Creating 3D Virtual Landscapes

by HD Mothersole – Wycombe High School

Creating 3D Virtual Landscapes, Colour -Layered Maps and Cross-Sections using OS Maps and *Microsoft Excel*.

At some stage in Year 7 you were (or will be) shown how to construct a cross section of a landscape using a contour map, a pencil and a piece of paper.....oh and considerable concentration and patience!

This is an alternative method of creating not just cross-sections, but a data base from which you can produce colour layer maps and 3D virtual landscapes, which you can rotate so as to achieve the best angle to view your landscape.

Why might you want to do this? Well, you will learn about the relationship between contour lines and the shape of the landscape; you will also appreciate the importance of detail on a good map and you will discover new ways of using *Excel* that may be applicable in a wide range of subjects, or in your Geography Coursework.

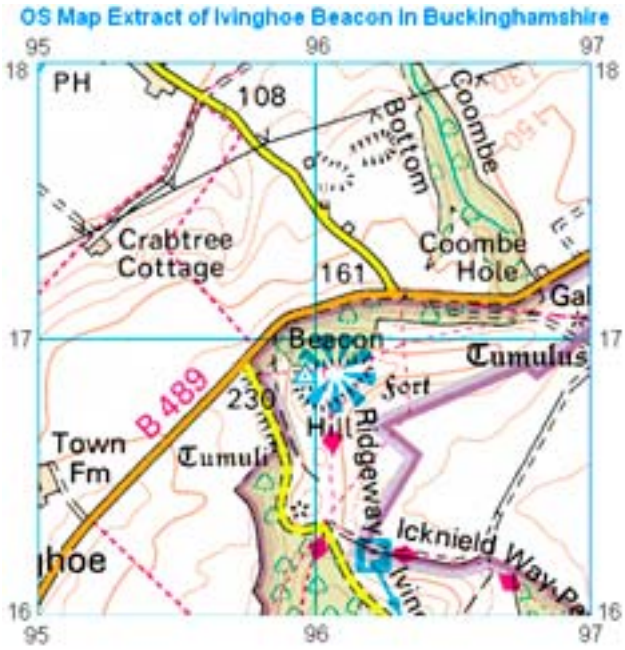
The principal is quite straight forward. You put altitude data that you have collected from an OS map, into a spreadsheet and then use a chart wizard to create your landscape.....Easy! Well not quite that easy. For example, those nice people at Microsoft aren't aware that you want to use their amazing software package to create a tastefully coloured map, so you will need to make some alterations to the "raw" map produced by Excel.

Creating Your Data Base

1. The first task is to **identify the piece of landscape** you would like to work with. It is best to start with a small piece of rural landscape that is hilly. You will be able to see the contours clearly and there will be enough relief to make your virtual landscape interesting. Here we have chosen the area around Ivinghoe Beacon.

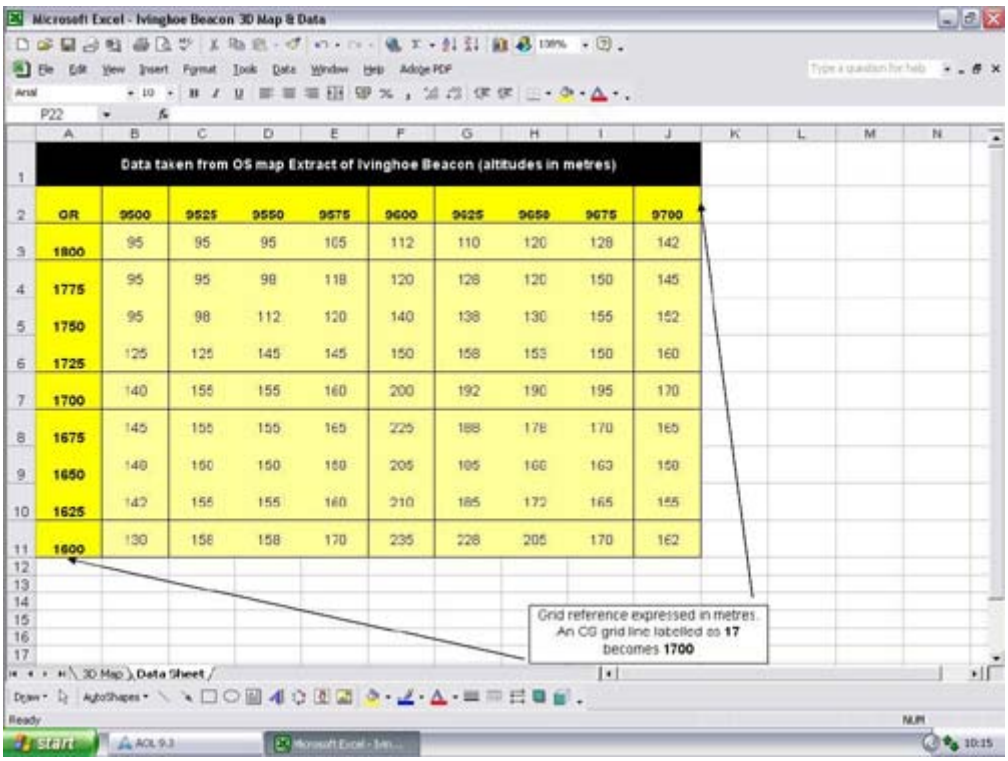
2. **Find an OS map** (1:50,000 or 1:25,000) of the area. If you don't have one, use an Internet map site such as streetmap.co.uk , which uses OS map 1 km squares as its middle scale map. Even if you have a paper map, you may find that contours on the enlarged 1km squares from the internet are easier to read.

