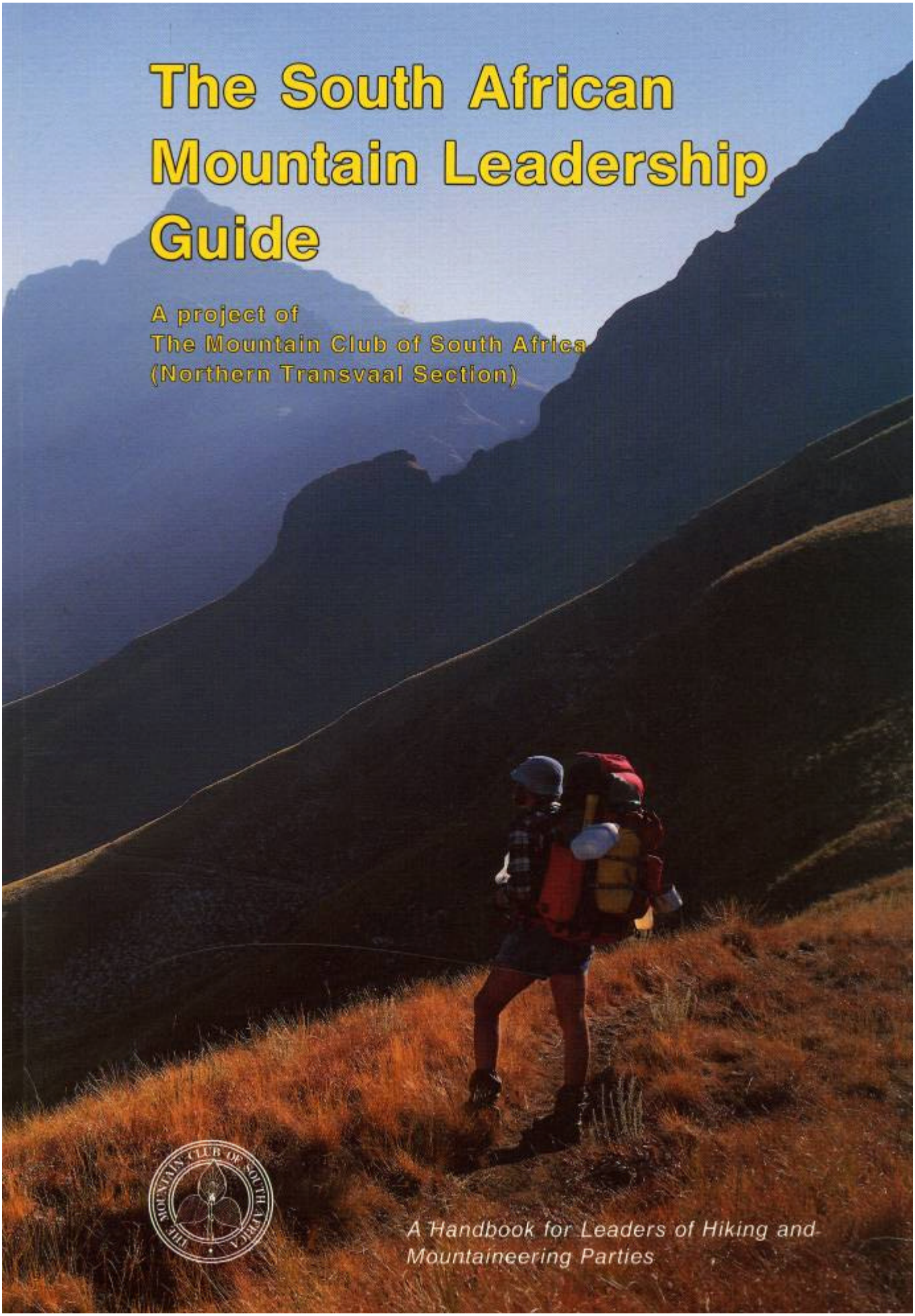
The South African Mountain Leadership Guide

A project of
The Mountain Club of South Africa
(Northern Transvaal Section)



A Handbook for Leaders of Hiking and Mountaineering Parties

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Cover photograph: Afternoon in the Cathedral Peak Area Niel Griffin

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Foreword

It is fitting that this, the first South African Mountain Leadership Guide, should appear during the Centenary Year of the Mountain Club of South Africa. As a joint venture of the Club, to which members of several of its 13 Sections have contributed, it presents a distillation of the wisdom gained from many years of mountaineering in South Africa and elsewhere. Although several books on the same subject have been in use overseas for some time (to which reference is made at several points in the book) this is the first time that a book has appeared which focuses on South African mountain conditions.

Although the word 'training' does not as yet appear amongst the Objects of the MCSA listed at the end of this foreword (it will certainly be included when the constitution is next revised), members of the Club have increasingly become involved in presenting a variety of training courses in different aspects of mountaineering to their own members and to members of the public. The material produced for these courses, particularly that from the Northern Transvaal, has been used as the main source for this guide. Credit for bringing these various training activities together and for promoting the Club's role as a major player in the South African mountaineering training scene goes to Garth Hattingh, National Convenor of the MCSA's Sub-committee for Training and Safety and his committee. Johan van Eeden is to be congratulated for bringing all the Club's training material together into a single comprehensive guide.

It must, however, be stressed that one cannot expect to become a competent hiking or mountaineering leader merely from reading this or any other guide, nor even from attending a series of training courses. Respect for the mountains, both for their challenges and their hazards, can only be learnt by being exposed to them in the flesh, preferably under the guidance of a competent leader. Assessing one's own, and one's party's abilities, and knowing when to turn back, are skills which are best developed by sharing such decisions in the mountains with experienced mountaineers or hikers. One needs to spend time on a mountain to appreciate its beauty and solitude, to be inspired to protect it from the ravages of Man.

