way home.</p>  |

To the above the individual should add 4-oz butter, 4-oz sugar, salt, tea, coffee or cocoa to suit himself.

SUGGESTED ALTERNATES TO THE ABOVE MENUSBreakfast

- Omlet: powdered eggs mixed with water and powdered milk, then fried in pan in which small amount of bacon has been fried.
- Oatmeal delight: (or other cereal) cook dried fruit and cereal separately then mix just before eating.
- Cocoa: mix ingredients in proper proportions at home, allow 1 tsp. cocoa, 1 tsp. sugar, 1 tbsp. powdered milk per cup. To make, add small amount of hot water to make a paste, then dilute.
- Bacon: 1/2# will make 4-6 servings. "Cottage butt" makes an excellent substitute for bacon, less fat, meat more like ham. May also be used in dinner menus.
- Powdered milk: To mix add a little water slowly to 1 ounce of powdered milk to make a thick paste. Make smooth, then dilute till 1 cup of milk results.

Lunches: "Squirrel" lunches are recommended for all major peaks and all back pack trips. On one day trips one may carry more variety if desired. Always carry your own lunch, then you will have it when you are hungry.

Dried fruits: important to have a variety.

Butter: 1/4# per person per day adds much to appetite appeal.

Van de Kamps dark nut bread: is very moist.

Lemon: added for thirst.

Grapes, Thompson seedless: pack in paper carton to prevent crushing.

Tomatoes: small, firm, fresh tomatoes, packed in carton are good for thirst.

Raw carrots, celery

Dinners:

Homemade beef stew: made with little liquid, packed in quart cartons makes an excellent very quick dinner for the first night in camp.

Hamburger patties: made at home, packed with waxed paper between.

Fresh meat: carries better if the butcher cuts to size, packs with butcher paper between each piece and wraps the whole in two or three thicknesses of paper to prevent leaking.

Tuna, frankfurters, salmon, spam: all come in small cans and make good substitutes for roast beef. Chipped beef also good.

Boullion cubes: add much flavor to vegetables and noodle dishes.

Cheese rarebit: quantities for 2 or 3: Melt 2 tbsp. butter, add 2 tbsp. flour, mix until smooth, add 2 cups milk (make the powdered milk extra strong for more nutrition) slowly and stir till mixture boils. Add 1/3# medium sharp cheese and simmer until cheese is melted. Serve on oak-tak, pilot bread or Ritz crackers.

Whole kernel corn; green beans heated in butter.

Potatoes: boiled at home, fried in camp with onion.

Lima beans: make good dish with spam, soaked the night before, then will cook in a short time.

Rice or Macaroni: good substitute for noodles.

Jell-O: add one can fruit cocktail to jello. Make the night before needed.

Dried apples or a product "Apple Krispies" make fine apple-sauce.

Fruit cake or fruit cookies.

Lemon drops in hot water or tea for lemonade.

<u>OFFICIAL SCOUT KIT</u>	<u>RECOMMENDED KIT</u>
Moisture proof container 6 $\frac{1}{4}$ " x 4 x 2	Moisture proof container 6 $\frac{1}{4}$ " x 4 x 2
	36" triangular bandage
1 roll 2" 10 yard gauze bandage 1 roll 1" 10 yard gauze bandage	1 roll 2" 10 yard gauze bandage
1 roll 1" 2 $\frac{1}{2}$ yard adhesive	1 roll 2" 2 $\frac{1}{2}$ yard adhesive - roll on stick to save space in kit
2 2x3 steripads	2 to 4 2x3 steripads
6 $\frac{3}{4}$ " bandaids	6 $\frac{3}{4}$ " or 1" bandaids
Mercurochrome 2%	New iodine - 1 dram Merthiolate - 1 dram
1 3x3 picric acid pad	1 small tube tannic acid jelly 5%
	1 dram castor oil (bottle or tube) or $\frac{1}{2}$ % butyn in castor oil
	1 small box aspirin tablets
	10¢ embroidery scissors
	6 large safety pins
Boy Scout Manual	Boy Scout Manual
Halazone tablets	Boiling preferable
	2 ammonia ampoules
	6 toothpicks and cotton

It is recommended that you use the ingredients in the Boy Scout Kits and replacements may then be made from the recommended list.

The Mountaineers, Seattle, Wash.

FIRST AID

GENERAL PROCEDURE: Keep the patient lying down so that he will not further injure himself. Keep him warm and comfortable. Diagnose his injuries. Administer treatment: if treatment is beyond your ability do not attempt it but get the patient to a doctor immediately.

DIAGNOSIS: Serious bleeding, stoppage of breath and poisoning take precedence, in the order given, over everything else and demand immediate treatment. Since most mountaineering accidents are falls, either or both of the first two may occur and should be looked for at once. In diagnosing the injuries, first determine the nature of the accident from eye witnesses, then look for the injuries which such an accident may have caused.

TREATMENTS

- ARTERIAL BLEEDING: Stop immediately with finger pressure on appropriate digital pressure point; upper arm, under collar bone, neck, temple, groin, thigh. If cut is on arm or leg apply tourniquet on upper arm or thigh. Loosen and allow circulation every 15 minutes. (Stop venous bleeding by pressing clean compress on wound with tourniquet away from heart.)
- STOPPAGE OF BREATH: Apply artificial respiration. Maintain rhythm applying pressure 12 to 15 times a minute. Never miss a beat. Do not give up, breathing has been reestablished after 8 hours.
- POISONING: Dilute contents of stomach with water and cause vomiting.
- SHOCK: Treatment for shock should be given after all important injuries. Keep patient lying down, head lower than body, keep warm, give stimulant.
- FRACTURES: Extremities--Apply fixed traction splint if available, otherwise use ice axe, ski, board, etc., padded with coat for splint. Put forearm in sling. Leg may be strapped to other leg if no splint is available. Shoulder--Put arm in sling and strap to chest. Rib--Strap with adhesive or triangular bandage to prevent movement. Back--Strap patient to door or several wide boards fastened together.
- FREEZING: Replace damp clothing with dry on frozen part. Apply body heat or thaw in cold water. Do not rub frozen parts or expose to direct heat.
- MOUNTAIN SICKNESS: Deep rhythmic breathing. One, two or three breathes to a step.
- SPRAINS: Soak in cold water, tape and bandage tightly. If you are wearing a tight boot, keep it on as it is better support than a bandage.
- CRAMPS: Massage, keep muscles loose.
- HEAT EXHAUSTION: Lie with head lower than body, keep warm, give stimulants, give salt water to drink.
- SUN STROKE: Get into shade, lie with head elevated, cool body with cold compresses, do not give stimulants.
- BURNS: Apply wet picric acid gauze pad, or tannic acid jelly. Exclude air from burned parts.
- WOUNDS: Don't touch. Keep dirt out. Apply iodine and let dry before bandaging.
- INFECTIONS: Apply iodine or soak in salt solution.
- SNAKE BITE: Put tourniquet close to wound on heart side, tight enough to prevent venous flow but not arterial flow. Cut X across bite, cause to bleed. Keep quiet.
- SUNBURNED EYES: Keep shaded, wash out with castor oil or boric acid.
- REMEMBER: Do not give stimulants in case of serious bleeding until bleeding is checked. Do not give an unconscious person a drink.

IT IS STRONGLY RECOMMENDED THAT ALL PERSONS INTERESTED IN MOUNTAINEERING TAKE THE RED CROSS FIRST AID COURSE WHICH IS GIVEN EVERYWHERE FREE OF CHARGE. SPACE DOES NOT PERMIT MORE THAN A BRIEF LISTING OF ACCIDENTS ON THIS PAGE.

The Mountaineers, Seattle, Wash.

## SNOW TECHNIQUE

BALANCE CLIMBING: (Easier to learn on snow than on rock.)

Footwork essential for balance climbing.  
Necessary to maintain a steady rhythmic motion.

### STEPS:

On soft snow it is necessary to maintain a steady rhythm to make headway.

Use "tramp's walk", body swaying from side to side.

Knee bent, weight well forward.

Heaviest man in lead. (He will break thru steps if he is following.)

Take shorter than normal stride: as the steps deepen the stride becomes lengthened.

On hard snow steps to slant inward.

#### On slopes:

Steps short enough for the shortest in the party.

Do not take extra steps between those of the lead man.

Keep right and left feet straight in steps.

In using steps tread exactly in same step.

May improve step by treading slightly on the high side in soft snow.

When climbing vertically in firm snow thrust toe well forward.

Make a new step for a broken one inside the old one.

When coming down step down with weight on heels.

### ZIGZAGS:

Are made to prevent overtiring any one part of the body.

Make turns so that legs are not crossed.

Zigzags are not used on avalanched slopes.

If roped, allow man behind time to make turning step at corner.

### USE OF ROPE AND ICE AXE:

On steep slopes where belays are necessary thrust in the axe above you on each step as far as it will go then pass rope up around the shaft, this being done while the feet are at rest.

Parties do not rope on avalanche slopes; if necessary to use a rope, one man crosses while the man behind is anchored on safe ground.

Two probably best number on rope when glissading.

Axe held on high side of slope whenever possible for balancing.

### STANDING GLISSADE:

Body held upright or slightly backward; do not ride the axe.

The more the knee is bent the more the backward inclination from the hips. Avoid a sitting position.

Feet close together, toes pointing downward; on good snow, one foot slightly in advance of the other and carrying more of the weight.

Steering done as in skating or skiing by twisting the feet, swinging the body, or by thrust of axe.

Braking done by lifting the head of axe with one hand and thrusting spike in with the other.

### SITTING GLISSADE:

Is only used on slopes too soft or gentle for standing glissade, or on slopes of soft snow with patches of hard crust. This position also used in crossing doubtful snow bridges.

SITTING GLISSAGE: (CONTINUED)

Axe held under arm, transferred from side to side for steering.  
 Steering accomplished by swinging legs or obstructing with heels.  
 The straighter the body the faster the pace.  
 Braking done by opening legs and making trough; by pressure on ice axe.

THE ARREST ALONE: (The most powerful)

Face inward with shaft of axe under right arm pit.  
 Grasp head of axe with left hand and right hand close to it.  
 Force pick of axe into snow.