3. For greater accuracy, draw (in pencil on a paper map or in Paint on a digital map) a series of **additional grid lines** on your map extract (as shown below left):



4. Now **open a spreadsheet in *Excel***. You will need as many columns and rows as there are grid lines on your chosen area of landscape. **In this case, 9 x 9**.

5. Now **read off, or estimate, the altitude of the land in metres** at each location where your grid lines intersect and add the data to your spreadsheet. This is not always easy as not every contour's altitude is labelled. Remember that on 1:50,000 maps the 50, 100, 150, 200 etc. contours are slightly bolder and that the contour interval (vertical distance between contours) is 10m. In urban areas you are sometimes reduced to making well-reasoned guesses as contours suffer at the expense of other map information.



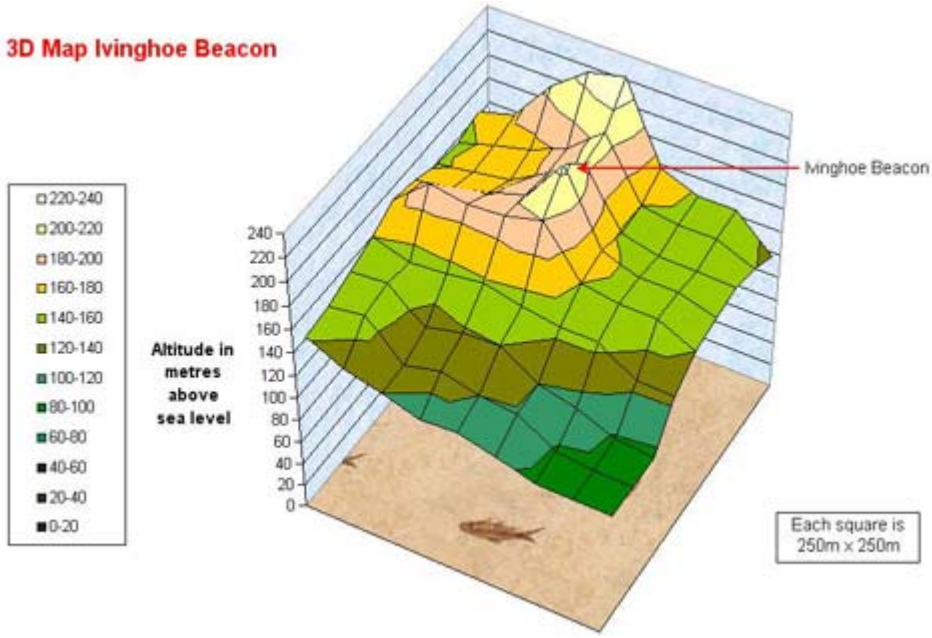
OR	9500	9525	9550	9575	9600	9625	9650	9675	9700
1800	95	95	95	105	112	110	120	128	142
1775	95	95	98	118	120	128	120	150	145
1750	95	98	112	120	140	138	130	155	152
1725	125	125	145	145	150	158	153	150	160
1700	140	155	155	160	200	192	190	195	170
1675	145	155	155	165	225	188	178	170	165
1650	140	160	150	150	205	185	160	163	150
1625	142	155	155	160	210	185	172	165	155
1600	130	158	158	170	235	228	205	170	162

On this example, the grid references have also been expressed as metres.

