

# MOUNTAIN AND MOORLAND NAVIGATION

Kevin Walker



Kevin Walker

**A PRACTICAL MANUAL**

ESSENTIAL KNOWLEDGE FOR FINDING YOUR WAY ON LAND





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He runs a wide range of navigation, hill skills and mountaineering courses, as well as offering personal tuition, 1:1 coaching, and private guiding. Further details of the courses and walking events are available on his web site at [www.mountain-activities.com](http://www.mountain-activities.com), where you can also check availability, make online bookings, and buy books and guides.

When not teaching or guiding, he spends most of his free time exploring, photographing and writing about the less well known parts of Wales, with occasional trips to further flung hills, most recently the Spanish Sierras de Tejada and the Nepal Himalayas.

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This book would not have been possible without the help and companionship of many people, including all those who have attended my navigation and hill skills courses over the years. Teaching is undoubtedly the best way to learn!

More especially, I would like to acknowledge the immense help and support that I have received from the many colleagues with whom I have worked (and played) on the hills. I count the camaraderie and our shared experiences amongst my most valued possessions.

Mention too must be made of my publisher Franco and his great team of editors and designers, who have made the process of turning my rough draft into a proper book easy and painless!

To all those whom I have mentioned, my grateful thanks – to any I have neglected, my humble apologies.

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# INTRODUCTION

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## **“GOOD NAVIGATORS ARE NEVER LOST ... BUT THEY MAY BE ‘LOCATIONALLY CHALLENGED’!”**

Navigation is a major part of the wider art of mountaineering and, as such, should be regarded as an essential component skill rather than the be-all and end-all of a day in the wild. I firmly believe that understanding this basic concept is vital to successful wilderness navigation. Put simply, it means that if you are a skilled navigator, you do not need to know *precisely* where you are all the time (although you will usually have a reasonable idea), because you have both the ability and the confidence to work out where you are when needed. This is a tremendous asset, for it affords you the freedom of the hills.

If you find you are a slave to your navigation, spending much of your time walking around with map in hand, trying to keep your thumb over your precise position, constantly consulting your compass and counting paces and minutes, then you are definitely doing it all wrong. Successful navigation should be simple and straightforward, and when done correctly, it will enhance the pleasure you get from the great outdoors, not detract from it.

I have now been running navigation courses for well over thirty years, and this book is based largely on my experiences. What I have come to realise is that the most common barrier to learning and understanding is a mistaken preconception; people think navigation is difficult, so they make it difficult. When attending my navigation courses, most people's expectations are that they are going to find it complicated, so when they wander across the moors and find that navigating is actually simple, they look worried and ask what they are doing wrong!

Although map interpretation, and more especially some of the poor visibility techniques, may appear complicated, they are actually quite straightforward. As long as you can get to grips with a few basic principles you will find that this type of navigation is easy. The best way to learn is to take it step by step, gaining as much familiarity, understanding and experience as possible of each stage, before progressing to the next.

There is a common misconception that we should correct at an early stage. When presented with a map and a compass and asked to select the most important tool for successful navigation, most people choose the compass. Unfortunately, this is totally wrong! Even if you are the best compass navigator in the world, able to follow bearings within incredible precision



it means nothing unless you can relate the bearing to a map. It is simply an invisible line that goes from somewhere to somewhere else – possibly through a bog and over the top of a cliff! Over-use of the compass combined with under-use of map interpretation is an extremely common error, even amongst experienced hillwalkers. Indeed, it is one of the most common reasons that candidates fail when being assessed for National Governing Body qualifications.

In reality, map interpretation should account for a good 90% of your navigation. Of the remaining 10%, compass work will account for about 6%, and estimating time and distance, the remaining 4%. With practice and experience, you should be able to read a map like a book; one which gives you such a complete and accurate picture of your surroundings that, for the vast majority of the time, there will be no need for you to use any other equipment or techniques.

I have tried to write this book in such a way that it allows you to follow a structured course of learning. Based loosely on my first navigation book (*Mountain Navigation Techniques*, Constable, 1986) and its subsequent reincarnations, I have completely revised and updated the original text, and have made much use of the experiences I have gained over many years whilst running navigation courses at all levels from total novice to aspirant instructor. In Part One, we look at maps, mapping and map interpretation, and how you can use your map to give you a detailed picture of the terrain. Part Two is concerned with compasses and bearings, and how you can use simple techniques to give you a precise measure of direction in even the thickest mist. In Part Three we examine a whole range of additional techniques that will be of particular use in poor visibility or when crossing featureless or difficult terrain, including how to estimate time and distance with great accuracy, and how to 'tweak' your bearings to make life simple. We also discuss the advantages and disadvantages of route cards, look at a few difficult situations, and introduce the somewhat thorny subject of GPS devices and smart phone apps. Last but by no means least, in Part Four we cover what I believe to be the real core of navigation – the art of relocation – or how to work out where you are when you are 'locationally challenged'. The reason this is left to the end is that it relies heavily on a reasonable familiarity with all the other techniques.