Nevertheless, this Guide does provide a valuable adjunct to experience; the novice will be assisted in learning about mountain leadership and how to behave in the mountains; the more experienced mountaineer or hiker will use it to consolidate his knowledge, fill in the gaps and learn new skills. Its use will boost skills, increase safety, and promote an appreciation of the beauty of our mountains.

Objects of the Mountain Club of South Africa

1. To organise and facilitate mountain expeditions.
2. To provide for the safety of mountain climbers, and to organise search and rescue parties.
3. To record and describe geological and mineralogical specimens and specimens of fauna and flora and to compile topographical, meteorological and climatological records.
4. To procure, extend and protect the rights of way to mountains and mountain areas.
5. To assist in the improvement and enforcement of Forest, Game and Wild Flower Protection Laws.
6. To investigate historical relics and landmarks and encourage their preservation.
7. To protect and preserve the natural beauty of the mountains and the natural water supplies of South Africa, to prevent and combat mountain, forest and veld fires, and to suppress vandalism.
8. To further the interests of mountaineering generally in South Africa and elsewhere.

Paul Fatti (President, MCSA) 14 December, 1990

Preface

The aim of this guide is to promote the safe enjoyment of the South African outdoors. It is intended for use by the expert and the novice alike, but its specific emphasis is on leaders of hiking or climbing parties, whether they are parents taking their children on a day hike, experienced mountaineers on an expedition, scout group leaders, outdoor pursuit instructors, or teachers involved in adventure or outdoor education.

Adventure can quickly turn into misadventure. Each year a number of people are injured or killed in our mountains. Sometimes this is as a result of circumstances over which they have no control, but more often because of ignorance of basic mountain safety procedures, overconfidence, carelessness, or a combination of these.

Since it is the leader's responsibility to make each trip a safe and rewarding outdoor experience for everybody entrusted to his care, safety procedures are dealt with at length in a number of chapters. However, no amount of theoretical background can substitute for experience, and every possible opportunity should be used to practise the techniques and methods outlined here, for example in the chapters on navigation and first aid.

The original manual on which this guide is based was compiled by members of the Northern Transvaal Section of the Mountain Club of South Africa for use during mountain leadership training courses. The decision to rewrite it and to extend its scope considerably was born of the need to have available in a single book, for use by the Mountain Club and mountaineers in general, all the information which the mountain leader might require.

With this publication the Mountain Club of South Africa (MCSA) hopes to have established a set of guidelines for training courses presented by its various Sections. This should help to prevent the proliferation of varying standards and will contribute to achieving a uniform approach to outdoor training schemes in South Africa.

Acknowledgements

Many people contributed to the writing of this guide, and I would like to thank them for all their help, suggestions and patience. In particular, my grateful thanks go to:

- Duncan Cromarty, who first mooted the idea of compiling a training manual,
- Lizelle Fletcher, whose enthusiasm resulted in the first training manual.
- The authors of the original chapters: John Fletcher, Duncan Cromarty, Frieda Minnaar, Roelf McLachlan, Petrus Nel, Derie van Eeden, Jannie Talma, Lizelle Fletcher, Gerhard Venter, Dirk Talma and Rob Goldie.
- Professor Paul Fatti, for his advice and guidance.
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- The Department of Education and Culture and Backpacker, for financial assistance.
- My wife, Magda, for help, suggestions, and patience, patience, and yet more patience.
- As well as all the other people who made suggestions, supplied information, gave advice, or were simply willing to help always.

Of a good leader, when his task is finished,

his goal achieved, they will say: "We did this ourselves."

- Lao Tse

Contents:

Chapter 1

Camping Equipment

Mountain weather can range between the extremes of intense heat and freezing cold during the course of a single day. The golden rule to follow as regards the clothing and camping equipment you take along on a hike or climb is therefore to prepare for the worst possible conditions, while hoping for the best.

Clothing

The function of clothing

The most important function of clothing is to regulate body temperature. This it does best when worn in multiple layers, with ventilating material next to the skin, followed by insulating layers to trap warm air, and an outer shell to shield the inner layers from wind and rain.

Food provides the fuel for muscular activity, the main source of body heat. Heat can be lost through radiation, conduction, convection, evaporation and respiration. Heat loss from the area of the head is a good example of heat loss through radiation. Since the supply of blood to the head remains constant, at 5°C as much as one half of the heat generated by the body can be lost from this region, and as much as three quarters at -20°C. Parka hoods and balaclavas are vital to prevent this heat loss. Heat is also lost through conduction, when one sleeps or sits on cold, wet ground, or when wet clothing is worn. Convection cooling occurs, for example, when the wind continuously removes the warm layer of air next to the skin.

The wind-chill factor should not be forgotten. Even the slightest breeze can convect away the layer of warm air next to the skin. The cooling effect of a strong wind on the skin is equal to much lower temperatures, owing to increased evaporation and convection. *For this reason, a lack of adequate wind-proof garments plays a role in most cases of hypothermia*.

The evaporation of perspiration from the surface of the skin also causes cooling, while the warm, moist air breathed out during respiration represents a further heat loss. Because of the rapid changes in temperature, wind intensity and level of exertion typically experienced while mountaineering, it is important that one should be able to put on and remove garments quickly and easily.