THE ARREST OF A ROPED PARTY:

Jam axe thru loop in rope inclined toward the slope.  
 Anchor man swings below the axe.  
 When there is no loop in the rope, throw the rope over the axe.

STONE TESTS:

Throw a few large stones on snow slope to test it for avalanching;  
 they sometimes clear off the avalanche snow.

GLISSADING FACE INWARD:

Used on doubtful and on steep slopes where a quick arrest may be  
 necessary.  
 Allows us to watch companions above.  
 Allows glissader to watch for rolling stones in couloirs.

THE PLUNGING STEP:

Used on snow too soft for glissading.  
 May start a small snow slide in which you can ride.

References:           Young's Mountaincraft  
                           B.A. of S.A.C.

CLIMBING PARTY MANAGEMENT

MANAGEMENT CAN START WITH ARRANGING TALK. We've had good talks, but some are too long. Arrange them in newspaper style with important points first. Then you can stop within the time limit. You may have lots of knowledge but people can only absorb so much at one time.

DIVISION OF DUTIES IN A LARGE PARTY ARE: Leader in charge, manager, inspector, rear guard. Sometimes you may have a guide, and a secretary. (Summer Outing) It is possible to perform all the supervision with one person in a smaller party.

MANAGER:

Publicize minimum requirements for trip:

For instance on Rainier Ice axe, crampons, wool mitts, colored glasses, first aid, rope, extra clothing, minimum training and climbing experience. Refuse to allow those to go on trips not passing qualifications. Arrange transportation, furnish Leader list of those on trip. Make sure necessary equipment, such as ropes, are carried by the party before leaving town.

LEADER:

Should be familiar with route or else publicize that it is a scouting trip. Should be on hand to look after party; if late, appoint a substitute until he arrives.

He should oversee:

Get members to arrange packs for trip the night before.

Announce rising time, time allowed for breakfast if cooking is done.

Arrangement of ropes and parties.

Look over persons climbing and have equipment inspected.

Rear guard appointment.

Remedies for the morning slow pokes that do not get ready on time:

Party humiliation.

A dash of cold water on the sleepy head. (Better use discretion)

Cook in small groups.

Let rear guard bring up the stragglers.

Early call preferable, if late call entirely leader's fault if party is back late.

Set a moderate pace. Rests short, about 2 minutes, while fresh and not very often. Use long rests for camera shots, lunch, and clothing changes.

Inform party of time.

Keep party moving in rhythm. The leader need not head a column. He can send his better men ahead to kick steps, place ropes, scout, etc.

Separate party within 45 minutes after starting and every 2 or 3 hours thereafter. No need to be ashamed to ask leader to call separation, or remind him at rest period.

General things to do on the climb:

Look back to see how members maintain pace.

When leaving someone behind, they must stay at a set location.

Spread party fan-shaped when danger of rolling stones.

Give instruction or have someone give it when occasion demands it.

Sometimes more enjoyment for all to separate party into slow and fast group. The fast can kick steps, choose more interesting deviations, etc. to absorb time, as generally better for all to be on summit at same time.

Put tired members in front to rejuvenate them.

Rope party when danger of getting separated in fog or darkness.

LEADER: (Continued)Appoint at camp:

- Person to dig garbage pit.
- Someone to arrange men's and women's toilets.
- Someone to look after drinking water supply and mark stream.
- Perhaps evening campfire arrangement and entertainment.

REAR GUARD:

- Brings up the stragglers when party starts. Prefer not to have any.
- Be sure no one drops out without permission from the leader.
- Look back often toward rear so topography will be familiar when he leads the party back on the return.
- Notify leader if pace is too slow or too fast.
- Notice location of last water, shelter, or other useful topography.

FOR THE PARTY:

- Accept management as a matter of convenience.
- A well managed party will be smooth running and will not have an over managed appearance.
- Party must be familiar with party management and be willing to help with work.
- When leader is talking, cease talking and all other operations. Pay attention.
- No short cutting unless told to do so by leader, as it tends to rush those in front and is very tiring.
- Do not criticize leader even on his mistakes until trip is over, then improvements may be suggested at a climbing committee or to the committee.
- It is permissible not to follow a leader only on such occasions such as routes of **great** danger, like along a cornice. Then make safe steps paralleling the unsafe ones.
- Bursts of temper and hot words should be avoided. If they occur, they should be forgotten as sudden crisis sometimes set them off.
- Hide or destroy all waste. Leave the mountains as you found them, clean and beautiful.
- Mountain sickness at high altitudes is caused by lack of oxygen. The cure is deep rhythmic breathing of one, two, or three breaths each step.
- All men in party should expect to carry some party equipment, such as a rope.
- To thoroughly enjoy a trip:
  - Good health
  - Good fellowship
  - Good climbing
  - A knowledge of mountaineering.



AVALANCHESDEFINITION AND TYPES

An avalanche is the fall of a mass of snow, ice, or rock down a mountain slope. The period of greatest avalanche danger is during the winter and spring. Superficial Avalanche occurs when one or more layers of snow slide off of the remaining snow. This is the most common snow avalanche. Ground Avalanche occurs when all the snow slides and leaves the bare ground showing.

## DRY POWDER SNOW (NEW SNOW) AVALANCHES ARE:

Light in weight as compared to other types of avalanches.  
 Very fast moving.  
 Accompanied by a high wind which they create.  
 Very destructive but, because of the large amount of air in them, a person can live for considerable time after being buried.  
 Chiefly dangerous for several days after heavy dry snow fall.  
 Known to have fallen on slopes with an angle as low as 23°.

## WET SNOW AVALANCHES

Winter Damp Snow Avalanches are:

Very heavy and destructive but slower moving than dry snow avalanches.  
 Formed from either new wet snow or melting powder snow.

Spring Wet Snow Avalanches are:

Heavier and more destructive than Winter Damp Snow Avalanches.  
 Often caused by an underlayer of crust that becomes well lubricated during spring thaws and allows the upper layers to slide off.  
 Nearly always fatal to persons buried in them because the person is either crushed when the heavy snow come to rest and expands, or soon suffocates.

## WIND SLAB IS:

Probably the most dangerous avalanche formation.  
 Formed by wind action on the lee side of ridges.  
 Practically without anchorage to the lower layer and when it is crossed will collapse and slide.  
 Chalky, dull white in appearance and breaks up and slides in blocks.

NOTE: Wind Crust is formed by wind action on the windward side of ridges, is well anchored to the underlayers, and will not avalanche when it is on the surface.

CAUSES OF AVALANCHES:

Snow is continually changing thru thawing, freezing, evaporation, and recondensation so that its internal structure undergoes many changes. During these processes a slope can change from safe to dangerous and back to safe without avalanching because no sudden stress was placed on it that would start a slide. However, during such changes it may slide due to internal weaknesses only.

The following are some of the most common causes of avalanches.

The steeper the slope the greater the chance for the snow to slip.  
 25° to 30° considered the danger line, but slopes of 15° have avalanched.  
 The deeper the snow the greater the chance of an avalanche.  
 Poor anchorage between the ground and the snow. Grassy slopes will avalanche more easily than wooded or boulder strewn slopes.  
 Poor anchorage between new fall snow and old crusty underlayers.  
 If new snow falls during freezing temperatures it will have poor anchorage to the undersurfaces.

## CAUSES OF AVALANCHES: (Continued)

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Warm spells and spring thaws and rains may lubricate grassy underslopes or underlayers of crust and allow the top layers to slide off.  
Traversing slopes by skiers or climbers may break the anchorage.  
Cornices or seracs often avalanche by themselves and may carry the slope they fall on down with them.  
Gullies usually avalanche before the ridges they divide. Often the first avalanche from a gully breaks the support from tributary gullies and they avalanche down over the original slide.  
Convex slopes will slide more easily than concave slopes.  
The weak point of a slope is often just below a ridge.  
Uniform, regular contours are more dangerous than ridged or broken up hill sides.

## PREVENTION

Wait several days after deep new snow has fallen before starting trips.  
Avoid deep powder snow on steep slopes if possible.  
Follow along ridges and ribs instead of open slopes or in gullies.  
Travel vertically up or down dangerous slopes.  
Study snow layers. Underlayers of crust may be wet, well lubricated and allow upper layers to slide off.  
Stay out of narrow valleys that may become "avalanche traps".  
Travel on the windward rather than the lee side of ridges, thus avoiding windslab and cornices.

## TACTICS WHEN CROSSING AVALANCHE SLOPES

Don't rope up unless the climbing hazard is greater than the avalanche danger.  
Travel rapidly, belay only from very strong positions.  
Space out, keep a long way apart.  
Go straight up or down the slope if possible, do not traverse or zigzag.  
Remove skies and walk. Skis cut more support from the slope than boots.  
Trail a long colored cord (avalanche rope) that can be easily seen if you are buried.  
Loosen skis and pack and hands in ski pole loops so they can be "cast off" fast.  
Think--know what you will do at any moment if an avalanche comes.

## PROCEDURE WHEN CAUGHT

If time permits and you are near the edge of the avalanche slope, it may be possible to get into the woods or some other place that is not avalanching.  
However, it is rarely possible to outrun an avalanche on skis.  
Kick off skis and poles before being caught.  
If slide is small, ram the axe into the underlayers and hold on.  
When caught, swim and roll vigorously toward the outer edge of the avalanche with your head uphill.  
Make every effort to stay on top of the slide.  
Beat your arms vigorously before the avalanche come to rest so as to keep air around you and to prevent being crushed.  
An avalanche is like a river; fast on top and center and slower on bottom and sides.

## RESCUE PROCEDURE

Tie in the point where the victim was last seen with some landmark.  
Hold the sight on some chunk or spot on the surface of the avalanche to see where it stops, if possible.  
The person caught will usually be found between these two points.

RESCUE PROCEDURE (Continued)

Estimate how far the victim was carried beyond the place where he was last seen.

Mark the spot where the victim was last seen.

Look for personal effects, equipment, or exposed parts of the victim.

Follow rapidly down the avalanche probing behind rocks, trees, or on ledges where snow was deposited.

Probe systematically every foot from the lower end of the avalanche to where the victim was last seen. Start at lower end of avalanche and work up.

