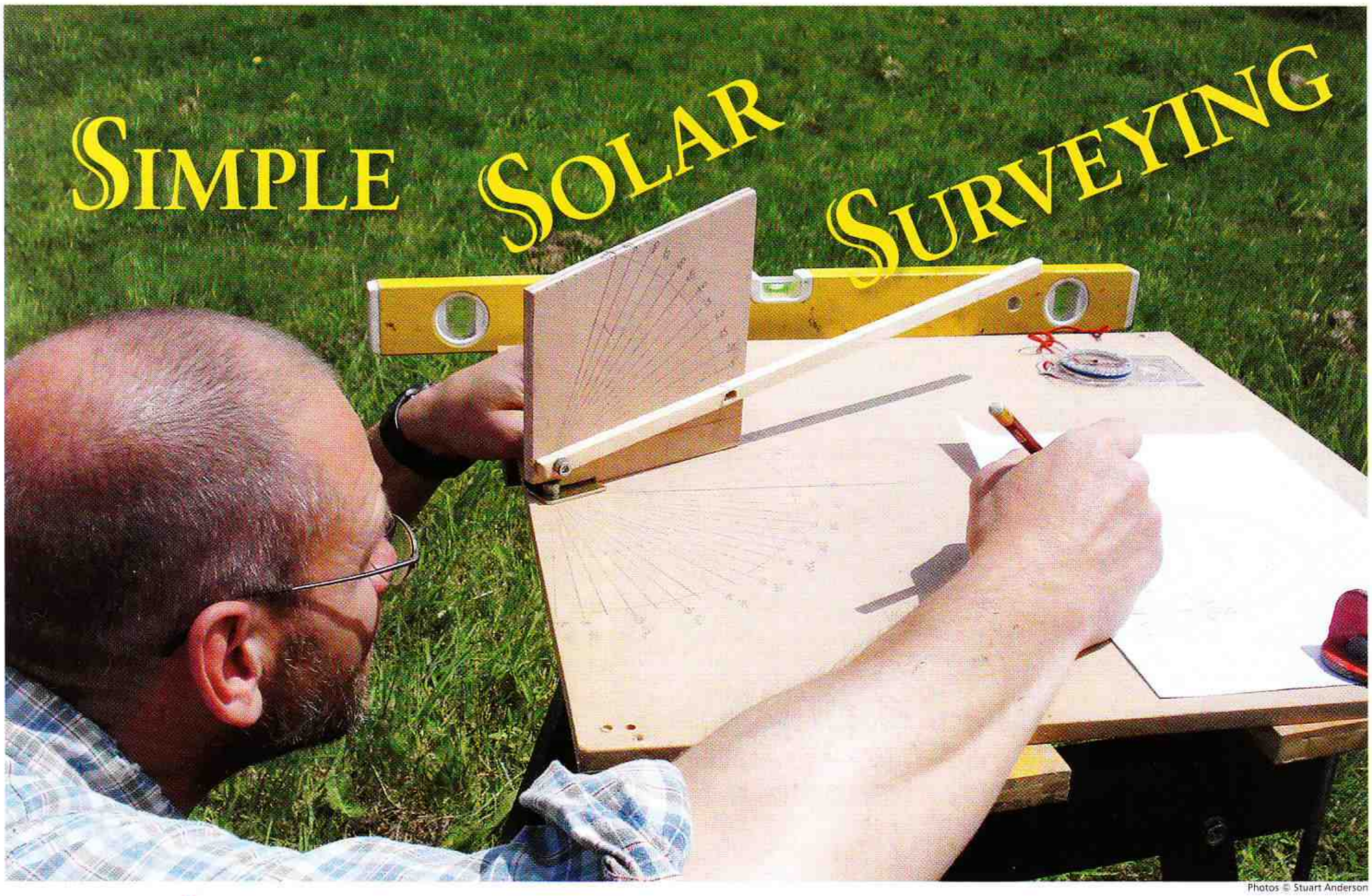

Photos © Stuart Anderson

Simple Solar Surveying

In order to maximise plant yields and solar technology efficiency we must first identify where the sun falls – Stuart Anderson shows us how.

When sowing and planting in the in the spring, how can we be sure that the plants' sun or shade needs will be met in the height of summer? Or avoid a summer-planted shrub ending up being in full shade all through the winter? And what about finding the best place to mount a solar panel? I'm going to show you how to determine where the sun will fall (clouds allowing!) hour-by-hour, throughout the year using a little device knocked together out of scraps of wood and a free download from the internet.

If you were to stand up straight and face due south, in the winter you'd be able to follow the sun throughout its daily journey across the skies moving just your eyes. Whereas, in the height of the summer, you'd have to look far back over your left shoulder to see the sun rise very early in the morning and at mid-day crane your neck to see it perched high in the sky, finishing up far over your right shoulder to see it set, in the late evening.

SUN PATH DIAGRAMS

A Sun Path Diagram is a representation of the sun's position by hour and by date, as seen from a given location. It shows the sun's position throughout the year on a single page. Diagrams come in many formats, including beautiful curved and round charts, but the one we'll be downloading uses 'Cartesian co-ordinates', where any point is located by two numbers, and 'orthographic representation', using straight lines.