	Wind Speed (km/h)				
	10	**20**	**30**	**40**	**50**
Actual Air Temperature	**Effective Temperature Felt**				
10	8	2	0	-1	-2
0	-4	-9	-14	-17	-18
-10	-19	-23	-27	-30	-33
-20	-28	-35	-41	-45	-48

The effects of wind on actual air temperature

To summarise:

- Be prepared for the most extreme conditions.
- Wear multiple layers of clothing that ventilate, insulate and wind-proof.
- Remember the wind-chill factor.
- Remove or add layers as circumstances dictate.

Above the waist

In cold weather the layer of clothing worn against the skin should be a type of thermal underwear, preferably made of polypropylene, chlorofibre or similar material. These materials provide thermal insulation, while sweat and moisture are wicked away from the skin to the outer garments where it can evaporate. This leaves the wearer feeling snug and dry during strenuous activity. Ventilation is essential when the body is working hard, since enclosing the body in an airtight material will cause perspiration to condense and soak clothing. Both a thermal vest and thermal long-Johns can be worn while climbing in very cold weather, or while sleeping. Wool undergarments are less efficient, and a cotton T-shirt retains no heat, as it rapidly absorbs and retains water like a sponge.

Two layers of clothing worn over a layer of underclothing will usually provide sufficient insulation from the cold. These two layers can be a woollen shirt and a woollen sweater or fibre-pile garment. Wool, which is absorbent, retains its insulating properties when wet; however, the weight and bulk of woollen clothing make it impractical as the sole source of insulation at very low temperatures. Nylon fibre-pile clothing is warm when wet, dries quickly and, weight for weight, is warmer than wool. At very low temperatures a down jacket, or duvet jacket, is excellent. Besides offering superb insulation, down clothing has two other properties to recommend it, namely lightness and compressibility. Its major drawback is that it loses most of its insulating properties when wet.

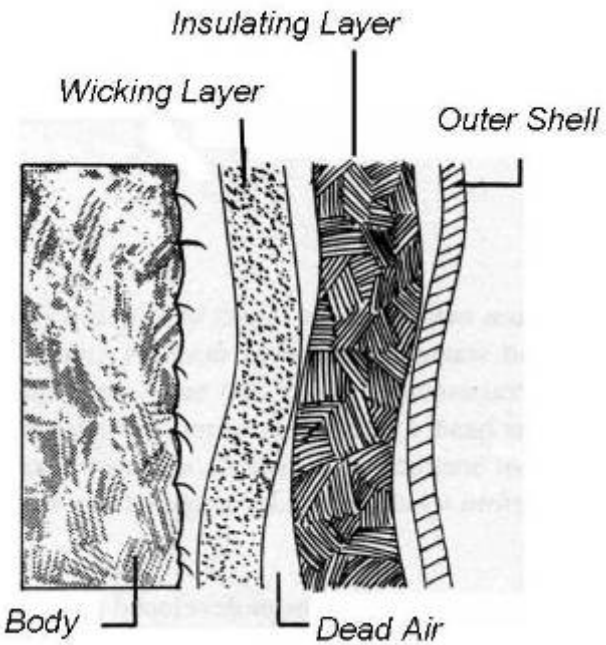
For wet conditions synthetic fillings such as Hollofil and Thinsulate provide alternatives to down. They retain their insulating properties when wet, although under normal conditions they are heavier than down for the same degree of insulation. Unless it is very cold, down clothing is seldom worn while one is on the move; it is usually worn during bivouacs or in camp at night.

The multi-layer principle should also be applied to the hands. A pair of woollen gloves can be worn as the first layer, leaving fingers free for cooking and other activities. In extremely cold conditions, thin chlorofibre gloves can be worn under a pair of thick woollen or synthetic mittens, under a third layer of nylon over-mittens.

Rain gear

In foul weather an anorak is usually worn over the inner layers of clothing as an outer protective shell to keep wind and water out. Anoraks made of cotton or similar materials are tough and wind resistant (but bulky and heavy) and repel water for short periods only. On the other hand, a completely waterproof anorak is also less than perfect, because it does not breathe; i.e. perspiration cannot evaporate through it. The ideal anorak is therefore windproof and waterproof, but made from a 'breathable' material.

A number of materials that offer these properties have been developed in recent years, including Gore-Tex and the locally developed material Ventex. Gore-Tex is a thin, microporous layer that allows water vapour to pass through, while acting as a barrier to water in droplet form. Ventex works on a different principle: it is a layer which chemically transmits water vapour from a region of high vapour pressure (next to the skin), to a region of low vapour pressure.



Garments coated with these layers are reasonably expensive, but they are quite effective. Whatever the material used, some degree of condensation can always be expected on the inside of the anorak if, for example, one is wearing it while carrying a full load uphill in the rain or doing similar strenuous work. Beware of the many commercially available 'anoraks' which fail to repel rain.

An anorak or parka should have a hood with a drawstring, so that the face may be covered and protected from the wind. The anorak should extend to below the hips and should have a drawstring around the waist. A large chest pocket and side pockets are useful for carrying gloves and other equipment. The main function of an anorak is to keep out the wind, which is an important factor contributing to hypothermia. A separate raincoat of light plastic, or a heavier knee-length cagoule, can be used when walking in heavy rain. Condensation, however, will always be a problem.

Below the waist

Climbing trousers should be loose fitting and of a closely woven, rugged finish in order to provide abrasion resistance and wind proofing. Wool is ideal for this purpose. Long-Johns are ideal for sleeping in and for wearing as a first, under-layer on cold days or in camp after the day's hiking. Shorts are suitable for almost all conditions, except extreme cold.