Stagger the probers so that no time is wasted or area overlooked.

Dig trenches up the slope if probing has failed.

Send for help.

Don't give up too soon. People have been revived after being buried several days.

Keep an alert watch for other avalanches.

Give artificial respiration if breathing has stopped. Warm slowly, by placing frozen members in cold water or by placing next to body till circulation is restored. Do not warm too rapidly or use direct heat or the cells may be destroyed and amputation may be necessary later on.

Waste no time in bringing the victim back to normal. If he is not revived as quickly as possible, pneumonia may follow.

Give no stimulants until the patient is conscious.

SNOW AND ICE GULLIES quite often become chutes down which rock may fall at any time. If this type of chute must be crossed, the party should do so one at a time with a strong belay from a safe place.

The danger from falling rock in snow chutes can be judged by the amount of fresh debris at their bases.

Ice Falls and Seracs may topple at anytime, but generally the safest time to travel thru dangerous ice is when everything is frozen solid early in the morning.

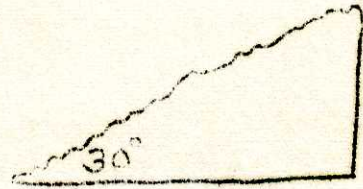
From your knowledge of summer slopes and surfaces estimate winter avalanche conditions and possibilities.

COLONEL BILGERI'S SIX POINTS ON AVALANCHE DANGERS  
(Three for the hill-side, three for the snow)

1. THE ANGEL OF THE SLOPE. All snow slopes of 25° and more may be dangerous and should be crossed cautiously.
2. THE TERRAIN. Uniform, regular contours are more dangerous than ridged or broken up hill-sides.
3. THE GROUND. A slope covered with stones or trees holds the snow better than a bare one.
4. THE DEPTH OF THE SNOW. The deeper the snow the greater the danger of an avalanche.
5. THE CONSISTENCY OF THE SNOW. The more feathery or the wetter the snow the greater the danger of an avalanche. Wind slabs must be recognized and avoided.
6. THE ANCHORAGE OF THE SNOW. Snow unanchored to its underlayer is more dangerous than snow securely attached.

TYPES OF SLOPES

30° slopes of snow, ice or rock usually free all the time from avalanching.



Steeper slopes with rough or upturned notches which hold snow in early winter but which will slide over in spring.



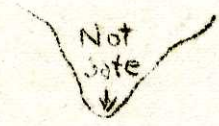
Steep slopes with downward sloping notches which are always liable to avalanche.



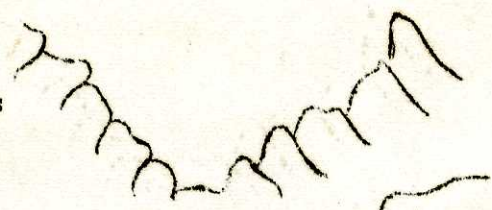
Glacier Valley, safe for travel.



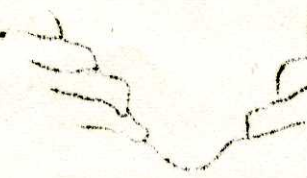
River Valley, unsafe for travel.



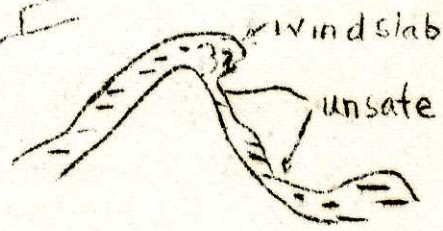
River Valley, safe in early season or until snow smooths out the surfaces.



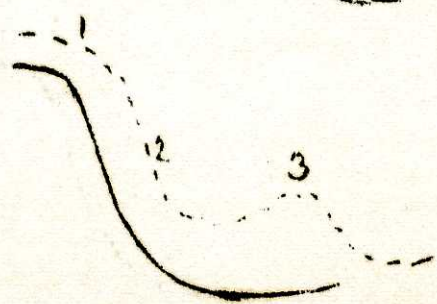
River Valley, dangerous formation helps snow to avalanche.



Windslab Cornice; section below it is unsafe for travel as slab may drop down.



Typical snow slopes: travel along level of points marked 1 or 3 is relatively safe. Along 2, snow may avalanche by cutting loose.



References: Mountain Craft, third edition, by Young.  
The Technique of Alpine Mountaineering - Uto Section of the S.A.C.  
Snow Structures and Ski Fields by Seligman.

ROPE TECHNIQUE - BELAYS

REMEMBER: The rope is used principally for safety.  
 Always rope up before the tight spot.  
 If in doubt, rope up.  
 Practice rope work where there is no danger of falling.  
 Don't wait and experiment in dangerous spots.

ROPING UP:

Know what to do, do it rapidly. When leader says "Rope Up" do so and call out "Ready" when finished. Be able to judge the length of rope in coils so you can tie in quickly and easily at right point.

Order on the rope: A Best, B Good, C Beginner.

Difficult ascents - three men - order A,B,C. Two men A,B.

Difficult descents - C,B,A. Two men B,A.

Easy to moderate ascents - A,C, B,C, A,B, C,B.

Horizontal Traverses - A,C,B. A,C,C,B.

Accident risk on moderate traverses - C,A,C - also used for training.

Moving singly on difficult work:

Ascents in 4 man team - 1, then 2 and 4, then 3.

Descents in 4 man team - 4 and 2, then 3 and 1.

Descents with strong party - 3, then 2 with 3 continuing then 1.

Moderate ascents with good party 2 will let both 1 and 3 move together.

Do not waste time; watch holds used by those ahead.

Take your stance immediately when arriving in position.

Try to coil rope neatly.

First man carries reepschnur for hauling up axes and rucksacks where needed. Tie them in the middle of the line and guide them from below. Use clove hitches, or other simple knots, rather than a labyrinth of grannys.

CLIMBING IN COMBINATION:

Watch feet and hands of man ahead, climbing with his holds as much as possible in order to maintain rhythm and maintain his confidence in you.

Avoid all tugging and jarring of rope; any disturbance to balance of man ahead; loosening of rock by dragging rope; cutting entangling or getting rope dirty.

On easy rock all move together as a unit.

Each man carries slack coil in hand to allow for variable speeds.

Swing rope rhythmically free of obstructions.

Lead man reduces **his** speed for more difficult spots reached by followers.

Second man always avoids pulling up first man, even to extent of sacrificing own comfort and rhythm.

On difficult rock move one at a time.

Never move further ahead than the anchor man can successfully stop a fall. (60 feet much too far).

Always be positive rope will hold in event of a slip.

No belay is better than a poor belay.

If upper man slips and slides down toward anchor man, latter should keep rope taut and haul it in so that he will not be jerked off his position when rope pulls taut. This will also gradually break fall of upper man.

Occasional pulls on rope are not objectionable if in a hurry or because of weather, etc., but never attempt to climb beyond your ability. If you need too many pulls, join a slower rope on a less ambitious climb for your own development's sake.

CLIMBING IN COMBINATION: (Continued)

Always take in and pay out rope smoothly, keeping it evenly taut.  
 Stay with the rope even if good holds are available; it is a safety device and should be used as such. If the rope is removed, be doubly watchful as relaxed vigilance brings danger.

BELAYS:

A belay is a safety measure and employs the use of the body, natural projections or angles on rock, and pitons and carabiners, with the rope. Direct belays are a connection of the active rope directly to the solid rock. There is no give to the rope if a fall comes and it is therefore not recommended as a belay to the man in the lead. Indirect rock belays have some form of human spring such as knee, forearms, shoulder, etc., interposed between the active rope and the solid rock. Rock belays must have a groove for the rope. In order to keep rope from wedging, it may be necessary to cut groove with piton hammer or ice axe, padding it with a cap, glove, smooth rock or dirt to insure free movement of rope. Body belays are made on an open stance with no rock connection on the active line. Always use an anchor in the inactive line if any doubt of balance.  
 Shoulder belay.  
 Hip belay.  
 Thigh belay.

ANCHOR:

An anchor is the loop of inactive rope with which a stationary climber secures himself to a rock point in order to protect himself and the rest of the party behind, in event the leader falls. Anchors must be close at hand or vertically above. They may be made by a double loop on a belay or to a piton if necessary.

REMARKS:

Always select as comfortable a spot and position as possible for your party to rest. This applies also to anchoring the rope and belaying stances so the members of the party can be at ease while waiting to go further. This avoids nervousness.

### SIGNALS

The main requirement of signals is that they be concise, direct and of easily differentiated vowel sounds. These are the signals adopted by previous climbing courses.

Always acknowledge a signal by the repetition of the signal. Taking a two man team for example:

The second man says "Stop" - if he has need of the leader stopping. The leader calls out "Stop" to acknowledge the signal, and does as directed. When he hears the word "Go" he acknowledges it by repetition and proceeds.

Number two man call out the number of feet of rope left at ten foot intervals - as - "Thirty", "Twenty", "Ten", etc.

When the moving man wishes to stop he says "Hold" to the man belaying him, and "Pay out" when starting again. In the event of a slip, especially for a party moving together, always give a warning cry "Look out" - preferably before the actual fall.

When the moving man anchors, he calls "Anchor" and when he is ready for Number two man to advance he calls "Come ahead". Number two man, of course, always acknowledges and calls out "Coming" as he starts.

Another very important signal is "Rock" - indicating the loosening of debris.

Then there is the distress signal of three of any thing which must always be answered by three of any thing. In Europe, we have the International Distress Signal of six of any thing at ten second intervals, acknowledged by six signals repeated at twenty second intervals.

Reference - MOUNTAINEER CLIMBER'S NOTEBOOK.

## ADVANCED ROCK CLIMBING TECHNIQUE

Before pursuing the more technically advanced study of Rock Climbing it is essentially necessary that you have a complete understanding and the proper application of the fundamentals of Elementary Rock Technique.

SUM OBJECTIVE - To better your mental and physical realization of being able to overcome increasingly difficult obstacles in the art of mountaineering with the utmost efficiency and safety to yourself and others.

### REVIEW FUNDAMENTALS

Climb with eyes- insures proper progress of climb route.  
 Three point suspension - safety measure - always two holds left.  
 Test all holds.  
 Balanced climbing necessitates - short lifts, small holds for the hands and feet; continuous rhythmic movement.  
 Results in maximum efficiency, safety, and conservation of time and energy.