If you are new to navigation, there are a few technical terms which may be confusing. To help make things clearer, the first time such 'jargon' is used I have shown it in **bold**, and many of these terms are then explained further in the glossary at the back of the book.

There is one point that must be stressed right from the start; simply sitting down and absorbing all the information in this book will not, in itself, make you a good navigator. Without practical experience you will still be next to useless when it comes to navigating in the sort of conditions where your life, and perhaps the lives of others in your group, depend on your accuracy.

Use every opportunity you can to gain as much experience as possible of all the techniques, particularly map interpretation, and continue practising them regularly. Your ultimate aim should be to become so familiar with the basic techniques that they are second nature. When walking as a member of a group, stop relying on someone else to do all the navigation, and offer to help or even to lead part of the walk yourself. When you are a passenger in a car, have a 1:50,000 scale map handy, and try to work out what is coming up ahead, not just in terms of the road configuration, but more in terms of the terrain and the general shape of the land. Use a 1:25,000 scale map to plan short walks near your home; work out what you think you are going to see, then go out and check how right you were. Who knows? You may even find out something about your neighbourhood which you had never realised before. Indeed, there are countless things you can do, even if you live in the middle of a city; and if, at this early stage, it all starts to become a little tedious – stop! Do something else for a while and then come back to it. Navigation should be, and can be, fun!



## 7 SETTING THE MAP

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### Holding the picture the right way up!

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When you look at a picture, you usually try to hold it the right way up so that it makes sense! So, too, with a map.

A map is simply a picture of the ground, so in order to make the best sense of that picture, it is important that you hold it the right way up. This is known as **setting the map**, and it is one of the most useful yet least understood (and therefore least used) of all navigation techniques.

Many people new to map reading and interpretation hold their map so that they can read the writing – yet this is only correct when they are facing north. This is because all OS and BMC/ Harvey maps are drawn with the ‘top’ of the map facing north. So the top of the map is the northern edge of the picture, the bottom is the southern edge, the left side is the western edge, and the right side is the eastern edge. A correctly set map will always have its top (northern edge) pointing north.

So how do you set your map? In certain circumstances (when, for example, walking in poor visibility or crossing featureless terrain) it may be very difficult or even impossible to set your map without the aid of a compass. This technique is described below. However, it is often possible to set the map by eye, especially if your map interpretation is good. What is needed is some feature (or better still, a combination of features) that is obvious both on the ground and on the map. The best features of all are linear features such as paths, rivers, edges of forests, field boundaries, cliffs, ridges, spurs, and valleys – anything, in fact, which runs (more or less) in a straight line. All you need to do is turn the map in such a way that the feature shown on the map runs in exactly the same direction as the feature you see on the ground. Admittedly, you may find that you get a few attempts back-to-front (or 180° out), but this mistake should become quite apparent when you start to compare other features!

Photo 13 | *Setting the map with the compass needle.*

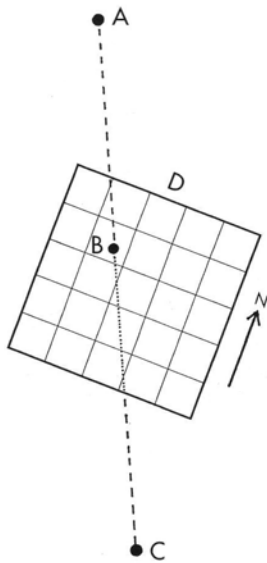


Where you cannot find any linear feature, you need to find a combination of at least two, preferably three, other features. For example, there may be a prominent mountain peak directly in front of you and a stream junction to your left. In this situation, you should turn your map so that the features on the ground appear in corresponding positions on the map – in other words, turn the map so that the mountain peak lies towards the part of the map furthest from you whilst the stream junction lies towards the left.