Anorak bottoms, or wind pants, are made of light, tough nylon and are used to provide protection against wind and rain. Ventex and Gore-Tex pants are also available. They should be big enough to allow you to put them on without first having to take off your boots. Denims are not suitable for hiking, since they are too heavy when it is hot and provide no insulation when it is cold.

Footwear

Boots

There is no such thing as the ideal boot. Usually a single pair of boots must suffice for all conditions, which means that a compromise has to be reached with regard to a number of conflicting requirements.

A boot should be comfortable, yet sufficiently robust to protect and support the foot. It should be flexible enough to allow walking on steep slopes, but rigid enough to support the ankle on rough ground. A firm toe and heel counter lend additional protection. There should be as few seams as possible, since stitching and seams allow water to enter and shorten the life of the boot because they wear more rapidly than the rest of the boot. A sewn-in tongue also helps to waterproof the boot up to the ankle.

The attachment of the upper to the sole is of critical importance. Soles may be moulded, screwed, nailed, sewn or glued together, or any combination of these. A narrow welt (the outside upper ridge of the sole, to which the leather is sewn) is preferable, particularly for climbing. The sole should provide good traction and should be of sufficient thickness to protect the feet and absorb shock. The rubber-cleated lug sole known as a 'Vibram' offers good value for money. Because of their general durability, comfort and lightness, Vibram-type soles are standard on many hiking and climbing boots. They also give excellent grip on both dry and wet rock and provide good insulation against the cold.

Price is a fair indication of the quality of a pair of boots. A cheap pair with a moulded sole will probably last for a season or two, while with proper care a good pair of leather boots can last for many years. Care of leather boots entails removal of mud and dirt, while they should be left to dry in a cool, ventilated storage place to prevent the growth of mildew or rot. (Boots should not be left to dry in the sun or near a fire, since they can dry out and crack.) Waterproofing is best applied a day or two before a hike, to allow the preservative to soak into the leather. 'Dry skin' compound or a good wax shoe polish can be used.

Other types of footwear

In addition to the leather boots described above, there are other options available for specific purposes. So, for example, there is a range of 'soft' boots with a soft but firm upper and a flexible, cushioned sole. Many people find these soft boots, or even a pair of running shoes, perfectly adequate for most hiking purposes, including hiking over rough terrain. While running shoes are far less likely to cause blisters, one has to watch your step in them very carefully, since they provide less ankle support. For this reason, you should also ensure that any soft boots, half boots, or running shoes used for hiking have a hard plastic support (identical to the heel counter used on some running shoes) just above the sole, at the bottom of the heel of the shoe. Such a heel counter helps to prevent the shoes from 'collapsing' inwards after a short period of use.

Running shoes used for hiking purposes cannot be expected to last long, since they are not made for hiking. Whatever type of shoe or boot you use, it must have a sole with a tread that will grip on smooth, wet rock. A number of accidents in the mountains are attributable to incorrect footwear.

For Alpine climbing heavy leather boots are often used, while a double plastic boot is mostly used for snow and ice conditions.

When trying on a new pair of boots, remember to wear the same number of pairs of socks you are likely to wear on the hike. Try on the shoes or boots during the afternoon, when your feet have swollen a little from the mornings walking.

Socks

Socks perform four vital functions:

- Cushioning.
- Sweat absorption.
- Insulation.
- Reduction of friction between your foot and the boot or shoe.

Wool is an excellent material for socks. A light, closely knitted wool-nylon sock can be worn next to the skin, and a heavy, rough-knitted wool-synthetic fibre blend can be worn over this. Alternatively, a single pair of wool-synthetic fibre socks can be worn. The synthetic fibre content (approximately 30%) is important, because it prevents shrinking, allowing the woollen sock to keep its shape.

During a hike you should rinse your socks whenever you get a chance, and let them dry in the sun. Pure-wool socks should not be washed with a detergent that can dissolve the natural oil in wool. Under no circumstances should washing powder or detergent be used to wash socks and other clothing in or near rivers or other natural water sources.

Two pairs of socks, one thin (preferably cotton) and one thick (wool-synthetic fibre), should be worn with rigid leather boots. The double layer prevents the foot from rubbing against the boot, reducing friction and preventing blisters. Inner soles can provide additional cushioning and insulation.

Gaiters

Gaiters made of nylon, with an elastic top and bottom, are designed to attach to, and fit snugly over, the upper boot. Depending on whether short or long pants are worn, they may extend up to the knee or merely cover the top of the boot and sock. When worn with shorts their function is to prevent .pebbles and sand from getting into the boot and grass seeds from penetrating the socks. They also keep the upper boot dry when one is walking in wet grass or snow. When worn with long pants they protect your pants, keep them dry, and provide additional insulation against the cold.

Rucksacks

Rucksacks come in many different shapes, colours and sizes, from tiny packs designed to hold necessities for a one-day hike or climb, to large expedition packs. The choice of a rucksack depends on the needs of the individual. Many climbers use more than one pack: a so-called day-pack for short trips, a larger, soft, frameless pack for weekend use, and a large frame pack or frameless pack for longer trips or expeditions.

Types of rucksack

Rucksacks can be divided into three main categories, namely external frame packs, internal frame packs, and frameless packs.

***Left**, summit rucksack without exterior pockets to catch on overhangs when hauled up rock faces.*

***Centre**, soft pack, with padded hip-belt and without protruding pockets to catch on brush or rock.*

***Right**, external frame pack with contoured metal frame and padded hip-belt.*

Most of the smaller day-packs and weekend packs, used to carry light loads, are frameless. They include packs with volumes of roughly up to 35 litres. The larger packs, with an average volume of 75 litres, make use of one of a variety of frames to facilitate the carrying of heavy loads.