### ALWAYS ROPE ON

Difficult passages  
 Where the rock is unsound  
 MOVE ONE AT A TIME

Avoid fixing holds so securely that muscular effort is required to free yourself.  
 Moving up and down notice all suitable projections for holds and belays.  
 Test all belays - safety of team is only as strong as its belays.  
 Use double rope wherever possible - easier on the body.  
 Use waist sling and carabiner attachment to climbing rope - added safety.  
 Shock of fall to come indirectly on rock, absorb shock by body belay.

### CRACK CLIMBING - WILL NOT ADMIT BODY

Foot thrust and foot jam.  
 Foot inserted in narrow cracks and twisted.  
 Side cling holds with hands to balance foot thrust - Layback.  
 Hand cling holds with hands pulling against each other on opposite sides of crack - for short intervals only.  
 Using two hands on opposite sides in press holds to retain balance.  
 Jamming of leg into crack.  
 Clenching of fist.  
 Tightening of muscles of forearm.  
 Sometimes even inflation of chest to secure temporary anchorage for weight lifting.

### CHIMNEY CLIMBING - WILL ADMIT BODY

Best method of ascent is back and foot (sometimes called back and knee).  
 Back against one wall, feet against other, feet slightly lower than body.  
 Avoid getting legs straight across at right angles to body, as body sinks in clothes and wedges.  
 For movement - bring one foot across under body, hands down and under body, palms against rock, straighten bent knee, raising body. Return foot to higher position on opposite wall, then repeat with opposite foot.

Narrow Chimneys, also can be used on wide chimneys - bridge with one foot pointing up one side, other foot downward on opposite side, knees bent, hands placed like feet. Ascend by rocking up chimney.



Face outwards or sideways - footholds are thus more visible. The jam for arms, knee, thigh, or shoulder safer in these positions.

When descending, climb face outward as much as possible.

On difficult descents best man last - securing others and retrieving rope.

METHODS OF ROPING DOWN AND RETRIEVING ROPE

A safe method of descent on difficult rock walls or chimneys when safety and the time element are paramount, must be learned thoroughly or not at all.

Practice in places where there is no danger.

A climber roping down may be belayed by a second rope from man above.

ANCHOR FOR ROPE - select suitable and firm belay - projection point of rock - be sure rope or sling will not slip off - protect against sharp edges.

Thread rope sling through metal ring and tie ends of sling together securely - placing sling over rock belay.

DOUBLE ROPE - Thread climbing rope thru metal ring to half way mark. Tie ends of climbing rope together and throw to bottom - be sure it reaches bottom. To retrieve untie ends and pull either half through ring.

SINGLE ROPE AND REEPSCHNUR - Thread end of climbing rope through ring on sling - tie another ring to end of rope - ring being larger, or as large, as the one on the sling so it will not slip through it. Fasten reepschnur ( $\frac{1}{4}$ " ) to large ring. To retrieve pull climbing rope through ring by pulling on reepschnur. Instead of using ring can tie Bowline knot on standing part of rope, attaching reepschnur to bight on bowline.

On short descents place middle of climbing rope over belay. Descend and retrieve rope by grasping both ends and springing or whipping it off.

RAPELLING METHODS

DOLPERSITZ - Pass double rope from above between legs from front to back - round left thigh, then in front again, over left shoulder, round back of neck, over right shoulder in front, hanging down freely. Hold standing part of rope in left hand at level of shoulder - hold hanging end of rope at level of thigh.

SUSPENDERSITZ - Pass double rope from above between legs from front to back - one part each around to front over left and right thigh - two ropes cross in front and drop over right and left shoulder - hanging down in back. Hold double rope in front with both hands or use one hand at thigh level to hold hanging ends of rope in back.

GENEVA METHOD - over one leg, passing rope under right thigh from inside to outside, then over right forearm at level with elbow, seize rope with both hands and slide down. This method not as safe as other two.

CHAIR (for injured climber) - make triple bowline, one loop around each leg and waist - use chest sling. Man is lowered sitting in loops.

PITONS AND AIDS

- Rock piton - thin wedge-shaped malleable iron spike, 3 to 6 inches long, with circular hole in driving end for attaching carabiner. Lateral and vertical types for lateral and vertical cracks.
- Piton hammer - special hammer with flat striking face and point at other end of head - handle about 9 inches long. Safety sling on end to attach around wrist or neck.
- Piton catcher - thong with snap on either end. Used to safety piton while driving.
- Carabiner - detachable ring with spring hook opening - used to attach rope to piton. Two types - oval and pear shaped.
- Safety Carabiner - a large carabiner with threaded sleeve to lock opening.

WHEN USED

As a safety measure whenever the difficulty warrants an additional safeguard.

## Examples

- When climbing vertically on very difficult rock.  
On long horizontal and diagonal traverses.  
Where lack of sufficient safe holds are met in the line of progress.  
On glazed and wet rock.
- For Direct aid - To provide a necessary hand or foot hold where none exists.  
To get over otherwise impossible places.
- In free roping - To improve an otherwise unsafe free rope descent.  
Where nothing else exists you can rope off directly from pitons.

HOW USED

- Drive correct type of piton into crack with hammer.  
A well inserted piton usually makes a high singing sound when driven.  
Point of piton should be slightly downward whenever possible.  
Attach climbing rope to piton with carabiner.  
Move on to next position.  
When climbing vertically pitons should be much closer together than when traversing.

DIRECT AID PITONS

- Slings - Pitons with rope slings attached can serve as hand and foot holds where none exist.
- Pulley roping - Lead man is held into rock by steady pull on rope from second man thru piton. This enables the lead man to free his hands to reach new holds or insert another piton.
- Pendulum - Piton inserted well above lead man allows him to swing or work his way across a short holdless or near holdless pitch.

PITON BELAYS

- Indirect - Anchor self (belayer) to piton by waist loop and then safeguard moving man with a body belay.
- Direct - When belaying thru a series of pitons you become a counterweight. That is, the rope from the lead man runs thru the pitons and then across the outside of the belayer, under and across the hips. Thus the rope is fed from the inside and, if a pull comes, the rope will hold the belayer against the rock.

PITON ANCHOR

A fixed rope from person's waist fastened to carabiner in piton.

REMARKS

Last man up or down removes pitons.

Practice piton use in easy stages.

Pitons are of special advantage in explorative climbing.

When doing difficult rock climbing which requires the extensive use of pitons a rope of from 125 to 150 feet should be used by a three man team, and at least 10 carabiners should be taken along.

REMEMBER - ALWAYS REMOVE AND REINSERT ALL PREVIOUSLY PLACED PITONS.

## References:

Young's "Mountaincraft"

"Alpine Climbing", by Wodderburn

"Technique of Alpine Mountaineering", by S.A.C.

ICE TECHNIQUEAREAS OF PRACTICE:

## Glaciers

Smooth snowfields and snow fingers.  
 Bergshrunds, crevasses, and seracs.  
 Ice chimneys, and gullies.  
 Cornices.

## Types of ice

Neve.  
 Blue or grainy ice.  
 Snow ice (caused by infiltration of water).  
 Clear (water formed).  
 Black or pressure ice.

EQUIPMENT:

Ice axe of an approved type.  
 Crampons, Eckenstien pattern are most practical.  
 Climbing rope, auxiliary rope and rope slings.  
 Ice hammer and pick and pitons.  
 Clothing adapted to low temperatures.

GLACIER TRAVEL:

Easy flexible gait.  
 Balance and friction technique of climbing.  
 Balance climbing as on rock, using balance and rhythm and friction holds where needed.  
 Belay as on rock.  
 Body belays (stance only).  
 Axe belays.  
 Piton belay used with body belay.  
 Natural belay (in this case, ice niches and hummocks).  
 Route:  
 Travel at right angles to direction of crevasses.  
 Test for crevasses with ice axe when the terrain is at all doubtful.  
 Test all questionable snow bridges and belay during tests.  
 Hollows and darker portion of glaciers are usually best for travel.  
 Locate hidden crevasses.  
 Open continuations on either or both sides of suspected place.  
 Sagging surface of small cracks.  
 Changes in color or texture of the snow.

ROPE UP METHODS:

Use double sling knots.  
 25 to 60 feet spacing for team of three.  
 Carry auxiliary rope and slings for emergency use.  
 Rope up combinations, two or three man team:  
 Single rope with end man carrying the auxiliary rope on three man team.  
 Double rope and stirrup technique for two or three man team.  
 Single rope for two man team but each man carries three slings in pockets for use with Prussik knot.

STEP CUTTING:

Make flat inward sloping steps.

STEP CUTTING: (Continued)

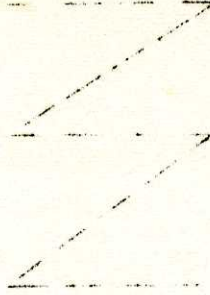
Small steps with larger turning places require the least energy.

The adze of the axe is usually the fastest and the best cutting edge for all but water and pressure ice.

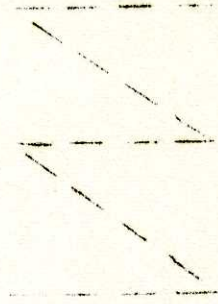
Courses of steps:



Either hand.



Left handed.



Right handed.