If you are unable to identify any features, or in situations where the visibility is too poor to see more than a few metres, you will need to use your compass. The easiest way to do this is to use the magnetic needle. Ignoring everything on the compass apart from the magnetic needle, place your compass on the map in such a way that the pivot of the needle lies close to a north-south grid line. Now **turn the map** (not the compass!) until the north-south grid lines run parallel to the needle, and the red (**north-seeking**) end of the needle points towards the top of the map. Your map is now set to within a few degrees (see Photo 13). For obvious reasons, you must ensure that you are using a north-south grid line rather than an east-west grid line, and that nothing metallic or magnetic is affecting the needle!

Whilst purists may argue that this technique is not 100% accurate (for reasons described in Chapter 11), it is sufficiently precise for the vast majority of situations in the UK for the next twenty years or so. If you are intending to use this technique abroad, or if you wish to be more precise, you will need to take into account an error factor known as **magnetic variation**. This is explained in Chapter 12.

With practice, this quick, simple and straightforward technique is suitable for use in the vast majority of situations. However, some people find it difficult to line up the needle and the grid lines with the required degree of accuracy. Additionally, if you are setting your map using



**Figure 9** | *Single line of sight location with a set map.*  
*A = Feature on ground.*  
*B = Feature on map.*  
*C = Your viewpoint.*  
*D = Top of map.*

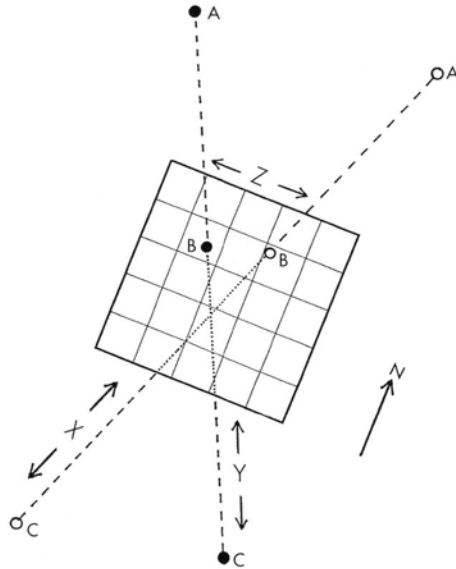
this method and then looking at features a long way off, the inherent inaccuracy will become magnified by the distance. In either of these situations, you will find it better to use one of the more accurate alternative techniques described in Chapter 12.

With your map set correctly, everything on the map is in exactly the same orientation as it is on the ground, and vice versa. This means that features behind you on the ground will be behind your position on the map, features to the left of your position on the map will be to the left of you on the ground, and so on. Setting the map therefore allows you to do some very useful things using **line of sight**. For example, let us assume that you are not sure of your position. Looking around, you see a feature to the left of you on the ground that you can recognise on the map. If you now set your map, you know that your position must be to the right of that feature on the map. Taking this one stage further, if you face the feature before setting your map and then imagine an invisible line that stretches from the feature on the ground, through the feature on the map, and back towards you, your position will be somewhere on that imaginary line between the feature on the map and you (see Figure 9). When using this technique, it helps if you hold the map horizontally in front of you, about level with your chin, and use some form of straight-edge (such as the base plate of your compass) to sight along and then to indicate the invisible line.

If you can see two features that you can identify on the map, you can be more precise in finding your position. First, face one of the features and set the map as described above. This time, instead of imagining the line and using a straight edge to indicate where the invisible line runs, physically draw it on your map (a laminated map and Chinagraph pencil will make life easier). Now face the other feature, check your map is still set, and do exactly the same, drawing a second line. Your position will be fairly close to where these two lines cross (see Figure 10). If you can see and identify more features, you can draw more lines and, theoretically, be more accurate. However, to

Figure 10 | Double line of sight location with a set map (compare with Figure 9).

X = First line.  
Y = Second line.  
Z = Top of map.



my way of thinking, if the visibility is good enough that it allows you to see two suitable features and get an approximate location, you should then be able to use map interpretation to get a more accurate fix. This technique is a simplified and practical version of a compass procedure called taking a **resection** – a technique which I believe to be less than useful in mountain and moorland scenarios, although it is discussed briefly in Chapter 15.

Let us now use a hypothetical example that illustrates another way in which setting the map can be useful. You have been enjoying your gently undulating section of heather moorland for some time when you notice a nasty-looking squall line rolling over the horizon towards you. Because you have been wandering more or less aimlessly, you do not have a very good idea of where you are, so you decide it might be prudent to work out a somewhat more accurate position before the visibility deteriorates. Once you know this, you will (as we will see later in this book) be able to navigate your way to wherever you wish, safely and with the least amount of difficulty, no matter how poor the visibility becomes.