An external frame rucksack is usually a multi-compartment nylon bag, attached to an aluminium H-frame, to which two padded shoulder straps and a hip-belt are attached. The frame has one or two tensioned nylon mesh bands that rest against the shoulder blades, creating a space between the rucksack and the back. The hip-belt is attached to the bottom of the frame and rests on the hips, distributing some of the load to the hips. The pack therefore touches the back in two or three places only, providing a certain degree of ventilation.

A correctly chosen frame optimises load positioning, permitting a heavy load to be carried with the minimum discomfort. A frame also provides many points of attachment for bulky items such as tents. Because of its size and the protruding parts of the frame, the main disadvantage of an external frame pack is that it restricts movement in dense undergrowth; it will also tend to catch on overhangs when hauled up on the end of a rope. Because it does not rest immediately against the back and is inflexible and bulky, it is not as well balanced as an internal frame pack and is therefore seldom used by rock climbers.

The *internal frame pack* is more compact than the external frame pack, with less external packing space. It has a pre-shaped internal metal frame which is sewn into the back panel of the pack. This kind of rucksack is also designed to allow only two points of contact with the body: the shoulders and hips. The main disadvantage of the internal frame pack is that it is not as convenient as the external frame pack for very bulky or heavy loads. Internal frame rucksacks are currently the most popular bags on the market.

The 'body-huggers', or frameless packs, are designed for use mainly by climbers, or as day-packs. This kind of bag has no rigid frame to inhibit the climber's freedom of movement on steep slopes. It also provides excellent stability. The disadvantages of this type of bag are:

- As with internal frame rucksacks, there is little ventilation along the back because the bag lies snugly against the back (many hikers maintain this is not a problem).
- It is perhaps more tiring to carry a very heavy load in a frameless rucksack.

Selecting the correct size rucksack

It is important to select the correct size frame in order to ensure comfortable load carrying. The simplest rule to observe is that that when your highest prominent neck vertebra is in line with the point where the shoulder straps are attached to the rucksack, the bottom of the hip-belt should be in line with the hips.

You should fill up the rucksack in the shop with various items to get an idea of what it feels like with an actual load. Before purchasing a rucksack you should also experiment with various types of

rucksack belonging to friends and family, in order to get an idea of which type you prefer. Whichever rucksack you choose should have a comfortable, padded hip-belt.

The frames of some packs have screw joints, which allow the length of the frame to be adjusted. The size of the frame is more critical when a padded hip-belt is used, since an over-long frame causes the pack to be bounced about by the rolling movement of the hips during walking.

Other considerations regarding rucksacks

Rucksacks are designed to carry the load high and close to the back, so that, by leaning forward slightly, the centre of gravity of the pack is brought in line with the centre of gravity of the body. This ensures good balance and maximum load-carrying comfort. To ensure that the centre of gravity of the rucksack is as high and close to the back as possible, the heaviest articles such as a tent, food, stove, etc. should be packed towards the top of the rucksack (*see also Chapter 4, Hiking Skills*). A woman's centre of gravity is lower than that of a man; the centre of gravity of her rucksack can therefore be lower.

A hip-hugging, padded hip-belt is important, because it allows the load to be distributed between the shoulders and the hips and also provides additional stability.

With regard to the heaviest load one should carry, a useful rule of thumb is that a man should carry a maximum of a third of his own body weight, while a woman should carry no more than a quarter of her own body weight. Rucksacks are made of waterproofed nylon; however, they are never completely waterproof, particularly at the seams and zips. Plastic bags should be used to keep individual items dry, but a simpler solution is to use a single large plastic bag to line the inside of the rucksack.

The many different types of packs available offer a large variety of combinations of main compartments, side-pockets and closure arrangements, and they can be loaded through the top, the front, or both. A bag with a single main compartment, or 'straight-through' bag, is useful for carrying bulky items or for expedition use. A disadvantage of this kind of bag is that one has to unpack most of the bag's contents to get to items packed at the bottom. Side pockets can be very useful for items you want to get to quickly, for example cameras, or in order to separate the stove or fuel from clothing and food.

The most popular bag for general use has two main compartments and a number of side-pockets for smaller items. Remember that, in the case of frameless or internal frame rucksacks, the sleeping bag has to be carried inside the rucksack: allow approximately 15 litres for this. The most important consideration when buying a rucksack should be the main use for which the bag is intended. Advice from other hikers, and 'trial runs' with rucksacks borrowed from friends can also provide very useful hints regarding the relative performance of different bags.

Sleeping bags

The warmth, weight, and price of a sleeping bag depend mainly on the type and quantity of insulating material used. The major determinant of the insulation performance of a good mountain sleeping bag is its thickness, or loft.

Seasons rating

So-called 'specialist bags' are given a performance rating which relates to the seasons of the year and gives an indication of the minimum temperature at which the bag can be used. For example, a 'three seasons' bag refers to a sleeping bag suitable for use in spring, summer and autumn. The seasons rating can be linked to a temperature range, assuming that the person in the bag is wearing underclothing only, and assuming ideal conditions, i.e. the person is sheltered from the wind and insulated from the ground.