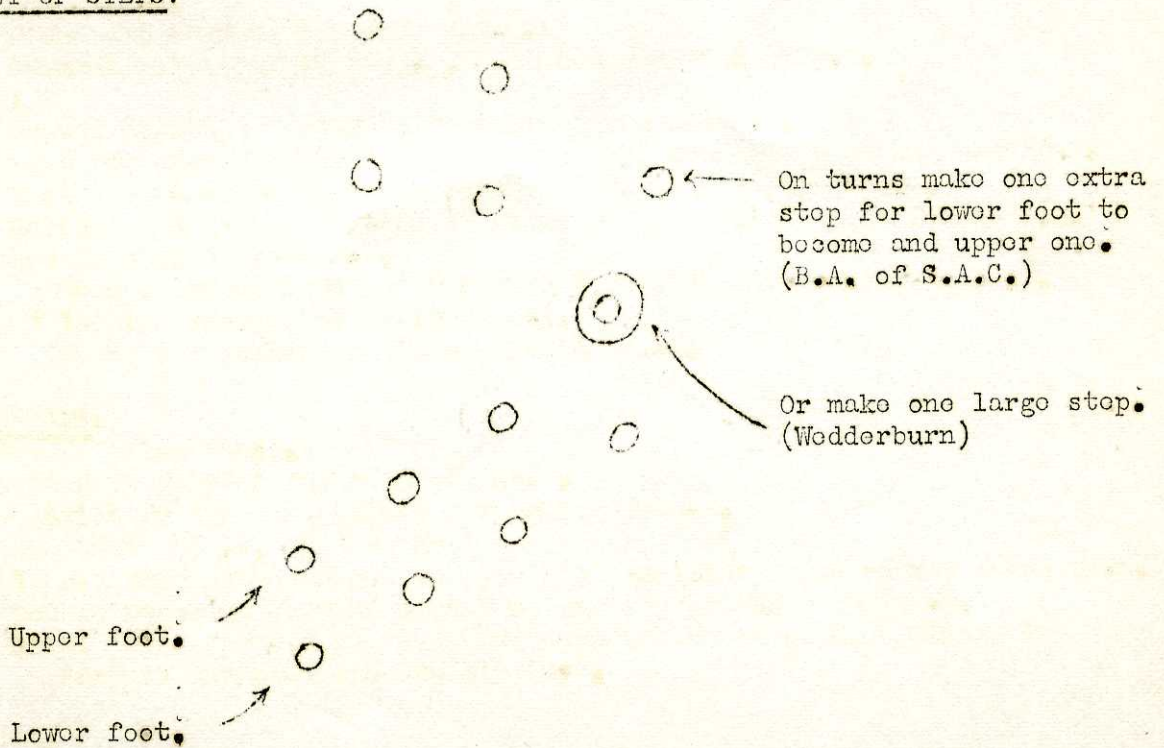
ARRESTS:

Turn on back and force ice axe shaft under the armpit and into the ice; keeping the head and hands off the ice.

Emergency stop.

Turn over (face downward) and force the pick of the axe into the ice. The axe should be held close so the adze is just over the right shoulder.

ARRANGEMENT OF STEPS:



Cut steps in staircase fashion.

The Mountaineers, Seattle, Wash.

USE OF CRAMPONS: (Few notes from Wedderburn)

The sole of the shoe must always be parallel to the slope.

Put crampons on before it becomes necessary; difficult to put crampons on while balancing in ice steps.

Check frequently for ball-up of snow in crampons.

Be careful not to catch your crampons in your clothing.

Some people prefer to make the turns away from the slope; because your ankles flex more easily down hill.

Going up a gully, turn out the toes so that all ten points will bite into the slope.

Above 55 degrees, short pitches can be climbed with feet pointing downhill.

Between 55 degrees and 65 degrees, ascend facing downhill, cutting notches for front two spikes.

Above 65 degrees, it will be necessary to cut steps.

Easier to descend than ascend steep slopes.

In descending, take care that each crampon is biting firmly into the ice before transferring weight on it.

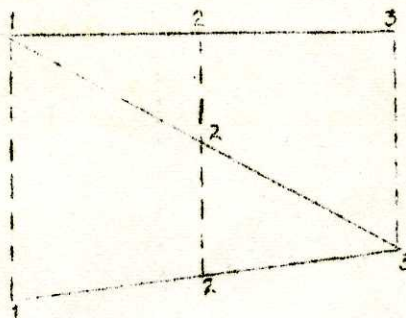
Long slopes of 60 degrees and steeper slopes require steps.

ASCENTS OR DESCENTS OF STEEP ICE OR SNOW SLOPES:

For expert party of three (fast method).

1 anchors while 2 and 3 drop down.

3 anchors while 1 and 2 drop down.

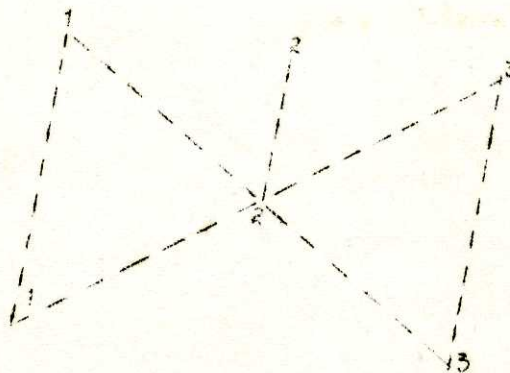


Safe method for average party.

2 drops down while anchored by 1 and 3.

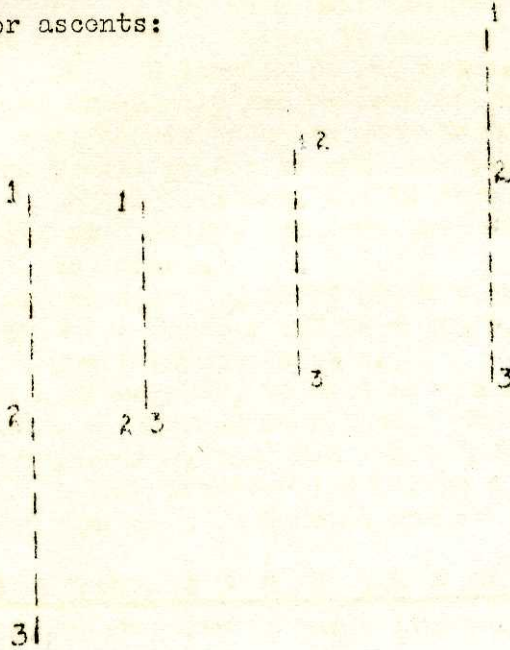
1 drops down while anchored by 2 and 3.

3 drops down while anchored by 1 and 2.



ASCENTS AND DESCENTS (Continued)

For ascents:

BIVOUACS ON ICE: EMERGENCY SHELTER

Shallow crevasses.  
 Excavations made in neve.  
 Ice hummocks.  
 Seracs.

TIME ELEMENT ON ICE CLIMBS:

On difficult ice slopes, allow equal time for ascent and descent.  
 Be familiar with other routes of descent if descent becomes impossible on  
 ice route.  
 Changes in conditions due to temperature should be considered at start.

References: Young's "Mountaineering", Third Edition.  
 B.A. of S.A.C.

TOOLS USED:

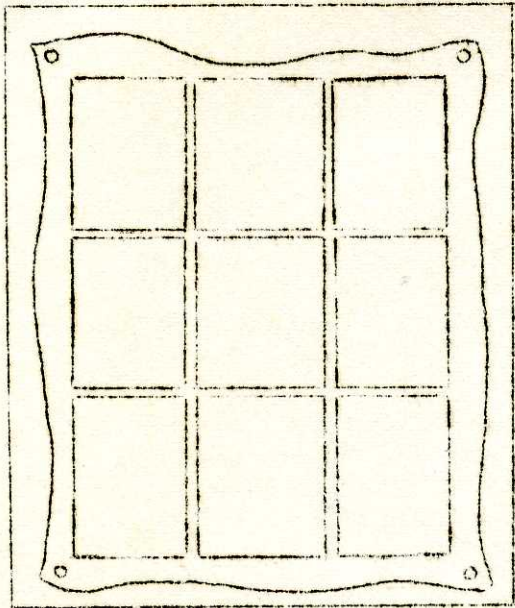
Scissors, 6 thumb tacks.  
Board, 14 by 20 inches or larger.  
Small paint brush (cost 5¢)

MATERIALS USED:

Cloth  $13\frac{1}{2}$  by 19 inches. (That used in class was  $38\frac{1}{2}$ " unbleached muslin, 68 by 72 threads per inch, purchased from Sears)  
Rubber cement -- any good grade cold patching.  
Water white lacquer. (Fullers)

PROCEDURE USED IN CLASS:

Fasten cloth to board with the 6 thumb tacks, stretching it tight.  
Roll map backward until curl is taken out and map lays flat.  
Cut off border on map, cut around and leave quadrangle title in upper right corner.  
The declination for the particular quadrangle with which you are working may be printed on this piece of margin so that you will have it.



Cut map into 9 equal parts. (You will find 4 fine 10 minute lines on the map which will facilitate the cutting.)

Reassembly the map in correct order alongside the board.

Coat the cloth thoroughly with rubber cement using the small paint brush.

Immediately place map pieces on cloth, leaving  $\frac{1}{4}$ " clearance between pieces.

To center the map properly, start at top, placing middle row of pieces first.

Care must be taken to keep the rows straight or the map will not fold well.

Press map pieces down firmly with fingers for a minute or two. Probably a few edges will not stick tight but don't let that bother you.

Take map off the board, turn board over and lay map on it, face down to dry. Press together again when dry.

Coat back of map with lacquer. Allow a few minutes to dry, then turn map over and coat the front.

Trim edges and fold map with title to the front.

PROCEDURE RECOMMENDED FOR HOLE MOUNTING:

Cut map in 9 equal pieces and submerge them in pan of water.

Wet cloth and thumb-tack to a board.

Apply paper hangers' paste. (Buy the powder and mix your own.)

Place map pieces on cloth and let dry for a day.

Apply lacquer to both sides of the map.

MAP HOLDER

MATERIAL: Old sheets of film (soak in hot water and scrub off the emulsion).

One-inch strips of waterproof adhesive.

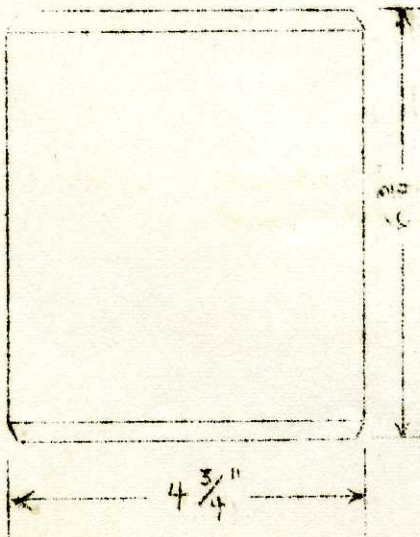
PROCEDURE: Cut out 2 pieces of film,  $4\frac{3}{4}$  by  $6\frac{3}{4}$ .