Taking a good long look at your immediate surroundings, you notice a pool, only a short distance away, with a stream leading from it. Working out your position is always easier if you can identify a definite feature, so you move closer to the pool in the hope that you might be able to see one or more distinguishing features. You note from the map that there are



*Photo 14 | Using line of sight with a set map. If you hold the compass on the map as shown, you can set the map with the needle, and sight along the edge of the base plate.*

four pools in your approximate area, but one of them can be ruled out because it has no stream issuing from it, and another can be discounted because it is totally the wrong shape. This leaves you with two possible locations, and as they are some distance apart, you reason that it is important to identify which is which. You could take a compass bearing along the line of the stream (as described in Chapter 15) and then compare this with the direction of the two streams on the map, but there is an easier way! What you should do is set your map using, first, one pool, and then the other, each time lining up the stream on the map with the stream on the ground. Once the map is set, compare the topography with the contour patterns. You may find that when you line up the map using the first pool, the map shows the land sloping down to the left, whereas you can see that the land *rises* to the left. So you then line up the other pool and – hey presto! – the map shows the land rising to the left. Any other features that you can see are also in corresponding positions on the map. If you are still unsure and would like some form of confirmation, if you now put your compass on your map, you should find that the red end of the needle points north and the needle itself lies almost parallel to the north-south grid lines. Indeed, you could start by setting your map with your compass and then comparing the direction of the streams from both pools. Once you understand the rationale, the detail and how you use it is entirely up to you.

### **To recap**

Setting the map is an extremely useful technique in which you turn your map so that everything on the map is in a corresponding or matching position on the ground. A correctly set map will have its northern edge pointing north.

Having your map set correctly enables you to navigate easily by using line of sight. It also allows you to work out your location by relating it to the position of known features that you can identify both on the ground and on the map.



## 8 SEEING THE LANDSCAPE

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### Building the picture in layers – map to ground

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Map interpretation is a two-way process – not just working from map to ground, but also working from ground to map. Not only should you be able to use your map to work out the lie of the land, but you should also be able to use the shape and detail of the land around you in order to find your position on the map. So far, we have concentrated on accessing the information from the map. We now need to look at how we can process this information in such a way that we can start to ‘see’ the landscape, and how we can make best use of this information when out and about.

I am convinced that having the ability to interpret your map will actually enhance your walking pleasure. It will make you more aware of your surroundings, and will increase your appreciation of landscape. This is because, in order to use map interpretation efficiently, you need constantly to evaluate your surroundings, subconsciously storing any landscape information that might be useful. One thing that the best navigators have in common is that they are all very observant, with a keen awareness of their surroundings. In order to be truly observant, you have to use not only your eyes, but all your other senses as well. For example, if you are heading towards a stream junction in misty conditions, ask the people in your party to keep quiet every now and then, because you may well hear the stream long before you see it. Similarly, if you are heading towards a wood in poor visibility, you may well hear the wind in the leaves before you see the trees, or if it is a calm day in heavy mist, you may well smell the leaves! Many people can smell water, and most people can smell bog! Touch, too, can be useful. If, for example, you have been following a bearing with the wind on your left cheek and you notice that the wind is now coming from behind, does it mean that the wind has changed direction? Or have you made a mistake? It is certainly worth checking, but you need to be aware in order to notice the change. Good navigators become attuned to everything going on around them.





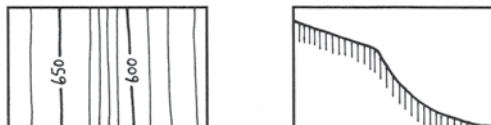
*Photo 15 | Having the ability to interpret your map will enhance your appreciation of landscape, allowing you to visualise not just the valley and the distant mountains, but the subtleties of shape, and even details such as the fence line.*

Whilst you need one type of observation to get information from the ground, you need a different type of observation – a special kind of visual discipline – to get the necessary information from the map. You need to study the map in such a way that you can select the right amount of information at the correct level of detail, and this will vary with the visibility and, to a lesser extent, the nature of the terrain. For example, let us assume that you are following a linear walk to a peak, and are intending to return along the same route. The outward journey is done in good visibility, and your landscape observation is such that when you pass a tiny V-shaped valley – a mere ripple on the landscape – you hardly notice it; it doesn't even register in your consciousness. Because you can see the surrounding landscape for a considerable distance, your map discipline is nearer map reading than map interpretation, and so you do not notice the tiny valley on the map – a V-shaped squiggle, just one millimetre across, reflected in two adjacent contour lines. On the return journey, however, the weather deteriorates and mist rolls in, and you soon find yourself in 20 metre visibility.