SEASONS RATING	MINIMUM TEMPERATURE (*C)
Summer	10
Three seasons summer	1
Three seasons winter	-6
Four seasons winter	-20
Expedition	-40

Size and shape

The purpose of a sleeping bag is to retain body heat by preventing it from being lost at a rate faster than it is produced. 'Dead' air is trapped by the material used as filling. Both natural down and synthetic fibre have excellent insulation properties. Most expedition sleeping bags are 'mummy shaped' to place the insulation material as close to the body as possible and to reduce the overall weight and size of the bag. A good bag will also have a hood or cowl which can be closed around the face by means of a drawstring. Tapered bags may be heavier than mummy bags; depending on the amount and type of filling used, they may be suitable for extreme temperatures. The cheapest type of bag is usually rectangular in shape, and these bags are usually suitable only for moderate outdoors temperatures.

Before purchasing a sleeping bag, you should try it out in the store to make sure that it is the correct length for you. A sleeping bag intended for use in sub-zero temperatures should certainly extend above your head, whatever its shape. The better sleeping bags have a foot pad — a round or square section sewn in at the bottom of the sleeping bag (containing the same fill as the rest of the bag) to prevent the bag tapering to a flat end. Bags with all-round zips seldom have such a pad.

Zips add versatility to the use of a sleeping bag. For example, a four-season bag with a zip can be used in summer with relative Comfort. A zip makes it easier to get into and out of a bag. Heat is lost through a zip, however, so that the better bags have no zip or have a down-filled baffle that covers the inside of the zip to minimise heat loss.

Filling

The choice is between natural down and synthetic fibre. If weight and space are major considerations, down is the first choice, for it is warmer, weight for weight, than synthetic fibre. The figures in the following table are merely a rough indication of comparative weights for different types of bag, since the insulation characteristics of a down bag depend very much on the quality of down used, just as the type of synthetic material used also affects the insulation performance.

The typical difference in weight for similarly bags

	Down	Synthetic
Three seasons summer	0,96 kg	1,3 kg
Three seasons winter	1,20 kg	1,6 kg
Four seasons winter	1,60 kg	2,0 kg

Under conditions where it is difficult to keep the bag dry, for example on caving, canoeing or snow and ice climbing trips, synthetic bags should be considered. Down loses its loft, and therefore most of its ability to keep you warm, when wet. A Gore-Tex or Ventex sleeping bag cover is therefore ideal for use with a down bag in cold, wet conditions.

While down is compressed by the sleeper's body, causing it to lose most of its loft, synthetic fibre resists compression and therefore provides better bottom insulation than down. Synthetic bags are also easier to wash and care for and are also the only bags that can be used by people allergic to down. Synthetic fillings are continuously being improved, and synthetic bags may yet come to be generally preferred over down bags.

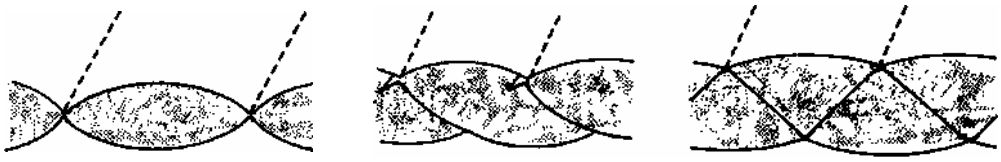
Type of filling	Advantages	Disadvantages
Natural (down)	Light Compact Excellent insulation	Loses insulation when wet More expensive Difficult to dry and clean
Synthetic (Hollofil)	Retains loft when wet Easy to dry and clean Less expensive than down	Heavier and bulkier Shorter life expectancy

Down versus synthetic filling

Construction

Three basic construction methods are used in down bags to keep the fill uniformly distributed:

- Sewn-through.
- Slant tube baffle.
- Overlapping tube baffle.



Sewn Through *Slant Tubes* *Overlapping Tubes*

In sewn-through bags the inner is stitched directly to the outer, a simple, inexpensive method, but one that leads to substantial heat loss at the seams. It is used only in the cheapest sleeping bags.

In the more expensive bags, features such as channel blocks and baffles are used to prevent the down from moving. Baffles are walls of material connecting the outer and inner shells of the sleeping bag and forming tubes across the width of the bag, usually about 20 cm apart. The most common method used to stitch bags is the slant tube method. This method eliminates heat loss through the seams. Another very effective design makes use of overlapping tubes.

Care of your sleeping bag

Dirt adversely affects the insulating properties of a sleeping bag, as does frequent washing. To keep the inside of the bag clean, a removable, washable inner liner should be used, made, for example, from an old winter sheet. A durable, breathable outer cover adds weight, but serves to protect the bag and to keep it clean and dry.

Every effort should be made to keep the bag dry, especially a down bag. Most commercially available stuff bags for sleeping bags are not waterproof and they should be lined with a plastic bag.

Down bags can be hand washed or dry-cleaned when necessary. Special soaps are available for washing down bags. They should be stuffed into a stuff bag and should not be rolled up. When storing a down bag it should preferably be stored loosely folded in a large plastic bag or hung up. Never leave it tightly compressed in a small bundle.

Ground insulation

Down, and to a lesser extent artificial fibre, is compacted by the sleeper's body into a thin layer, for example across the hips. Heat is then lost to the ground through conduction. For this reason, additional insulation is needed to ensure a comfortable night's sleep. On wet ground or snow such

extra insulation is essential.

Closed cell foam pads, which come in varying lengths and thicknesses, are light, extremely effective and reasonably priced, and they do not absorb water. Not only do they provide extra insulation against the cold ground, but they also make for a more comfortable 'bed'. A light-weight air mattress specially made for hiking is equally effective, though considerably more expensive. In an emergency, rope, extra clothing, or a frameless rucksack can be used to insulate yourself from the ground.

Tents

A tent performs approximately the same functions as an outer layer of clothing. It should be rugged and reasonably light-weight and should protect its occupants against wind and rain.