Fasten sides together with tape,  $\frac{1}{2}$ " lap on each.

Fasten bottom, covering over side tapes.

Use 2 pieces of tap at top, lapping each on inside.

Trim corners, rounding slightly.





ALPINE FLORA AND LIFE ZONES OF WASHINGTONGeneral information regarding Life Zones

Life Zones are belts of vegetation which correspond to changes in the temperature and precipitation of the environment.  
 Climatic variations from sea level to the summit of high mountains are comparable to the variations between the temperate and polar regions.  
 The altitude of a given Life Zone varies with the latitude of the region.  
 For example:

Timber line on Mt. Rainier is at approximately 7500 ft. altitude  
 " " " Mt. Shasta " " " 9500 " "  
 Mt. San Geronimo is timbered to the summit at 11,425 ft. altitude  
 (Southern California)

In a given latitude the boundaries of the Life Zones are indefinite and overlap widely due to climatic variations.

Examples of variations

Trees ascend further on ridges than in valleys  
 South slopes are warmer than north slopes  
 Zones ascend higher on the east than on the west slopes  
 Solitary peaks have more rigorous weather than those of similar altitude which are protected by surrounding high ridges.

Life Zones in Western Washington

Arctic-Alpine Zone. Above timber line. 5000-14,408 ft.

This zone is characterized by high precipitation (mostly snow), exposure to wind and extremes of temperature and a consequent short growing season.  
 Plants are mostly low with shallow root systems or growing in rock crevices.  
 No actual trees, altho there are stunted evergreen tree-like shrubs.  
 All species are perennial and many are identical with Alaskan and North Canadian forms. Comparatively few species.

Hudsonian Zone. Highest timber zone. 3500-7000 ft.

Characterized by high precipitation with considerable snow, somewhat sheltered environment due to forests and a longer growing season than the higher zone.  
 Flora is composed of forests with low undergrowth and a wide variation of species depending on whether the location is forest, alpine meadow, swamp or exposed rocky cliff. Plants are mostly perennial altho there are some annuals.

Canadian Zone. Lower timber zone. 1500-5000 ft.

Longer growing season with a high precipitation and slow evaporation. Comparatively little sunlight in the dense forest and a generally sheltered environment.  
 Plants are both annual and perennial with a large number of species ranging from the giant trees to the tiny flowers on the forest floor.

Transition Zone. Sea level. 3800 ft.

1. Humid Transition Zone west of the Cascades with extremely varied flora depending on precipitation, soil conditions, etc.
2. Arid Transition Zone east of the Cascades with characteristic arid and desert flora.

	TRANSITION 0-3800 ft.	CANADIAN 1500-5000 ft.	HUDSONIAN 3500-7000 ft.	ARCTIC ALPINE 5000-14,408
TREES	Douglas Fir Red Cedar Western Hemlock White Fir Spruce Alder (Red) Cottonwood Dogwood Madrona Big Leaf Maple Vine Maple Willows	Douglas Fir Red Cedar Western Hemlock Noble Fir Western White Pine Alaska Cedar Engelman Spruce Silver Fir	Sub-alpine Fir Alpine Hemlock White-bark Pine Alaska Cedar	
SHRUBS	Huckle-berry Devils Club Salmon berry Wild Blackberry Kinnikinnick Salal Oregon grape Syringa Spireas	Huckle-berry (red & blue) Salmon berry White Rhododendron Kinnikinnick	Huckle-berry Heather (red, yellow, white) Kinnikinnick Mt. Currant Rosy Spirea	Heather (yellow, white) Siberian Juniper Arctic Willows
FLOWERS	Pearly Everlasting Yellow Mimulus Skunk Cabbage Bleeding Heart Trillium Buttercup Daisies Lady's Slipper Twin Flower Wild Ginger Lupin	Pearly Everlasting Yellow Mimulus Marigold Forest Anemone Canada Dogwood Pipsissewa Coral Root Penstemons Lupin Indian Paint Brush	Gentian Pink Mimulus Mountain Phlox Mountain Aster Squaw Grass Pussy-claws Arnicas Tolmei saxifrage Avalanche Lilies Penstemons Valerian Lupin Indian Paint Brush	Mountain Phlox Golden Aster Squaw Grass Tolmei saxifrage Penstemons Lupin Indian Paint Brush
FERNS	Deer Fern Sword Fern Bracken Licorice Fern Maiden-hair Fern	Deer Fern Sword Fern	Lace Fern	Lace Fern

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Frye & Rigg: Elementary Flora of the Northwest. (Good keys, no illustrations)

Jones, Geo. N.: A Botanical Survey of the Olympic Peninsula.

House, Homer D.: Wild Flowers (Eastern U.S., excellent plates)

Piper, Charles V. & Beattie, R. Kent: Flora of the North West Coast (Keys, no illustrations)

St. John, Harold & Hardin, Edith: Flora of Mt. Baker (Keys & a few sketches)

The identification of plants to the family or genus is comparatively simple with the use of illustrations, but exact identification necessitates the use of the more scientific keys in most cases.

The Mountaineers, Seattle, Wash.

### Mountain Photography

The camera is a simple mechanical instrument for permanently recording scenes and incidents when placed in the hands of an experienced operator.

The requirements for following the art of photography are listed in the order of their importance.

A conscientious desire to pursue the art of photography.

An analysis of your personal requirements of the art of photography before pursuing it as to:

Depth of interest - "amateur snapshotting" or one who takes photography seriously. Hobby or commercial.

Equipment needed - Consult experienced photographers for expert advice on equipment and use thereof.

Funds available for purchase and operation of desired equipment.

THE CAMERA - Two distinct types most desirable to mountain photography

Roll film camera is

small, light and easy to carry in a crowded rucksack, ready to use at the touch of a button, unexcelled for "quicktakes" or candid shots, gives six to thirty-six exposures on one roll without reloading.

View or Place camera is

extremely versatile, useful for critical focusing with ground glass placed in plane of film, for photographing small objects with double extension bellows, for maintaining true perspective with lateral and vertical adjustment of the lens.

### THE LENS OR EYE OF THE CAMERA

A ground circle of optical glass forms image of object on film.

"f" number shows speed of lens - Smaller "f" for faster lens.

f6.3 lens sufficient for most mountain work.

f3.5 lens or smaller desirable for candid shots and poor light conditions.

Iris diaphragm adjusts effective "f" number.

Depth of focus increases with increasing "f" number.

Special lenses for special uses include:

Telephoto lens for long distance or mountain views.

Wide angle lens, which widens angle of view of camera.

### THE SHUTTER

This regulates the length of time that the film is exposed.

Two best types are:

Compur type shutter - set between the parts of the lens.

Focal plane - those above and fractions to 1/1250 second.

Speeds above 1/100 second used to stop action.

Speeds of T, B, 1/25, 1/50, 1/100 second sufficient for most.

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THE FILM

Films are classified according to emulsion:

Orthochromatic film - Verichrome, Plenachrome, etc., is used by the majority of amateur photographers.

Characterized by fine grain, long tonal range, untrue rendition of colors, moderate speed.

Panchromatic film - Name usually includes Pan.

Characterized by true rendition of colors, low filter factors. Available in great variety of speeds, tonal ranges, grain size. Includes all films of high speed, required for night pictures, "equictures", poor light conditions.

Infra-Red film - Specified as such.

Characterized by haze cutting properties, high contrasts, some white foliage. Requires filter.

Natural color film - Kodachrome, Dufaycolor, etc.

Single exposure gives natural color transparency. Viewed by transmitted light.

Requires careful exposure and proper lighting of object.

Faster films usually exhibit more graininess.

Whatever film you choose, stick to it and learn how to use it.

FILTERS

They may be made of colored gelatin or optical glass.

They absorb certain colors of the spectrum and transmit the rest.

They are used to correct color values or produce contrast.

The most common are:

K2 - light yellow - almost full monochromatic correction on Pan films.

G - strong yellow - penetrates haze - to obtain contrast where the subjects are yellow in color.

A - light red - to gain contrast - penetrates atmospheric haze - used with Infra-Red film.

X1 - light green - full correction for high red sensitive Pan films - used often when forest and rocks are both in picture.

PHOTOGRAPHIC EQUIPMENT AIDS

Exposure meters to judge the proper exposure.

Photo-electric cell is only dependable type.

Point meter at object.

Light values continually changing in the mountains.

Tripod for holding camera steady

It is essential that it be sturdily built.

It is necessary that the camera be supported for all exposures of over 1/25 second.

Lens hood to keep sunlight from striking lens.

It also protects lens from glare of reflected light.

Carrying case to protect camera and equipment.

A KNOWLEDGE OF COMPOSITION

The secret of artistic work is simplicity, proper harmony and balance of the masses.

Have a definite reason for making the picture.

The Mountaineers, Seattle, Wash.

A KNOWLEDGE OF COMPOSITION, con't.

- Take time to choose the view point.
- Select the dominant figure or object and make all other parts subordinate to that.
- Have an object of secondary interest connected with that.
- Have no two shadows or highlights of equal importance in the same picture.
- The principal object is usually to either side of the center.
- The horizon line is one third from either top or bottom of picture.

OPERATION OF TAKING PICTURE IN FIVE STEPS

- Select the principal object.
- Adjust the shutter properly.
- Select the proper diaphragm opening.
- Be sure unexposed film is in place.
- Make the exposure and place a new section of film in place.

SOME SUGGESTIONS

- In order to overcome obstacles in photography it is paramount that each problem be thoroughly and carefully analyzed.
- Study all good pictures and literature available.
- Compact and light equipment give you added time and energy for more pictures.
- Prevailing color in snow is blue or blue green. Snow against sky is whiter than sky. Over-correction by use of filters results in hardness.
- In shade snow is grey.
- Side or back-lighting gives more striking effects. Best time to take pictures is early morning or late afternoon.
- Most pictures of mountains look better if photographed from about half their ground elevation or lower.
- Clouds add artistic beauty to your pictures.
- Keep a record of your exposures; you profit by your mistakes.
- Learn how and when to use filters.
- To progress and learn how to take pictures - take pictures.