That tiny V-shaped squiggle on your map now becomes really important, for a 1 millimetre squiggle on a 1:25,000 scale map represents a feature that is 25 metres across! This means that the valley you hardly saw that morning is now a feature so large that you can hardly see the far side! Whilst I am not suggesting that you should be studying your map at this level of detail whenever you go walking, what I am trying to impress upon you is that there will be times when single squiggles on single contour lines become very significant, in which case you need to be looking at your map in sufficient detail to see them. It is in situations such as this where the 'layer system' becomes extremely helpful.

Let's start by working from the map to the ground. When looking at your map in order to see the landscape, you will find it easiest if you do so layer by layer, starting with layer five (the contour lines), and working your way towards layer one, thus building up your picture of the ground, layer by layer, piece by piece. Start by concentrating on the contours, and ignore everything else. This is difficult, but necessary! If you are in a complex area, it will help if you use a sheet magnifier and initially concentrate solely on the basic contour patterns. All you are trying to do at this stage is to work out the outline shape of the land. You need to do this in conjunction with the scale of the map in order to get some idea of size (remember, as a quick guide, the grid lines are always one kilometre apart). Once you have an idea of the outline shape, keep concentrating on the contours in order to put some detail into the landscape. For example, if you are looking at a slope, is it a smooth slope (in which case the contours are a uniform distance apart), a convex slope (in which the contours are closer together towards the bottom of the slope), or a concave slope (where the contours are closer together towards the top of the slope)? See Figure 7 for examples. Is there any obvious break of slope? This will be indicated where the contours are a set distance apart on one part of the slope, then a different distance apart on another part of the slope – see the central part of Map 4, Figure 11 and Photo 16. Are there any small spurs or valleys within the slope itself, or is it uniform (265347 on Map 4)? Are there any steps, terraces or platforms (268345 on Map 4)? Are there any ring contours (150151 on Map 1)? If so, do these represent hummocks or basins? The more detail you can pull from the map, the better – even if, at this stage, you cannot interpret exactly what landscape shape it represents.

Figure 11 | Break of slope.



Once you have worked out the shape in as much detail as possible, start looking at layer four – the linear features. Some of these may be physical features indicated by the contour patterns – breaks of slope, ridge lines and valleys being the most obvious examples. Other physical features might include vertical faces and streams. Then there may be man-made features such as long field boundaries and paths. Remember, however, that you need to be careful with all man-made or vegetation features, as these may have disappeared since the map was surveyed, or they may no longer be obvious on the ground.

Once you have exhausted the linear features, look at layer three (the pinpoint symbols). Get into the habit of using a magnifying lens, not only to ensure that you get as much information as possible from the map, but also to confirm that you really are seeing what you think you see. When you are sure you have seen all the pinpoint symbols, look at layer two (the area symbols) in order to clothe the area in rocks or vegetation; then glance at layer one (the ‘symbols for things that aren’t there’) in case there is anything else that helps. By building up your picture of the ground in this way, layer by layer, and in a structured manner, you are less likely to be overwhelmed by the amount of information shown on the map. It also means you are less likely to ‘cherry pick’ the information, which leads to the risk that you will miss subtleties that may be extremely useful.



Map 4 | © Crown copyright  
2016 OS 100057756.

### PRACTICAL EXERCISE (SEE APPENDIX FOR ANSWERS)

Many people trying to interpret their map for the first time do not take the process far enough – they get the basic shape of the land, but fail to work out the detail. So let’s illustrate the process with a practical example using Map 4. Imagine that you are hovering high above this grid square, looking down at the ground, and work out what you would see. Take some time to do this. Try to get as much detail as you can from the map so that you can picture the landscape, and when you believe you have got all the information possible, turn to the back of this book to see how well you did (and please let me know if you see anything that I have not mentioned!).

# MOUNTAIN AND MOORLAND **NAVIGATION**

## A PRACTICAL MANUAL

A concise and practical explanation of how to find your way on land.

Everything you need to know is here, from map reading to navigating in poor visibility. Simple descriptions alongside clear illustrations will help you to put Kevin's advice into practice, and master the knowledge and techniques needed to navigate in all conditions.

'Successful navigation should be simple and straightforward, and when done correctly, it will enhance the pleasure you get from the outdoors, not detract from it.'

Kevin Walker

**THE MAP**

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**MAP READING**

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**THE COMPASS**

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**BEARINGS**

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**GPS**

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**ROUTE SELECTION**

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**RELOCATION**

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