The choice of a particular tent depends mainly on the use for which it is intended. Will it be used only in summer or the year round, in temperate or extreme conditions? How many people should it sleep, and in what degree of comfort? Should it be light-weight or can it be heavy? Price is also an important consideration, since tents vary in price from cheap (and frequently inadequate) to very expensive.

Double wall construction

For a tent to be adequately waterproof and yet not trap condensation on the inside, it needs to be of a double wall construction. Such tents have two layers, approximately six centimetres apart: a light-weight breathable inner tent and an outer waterproof flysheet. Water vapour generated by breathing and perspiration inside the tent passes through the inner, condenses on the flysheet and runs down to the ground outside the tent. The double layer tent also has the advantage of trapping a warm layer of 'dead' air between the inner and outer walls, thereby insulating the tent from the elements and resulting in the temperature inside the tent being up to 10°C higher than the temperature outside.

The inner tent should have a sewn-in heavy-duty groundsheet which extends for approximately ten centimetres up the sides of the inner, in order to prevent runoff water from entering the tent and to ensure a comfortable pitch even on wet ground or snow. The inner tent should be made of a light, non-waterproof material. It should provide adequate space for sleeping and should preferably have two entrances with flaps that can be zipped closed. It should preferably have mosquito netting in front of all entrances and window panels. The inner tent is usually suspended from the flysheet which is supported by a framework of poles. It is important to ensure that the flysheet does not touch the inner as this will allow water to run down inside the inner tent.

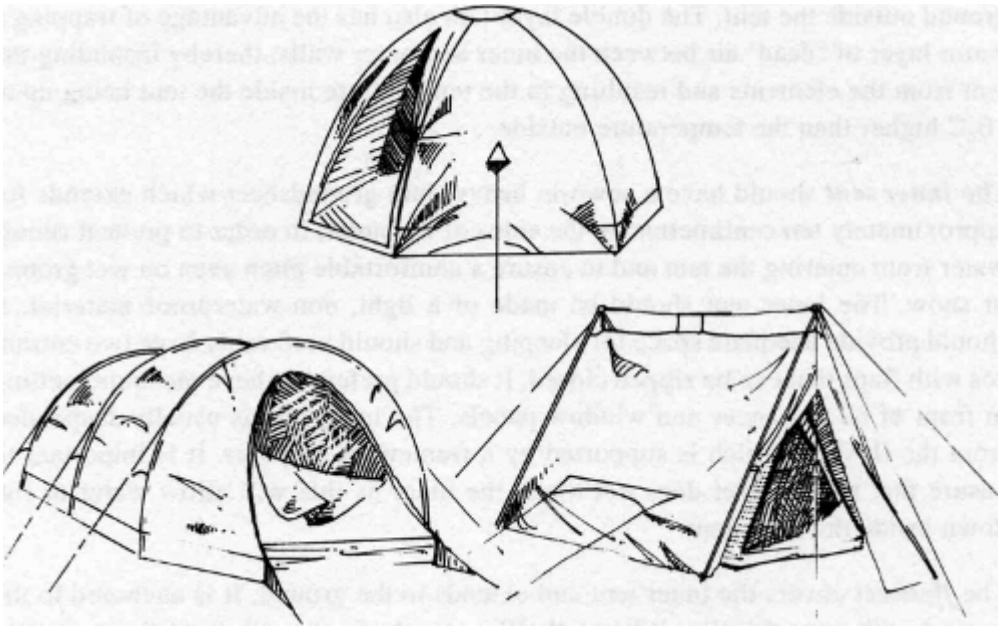
The flysheet covers the inner tent and extends to the ground. It is anchored to the ground with pegs. Ideally, it has a 'bell' in front of one or both of the entrances which provides sufficient storage space for rucksacks and wet boots and for activities such as cooking. A roomy bell outweighs the disadvantage of a slightly heavier tent, especially in foul weather.

For expedition mountain use, single-layer tents made of Gore-Tex or similar 'breathable' material are available. Their main advantage is that they are very light. However, they are expensive, and the material must be kept very clean. At extremely low temperatures the breathable layer may ice up and cease to 'breathe', thus causing the material to behave like ordinary tent material.

Shapes

Tents come in a bewildering variety of shapes and sizes and, once again, the main consideration should be the use for which the tent is intended. The most important considerations to take into account when buying a tent are: intended use, space, comfort, price, weight, and winds and temperatures anticipated in the area where it is to be used.

Tunnel and free-standing dome-shaped (geodesic) tents are becoming increasingly popular. Geodesic-shaped tents provide the greatest volume for a given surface area.



From left to right, tunnel tent, free-standing dome tent and A-frame tent

They therefore make maximum use of available space and usually have very few guylines. Some dome tents that have no guylines at all can simply be picked up and moved, but they have to be pegged down in strong wind to prevent them from being blown away. The tent poles used in these tents are made of light-weight metal alloy tubes or flexible fibreglass rods which are constructed in short sections that fold up in shock-cord-linked sections.

The A-frame tent has a less favourable volume-to-surface-area ratio than either the tunnel or the dome tent. It is, however, simpler in construction, lighter, and usually cheaper. When pitched correctly it is also very stable, even in strong winds. In general, dome tents are not designed for extremely windy conditions. A-frame tents, on the other hand, are well suited to exposed ridges, where the rigidity of the A-frame allows the tent to stand up to high winds.

Care of tents

Before putting a tent away, ensure that it is clean and dry, since fungus destroys all types of material. Waterproofing the seams of the tent is a good idea with most tents. Count all the pegs and poles before leaving a campsite and before going on a hiking trip.