GOOD LIGHT!

THREE CLASSIFICATIONS OF ROCK:

## Sedimentary

Sandstone, conglomerate, shale, limestone

## Igneous

Intrusive -- cooled slowly

Granitic (Mount Stuart)

Extrusive -- rapidly cooled

Obsidian, Little Tahoma

Pumice, St. Helens

Basalt, many types, one of the most interesting is the columnar structure Baker, Rainier

Metamorphic; either of the first two changed by pressure and heat.

Slate, marble, anthracite, gneiss, quartzite

These rocks usually softer than igneous

GEOLOGIC PROCESSES:

The geologic cycle consists of

Sediment -- deposition, supplemented by igneous formations

## Uplift

## Folding

Upward - anticline

Downward - syncline

Faults, fractures, slipping, joints in rock

General uplift of whole area

## Erosion

Rock structure, joints, great aid to water, plant roots in erosion

Rock decay results in talus slopes, scree

Heat and cold, expansion and contraction

Plant roots

Rain

Land slips, soil creep

## Stream erosion

Youth rivers V shaped valleys, rapid fall

Maturity valley floor widened

Old age, Meandering stream, sometimes flows so slowly that it deposits in its own bed.

Wind, effective in arid regions

## Glaciers

U shaped valleys all the way to the head.

Valley sides scoured. Boulders in moraines sometimes flat on one side.

Valley glaciers, may have tributary glaciers which do not cut as fast as the main glacier and are therefore left as hanging glaciers. (Yosemite).

Cirque, formed by gauging action of the glacier at its starting place. Often holds a lake after the glacier is melted.

Moraine, the deposits made by a glacier, may be along its side, lateral moraine, or at the end, terminal moraine.

## Marine

## Wave Action

Always remember three basic ideas when thinking geologically

All land masses subject to very slow changes in level, which brings them below the sea level at times and again above it.

Lands above the sea level are universally eroded by rivers, winds and other agencies.

Lands beneath the sea are the site of constant deposition of sediments carried from the adjacent lands.

THE GEOLOGIC TIME TABLE APPLIED TO WASHINGTON:

Cosmic History

Azoic without life

Archeozoic

Proterozoic, Priest River, Pend Orielle.

Rock identified with this period now metamorphic but so thoroughly changed it is difficult to tell whether originally igneous or sedimentary. All N.W. Washington below sea level and furnished with sediments from Idaho and Montana, possible there were other land masses to the west. During the middle epoch the region uplifted with granitic intrusions, and during the last of this period the whole was below sea level again.

Paleozoic -- identified in north half of state, especially Skagit and Snohomish Counties. Fossils found in this region indicate marine sediments in temperate water not deep. It is possible southern portion of state also covered by this marine embayment but, if so, rocks so formed are covered and not as yet found. Indications are that these embayments entered from the north.

Middle era, area raised, limestone reefs formed, Okanogan County, Huckleberry, Mt. Stenzgar, Old Dominion, and Abercrombie.

Late Paleozoic all area of Washington submerged.

Mesozoic -- identified in Northern Washington.

Area again raised and great masses of intrusive rocks were formed which did not reach the surface by several thousand feet. Cooled slowly resulting in granite formation. Gunns Peak, Index Group, Mt. Stuart, Ridge east of Little Kachees, Spectacle Lake.

Late Mesozoic, Olympics formed under the sea. Marine encroachments over western area resulted in deposits of mud and sandstone, interrupted by lava flows.

Era closed by general elevation of the area, record of life scanty, but seems to indicate a mountain barrier about Okanogan County with western part very humid and eastern very arid.

Cenozoic also known as Tertiary

Eocene: The very earliest portion of this period unknown in this state, later the Olympics became an island with deposits of sand and silt, many fossils. Willapa region has basaltic flows resulting in present hills. Sandstones and shales now quarried in Pierce and Thurston Counties laid down in this period. Swamp deposits to the east resulted in present coal period beds.

Oligocene: Marine again over western Washington with deposits being made from a plane in area of the present Cascades. Many fossils.

Miocene: Marine deposits in this era were restricted to small areas since most of Washington raised, the Cascades not yet to full height. Vast flows of basaltic rocks, Spokane to Oregon, Southwestern Idaho, parts of Nevada and California. (Only one other flow as extensive in world, Deccan Flow in India). Characterized by not coming from volcanic centers but from fissures or vents. Each flow not over the whole area. Soil formed in between flows, Ginkgo forest, shale in Grand Coulee.

North south warps, Vancouver Island, San Juan upwarp.

First true Olympic Mts. came into being. Other warps to the south, present Columbia River Valley a downwarp.

Keechulus and site formed during this period, Alta, Thompson, Huckleberry, Snoqualmie grandiorite, Granite, Red, Summit and east of Snoqualmie, Summit and east of Chair.

Pliocene resulted in raised coast, ending marine deposits.

Further uplift of Cascade area with a long period of erosion following which developed a peneplane, shown by the summits being so nearly the same height. The whole area was again elevated, the north higher than the south by faulting.

#### Quaternary

Pleistocene, characterized by great volcanic vents, cones, Baker, Glacier, Rainier, St. Helens, in other places masses of intrusive rocks.

#### Glacial epoch

Accumulations of ice so that the northern counties were completely covered. In the mountains alpine glaciers formed. Glaciers in the eastern valleys joined with the Okanogan to force the Columbia over. In the Cascades, Keechulus glacier extended from Chair peak to the lower end of Lake Keechulus where the moraine trapped the original lake. A tributary glacier came down Commonwealth and Gold Creeks. Snoqualmie Glacier, south fork came from Denny and Granite Peaks. The Cle Elum Valley Glacier was probably the largest of the region, being about 30 miles in length.

Cirques in the Cascades are seen in Lodge Lake, Joe Lake, Lost Lake.

Moraines are seen where Commonwealth and Guy Creeks join, at the foot of Lake Keechulus and Lake Kachees.

Glacial Blockade, diverted summit stream to the west by a deposit of debris.

Puget Sound - glaciated during the first glacial period, then during the interglacial period stream beds were formed in the old glacial valleys. Later these valleys were submerged and further glaciated forming the irregular bodies of water seen now in Admiralty Inlet, Hoods Canal, Strait of Juan de Fuca.

Recent era - Chiefly erosion, with no important changes. Differential crustal movements have elevated the costal region of Washington and Oregon from 20 to 200 feet.

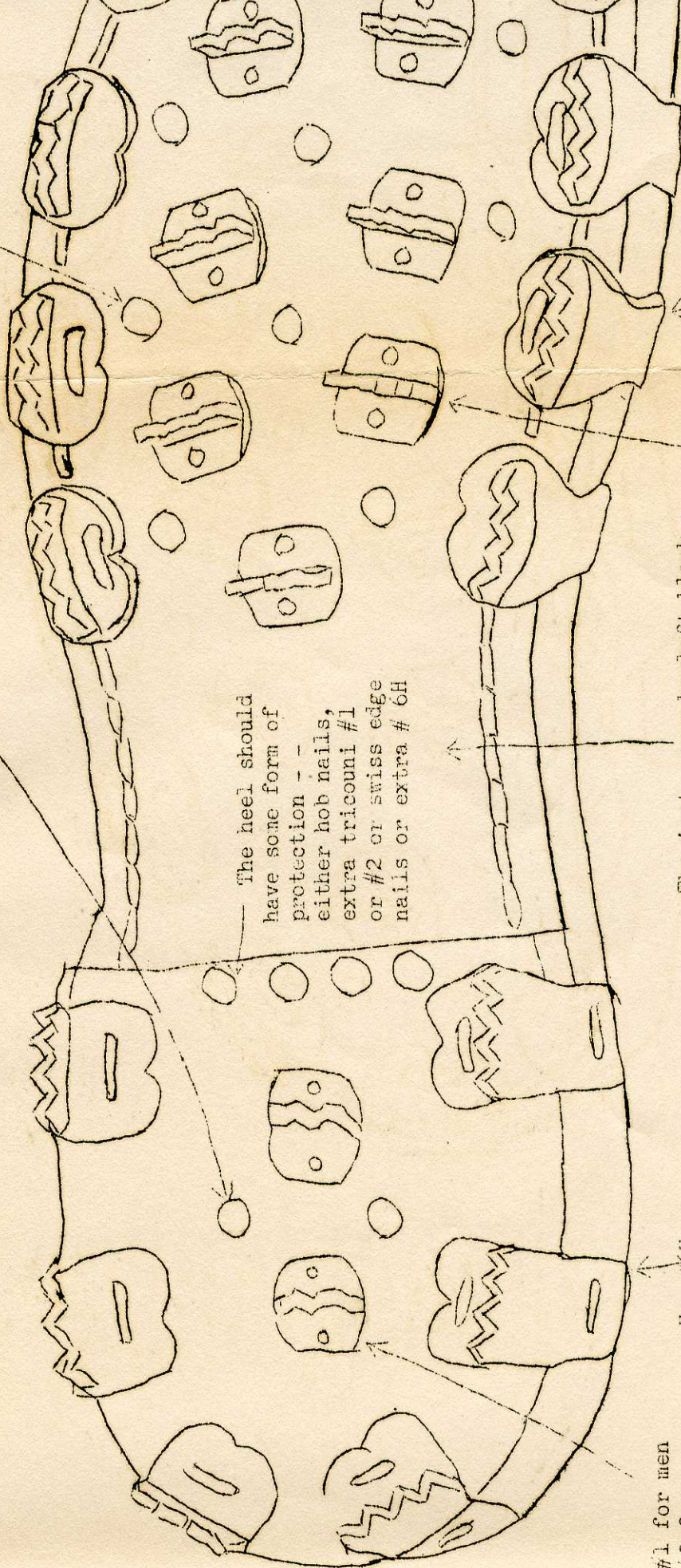
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- Weaver, Charles E.: Tertiary Stratigraphy of Western Washington, 1937
- Cotton, C. A.: Geomorphology of New Zealand, Part I, 1926



Recommended Nail Job for 8" boot  
 Preferably hard toe

fill in large open spaces with a large flat head hob to pro  
 from excessive wear. Do not use silver hobs or caulks as th  
 into the shoe by pounding on rocks.