The sun's position horizontally, east-to-west (called the *azimuth*) is plotted along the horizontal axis and it's *altitude* or *elevation* (the angular height of the sun in the sky from the horizon) along the vertical axis.

Using a clinometer (a device used to determine the angular height of an object) we're going to mark the outline of trees, buildings, or other objects on our chart, which will allow us to identify if and when these obstructions will cast a shadow.

DIY CLINOMETER

You can buy ready-made devices but it's probably more fun, as accurate and definitely cheaper to fabricate one as I have. All you'll need is a few scraps of wood, a right-angled bracket and a couple of nuts, bolts and screws. The idea is to make a tool that will allow us to sight along a pointer, which we can move in both horizontal and vertical planes. In this way, we can pick out the extremities of obstructions to the south and then read off the relevant angles to mark on our chart.

Draw a baseline towards one edge of a flat board and, using a protractor, draw on the angles 90° east, through 180° due south to 270° west. Drill a hole in the middle of the baseline, the pivot point, and bolt on the angle bracket. To this you need to screw a smaller square of wood, on which you've drawn the angles 0° - 90°. You may need to use spacers to ensure that the face of board runs along the lines you have marked on the base in order to give a true reading.

Drill a hole through the end of a thin stick of wood and bolt this to the bracket, just tight enough to stay in position once aligned.

OBTAINING YOUR SUN PATH DIAGRAM

Thanks to the kind people at the University of Oregon, you can go to one of their web pages where you can create a sun path diagram specific to your exact location, anywhere in the world, for free! Once you have their web page in front of you, enter the following information:

1. Enter the longitude and latitude for your location or just Google 'longitude latitude finder' to discover this.
2. Specify Time Zone: for the UK, this is 'UTC' (GMT).
3. Leave the 'plot dates' as set, then click 'plot hours in local standard time'.
4. Don't touch anything.
5. Label your chart, if you want.
6. Leave PDF checked.
7. Click on the 'create chart' button.

STEP-BY-STEP: CREATING A SUN PATH DIAGRAM

Pick your spot and set up the clinometer on a stable base that will allow you to look along the pointer comfortably. Using a spirit level, ensure that the base of the clinometer is level and, with a compass, orient it to face due south (for us in the northern hemisphere).

Sight along the stick, moving it until it is lined up with a point on the edge of the first obstruction. Then look at the scales on the clinometer and read off the two angles, transferring them to your chart. (To remind you, the angle on the baseboard goes along the bottom of the chart and the angle on the upright board is marked using the scale up the left-hand side of the chart.) Then move along to the next point and repeat the process. Join up the dots to complete the silhouette.

Remember that it's a diagram that shows about 270° on a flat piece of paper, so don't expect it to look exactly like the real thing: compare, for example the points 'b' and 'd' on the photo and my sun chart. This shows a whole year, so for January, read also November; February / October; March / September; April / August and May / July.

You can then see on the chart, by date and time, when you will be in shade (below) or sun (above) the line you've drawn. Look at point 'c' on my chart. This is the point where the sun first emerges (over the barn rooftop – see photo) in the middle of winter, on the 21st December. You can see from the vertical time lines that this will be about 11.20am and the sun disappears again at 4pm (behind the hedgerow). If you follow the April / August line, we can see that not even the tall pine trees at 'a' (out of sight on the photo) will obstruct the sun.

Please note that my chart shows UTC + 1 as I live in France. And there is British Summer Time (BST) to consider. What this means is that if you're reading off a date between the end of March and end of October, add an hour to the time you read off the chart to give you the actual time. This doesn't change the period of sunshine shown on the diagram, of course, it just means, for example, that you call 'three o'clock', 'four o'clock' instead.

GETTING A FEEL FOR SOLAR SURVEYING

Once you've completed your first diagram, move the clinometer to a new position and repeat the whole procedure. By comparing the two diagrams, you can start to get a feel for the difference in shading that you can achieve by repositioning; a small movement can often result in quite a large difference in sunshine and shadow. Remember that you are measuring what shade will fall on your measuring device, so you should ideally be measuring from the exact point you wish to know about, which could be flat on your belly for the veggies or looking out from an upstairs window for your solar panel. As you go higher, you'll see more sun, so you can still get a good idea from a comfortable position.

CONCLUSION

This is a simple, free way that can help you to learn more about how the sun falls on your site. However, this is just the beginning, rather than the whole story and to fully evaluate the solar potential of a site, you'll need to find out how the sun's radiance and typical weather patterns for your region, such as average cloud cover, might affect what sunlight you'll have available from month to month.

Writing instructions for someone else to follow is notoriously difficult – so I really hope I've managed to enlighten you rather than leave you in a shadow of confusion and that you'll enjoy surveying how the sun shines where you are

Stuart Anderson lives on a permaculture smallholding in France.
http://permacultureinbrittany.blogspot.com

RESOURCES

http://solardat.uoregon.edu/SunChartProgram.html
http://lifehacker.com/267361/how-to-find-latitude-and-longitude