Shelters for emergency bivouacs

An emergency bivouac can become necessary if a member of the party is injured or if the weather suddenly changes for the worse. If this happens, instant alternative shelter from wind or rain may be required if the group is not carrying tents or if the wind or the angle of the slope makes it impossible to pitch a tent.

The simplest type of shelter consists of a large polyethylene bag (the orange 'Survival Bags' are ideal) which can provide cover to one hiker. Such bags are cheap and light and can double as a waterproof ground sheet or as a bag in which to store the rucksack, if space in the tent is limited.

More expensive Gore-Tex or Ventex bivouac bags (or 'bivy bags' for short) have the advantage of 'breathing', i.e. they are waterproof, but they let most of the moisture resulting from perspiration pass

through the bag, keeping the sleeping bag relatively dry (see also the section on emergency camps in Chapter 2).

Stoves

A number of ingenious, light and reliable hiking stoves are available. Each has its own advantages and problems. Important factors to be taken into account when choosing a stove include:

- Preferred fuel and availability of fuel.
- Altitude and temperature where the stove is to be used.
- Reliability.

Most stoves should boil a litre of water in three to six minutes. You should experiment with your stove to establish the approximate burning time of the stove on a tank of fuel. Your estimate of how much fuel to carry should take into account that altitude, temperature and the wind will affect the performance of the stove. Remember that certain types of fuel are not readily available everywhere (a major consideration in the case of stoves intended for expedition use).

The ambient temperature, altitude, and wind all affect the performance of stoves. There is a big difference between a stove's performance at sea level and at altitude. For example, on top of a high mountain such as the Drakensberg a small gas stove will boil water quickly, but because the air-pressure is much lower than at sea level, the water will boil at approximately 90°C. Gas stoves also do not work very well in extremely cold conditions, because the gas liquefies. Any stove should be sheltered from the wind, which drastically reduces its efficiency.

Extreme caution should be exercised when cooking inside the bell of a tent, and no stove should ever be used inside a tent (see Chapter 2 for safety precautions to observe with stoves).

Ensure that the group carries more than one stove. On an expedition or in an emergency a life-threatening crisis could result if your only stove refused to work. Also make sure that essential spare parts and tools for undertaking elementary repairs are carried.

Fuel Type	Advantages	Disadvantages
Solid Fuel	- Ideal for heating a small teapot or preheating a paraffin stove	- Low heat output flame difficult to control
Gas (Butane)	- Instant full heat output flame easy to control simple to use no priming required no spillage likely - Replacement cartridges readily available	- High fuel cost - Reduced heat output for final 20-30% of cartridge - Butane remains liquid at subzero temperatures and will not ignite - Low total heat production for large meals - Limited availability in certain countries
Methylated Spirits	- Simple to operate - Does not require priming or pressurising - Spilled fuel evaporates easily without a lingering smell - The 'storm-cooker' and Trangia' work well in windy conditions	- More expensive than other liquid fuels - Slower cooking time than paraffin or petrol stoves - Smell of leaked spirits penetrates clothing and food
Paraffin	- Fuel easily obtainable - Burns with a very hot flame even in windy conditions - Spilled fuel will not ignite easily	- Spilled fuel leaves lingering smell; messy operation - Separate priming fuel required - Stove tends to be larger and more bulky - Requires regular maintenance of jet - More complicated to start up
Benzine / Petrol / White Spirits	- Fuel readily available - Fuel has highest heat output of any stove - Spilled fuel evaporates quickly and leaves no lingering smell - Burns very hot and performs well even in windy conditions - Easy to light and operate	- Spilled fuel is volatile and highly inflammable.

Sample check lists

It is unlikely that you will carry exactly the same items on each hike. However, certain items are standard for most hiking trips, and you can save yourself a lot of trouble and last-minute anguish by preparing check lists for the type of outings you normally undertake. Besides making life easier, such lists can help to prevent emergencies by ensuring that you do not forget essential items.

10 Essentials

1. Map of area (in a case or covered with adhesive plastic)
2. Compass
3. Flashlight with extra cells and bulbs (a headlamp leaves both hands free)
4. Emergency food supply and water bottle
5. Pocket knife (with tin opener)
6. Matches (in waterproof container) or lighter
7. Storm gear (sweater, anorak, gloves etc.)
8. Whistle
9. Emergency shelter/space blanket
10. Personal First Aid Kit

Other items required on most hiking trips

1. 5-litre water bag
2. Handkerchief (very useful for wiping away perspiration!)
3. Sunglasses
4. Toilet paper
5. Ground sheet
6. Closed cell foam pad
7. Mug, plate, eating utensils
8. Sun block lotion (and lip : protection)
9. Insect repellent
10. Nylon cord
11. Pots, pans ('billies'), scouring pad
12. Billy grip
13. Stove, fuel and accessories (e.g. pricker for primus stoves)
14. Shelter (tent and accessories)
15. Sleeping bag and stuff sack
16. Sleeping bag inner
17. Repair kit (wire, cord, needle, thread, pins, clevis pins and split rings)
18. Candles or other lighting
19. Camera and film (also binoculars)
20. Inexpensive watch
21. Glasses strap for people who wear glasses
22. Small metal mirror (can also be used for signalling in emergencies)
23. Personal toiletries (toothbrush, etc.)
24. Rucksack cover
25. Money
26. Entry permits and membership cards of mountain club (passport, if required)
27. Extra plastic bags
28. Clothing: shorts; collar shirt; underwear; socks; pullover; hat; gloves
29. Winter clothing, if required: thermal underwear; rain-pants; balaclava; mittens, outer gloves; down clothing; snow goggles