The heel should  
 have some form of  
 protection - -  
 either hob nails,  
 extra tricouni #1  
 or #2 or swiss edge  
 nails or extra # 6H

two #1 for men  
 one #2 for women

Use #6H  
 6 for men  
 6 for women

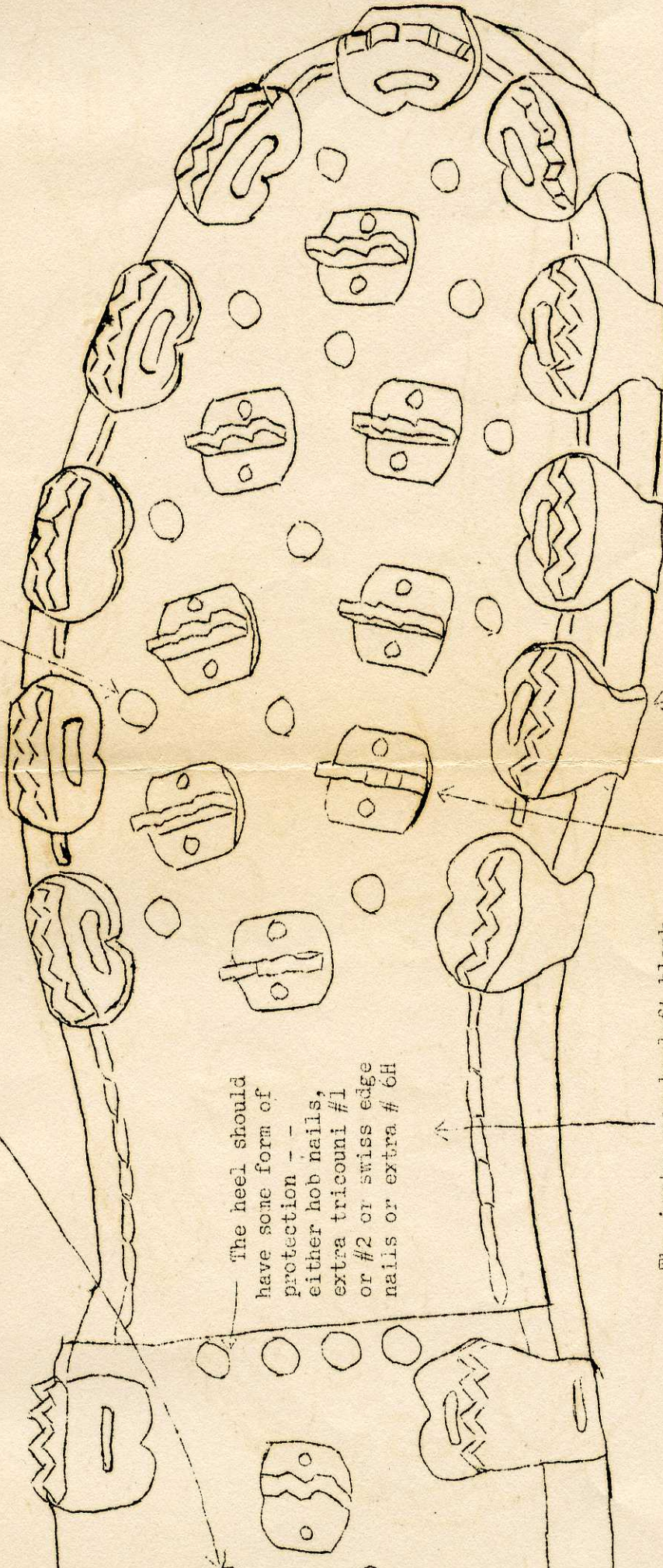
The instep may be left blank  
 or else filled in with wide  
 base caulks, tricounis, or hobs.  
 (They all add weight)

#613 (11 for men  
 (10 for women

(8 #1 in sole for mens shoe  
 (7 #2 in sole for womens shoe

for 8" boot

fill in large open spaces with a large flat head hob to protect sole from excessive wear. Do not use sliver hobs or caulks as they are driven into the shoe by pounding on rocks.



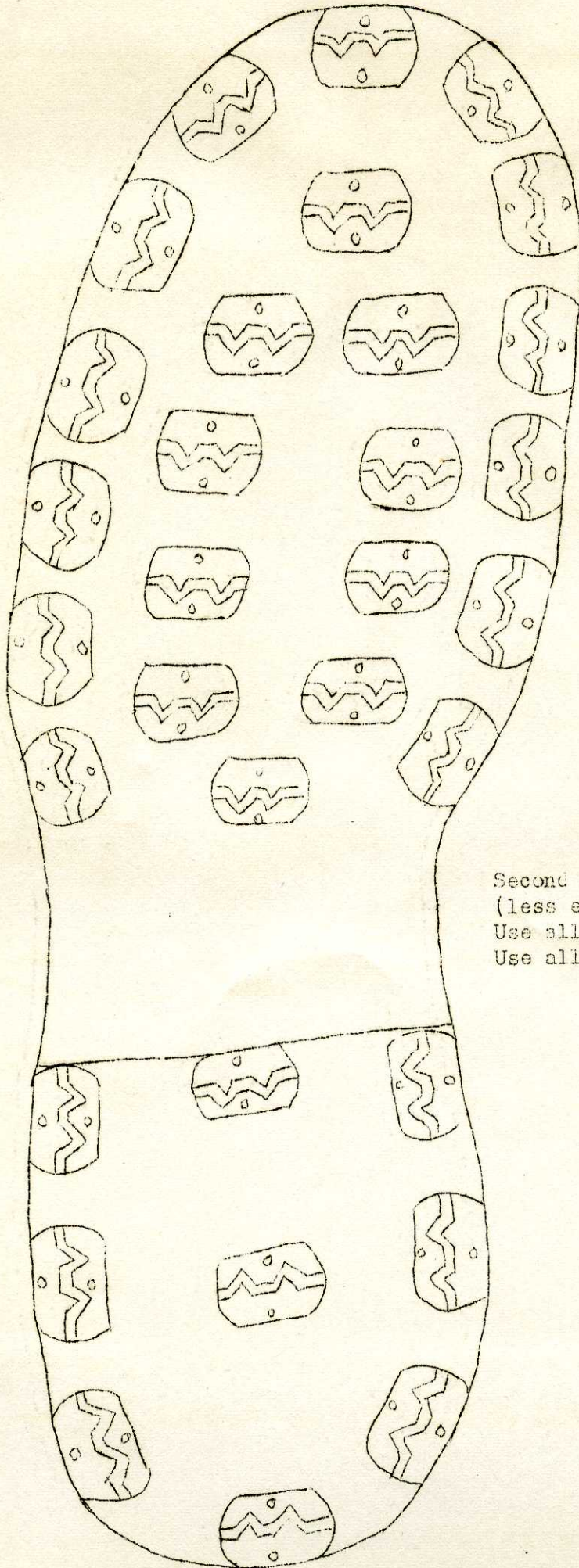
The heel should have some form of protection - - either hob nails, extra tricouni #1 or #2 or swiss edge nails or extra # 6H

The instep may be left blank or else filled in with wide base caulks, tricounis, or hobs. (They all add weight)

#613 (11 for men (10 for women

(8 #1 in sole for mens shoe (7 #2 in sole for womens shoe

n



Second choice nail job.  
(less expensive)  
Use all #1 for men  
Use all #2 for women

INSTRUCTORS FIELD OUTLINE - ELEMENTARY COURSE

Fold this sheet and carry in your pocket for reference  
for minimum instruction

## TRAIL TECHNIQUE

Length of steps vary with terrain.	Axe as cane, pick to front or under arm or in rucksack.
Short lift of foot uphill.	Never let spike end point to rear.
Walk in rhythm.	Short two minute rests.
Breathe in rhythm.	Relax on 2 rests - breathe deeply.
Swing legs over obstacles.	The rest step - pause on each step.
Straight knees, level feet on standing rests.	

## ELEMENTARY ROCK TECHNIQUE

Three point suspension.	Descend face outwards or sideways (except when nearly vertical).
Testing holds.	Spread party fan shape when danger or rolling stones.
Balancing on feet.	Belays - shoulder, hip knee in-direct rock.
Climb with rhythm.	
Use of pressure holds.	
Climbing with eyes.	
Climb using small holds generally to the right or left.	

## SNOW TECHNIQUE

Kicking and preserving steps.	Belaying with ice axe.
Length of steps.	The arrest alone.
Steps on zigzags.	Arrest in a roped party.
Standing glissade.	Plunging step.
Sitting glissade.	

## ORIENTATION

Magnetic declination.	Tell height by comparison with known heights.
Orient map with compass.	Read a topographic map.
Take bearing of peaks with compass.	Tell direction by watch and sun.

## WOODCRAFT AND CAMPING

Location of campsite.	Sanitation and clean camp.
Order in camp making.	Putting out fire.
Necessary equipment	Signing a camp fire.
Fire: wood, location, starting cooking.	

INSTRUCTORS FIELD OUTLINE - INTERMEDIATE COURSE

## ADVANCED ROCK TECHNIQUE - GROUP I

Short balance and rhythm climb alone.  
 Roped party climbing with belays.  
 Practice on stopping short falls.  
 Free roping: duelfersitz and suspendersitz.  
 Chimney stemming.  
 Crack Climbing.  
 Rib climbing.

## ADVANCED ROCK TECHNIQUE - GROUP II

Practice in driving pitons (Vertical and lateral).  
 Body belays with piton anchors.  
 Short traverse driving pitons for safety.  
 Using a piton for roping down.  
 Free roping practice.

## ICE TECHNIQUE -

## GROUP I

Practice in Bilgeri rescue.  
 Use of Prusik knot (An ascent and descent with three slings).  
 Two rope pulling method of rescue.

## ICE TECHNIQUE

## GROUP II

Picking a route across a glacier.  
 Locationg a hidden crevasse.  
 Traveling in a roped party.  
 Making an arrest alone.  
 Cutting steps.  
 Walking with crampons on slopes of varying steepness.  
 Body belays with ice axe anchors.  
 Roped party descent (not in straight line).  
 Glissading face outward.  
 Glissading face inward (on steep difficult slope).