6. Once you have completed your spreadsheet database, **save it!** You took a lot of trouble to create it in the first place.

7. **To Create a 3D Map**:

   a. **Highlight the data** by dragging the cursor across the spreadsheet (in the example above, the area in pale yellow).
   b. From the menus or by clicking on the icon, select **Chart Wizard**.
   c. Follow the step-by-step instructions for producing a graph. In **Step 1** (select graph) select '**Surface**' then '**sub-type 3D Surface'**
   d. In **Step 2** check **"Series in: Columns"**
   e. You can add labels in **Step 3** and create the **3D Map in Step 4.**
   f. If it looks a mess, do not panic! You can change the angle from which you view your map by either grabbing the corner of the frame with your cursor or by clicking with your right mouse button over the map and clicking on **3D-View...** Now play with the angles of elevation, rotation and perspective until you are happy.
   g. To **change the colours**, click carefully (and slowly) on the squares within the legend (key). This is fiddly, but once you have achieved it, you can change the colours in the legend and the colours on your map will automatically change too.
   h. You can **adjust your scale** by double clicking on the numbers on the height axis. This allows the figure maximum and minimum scale to be adjusted.
   i. Try right mouse clicks on the floor and walls of your map to change their colours or to add patterns.
   j. To add labels using **Insert... Picture....Autoshapes...** You can add text, colour etc. to the shapes. Try playing with the different options.



8. **To create a colour layer map**:-

   a. **Highlight the data** by dragging the cursor across the spreadsheet (in the example above, the area in pale yellow).
   b. From the menus or by clicking on the icon, select **Chart Wizard**.
   c. Follow the step-by-step instructions for producing a graph. In **Step 1** (select graph) select '**Surface**' then '**sub-type Contour'**
   d. In **Step 2** check **"Series in: Columns"**
   e. You can add labels in **Step 3** and create the **3D Map in Step 4.**
   f. To **change the colours**, click carefully (and slowly) on the squares within the legend (key). This is fiddly, but once you have achieved it, you can change the colours in the legend and the colours on your map will automatically change too.
   g. To add labels using **Insert... Picture....Autoshapes...** You can add text, colour etc. to the autoshapes. Try playing with the different options.

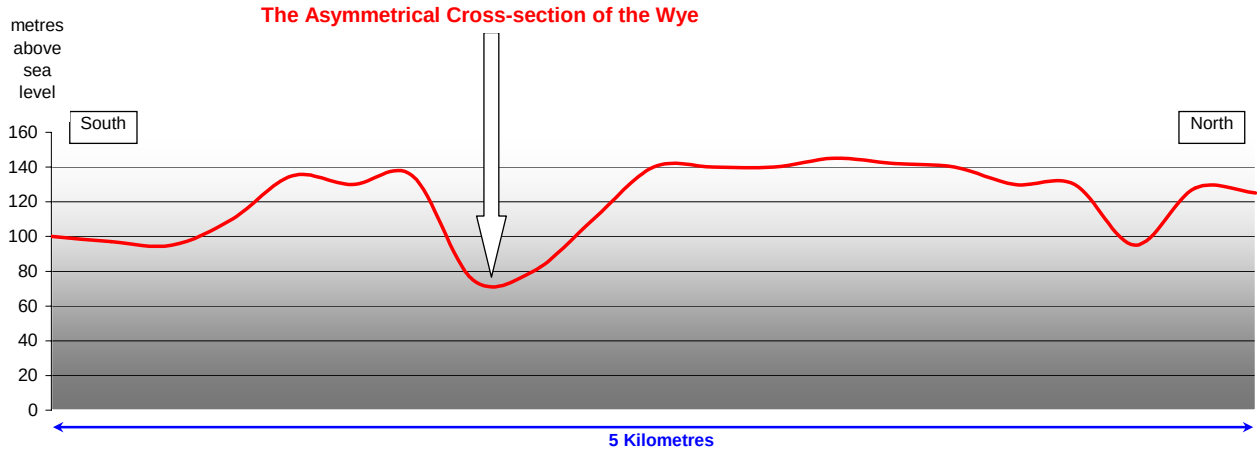
9. **To create a simple neat cross-section**:-

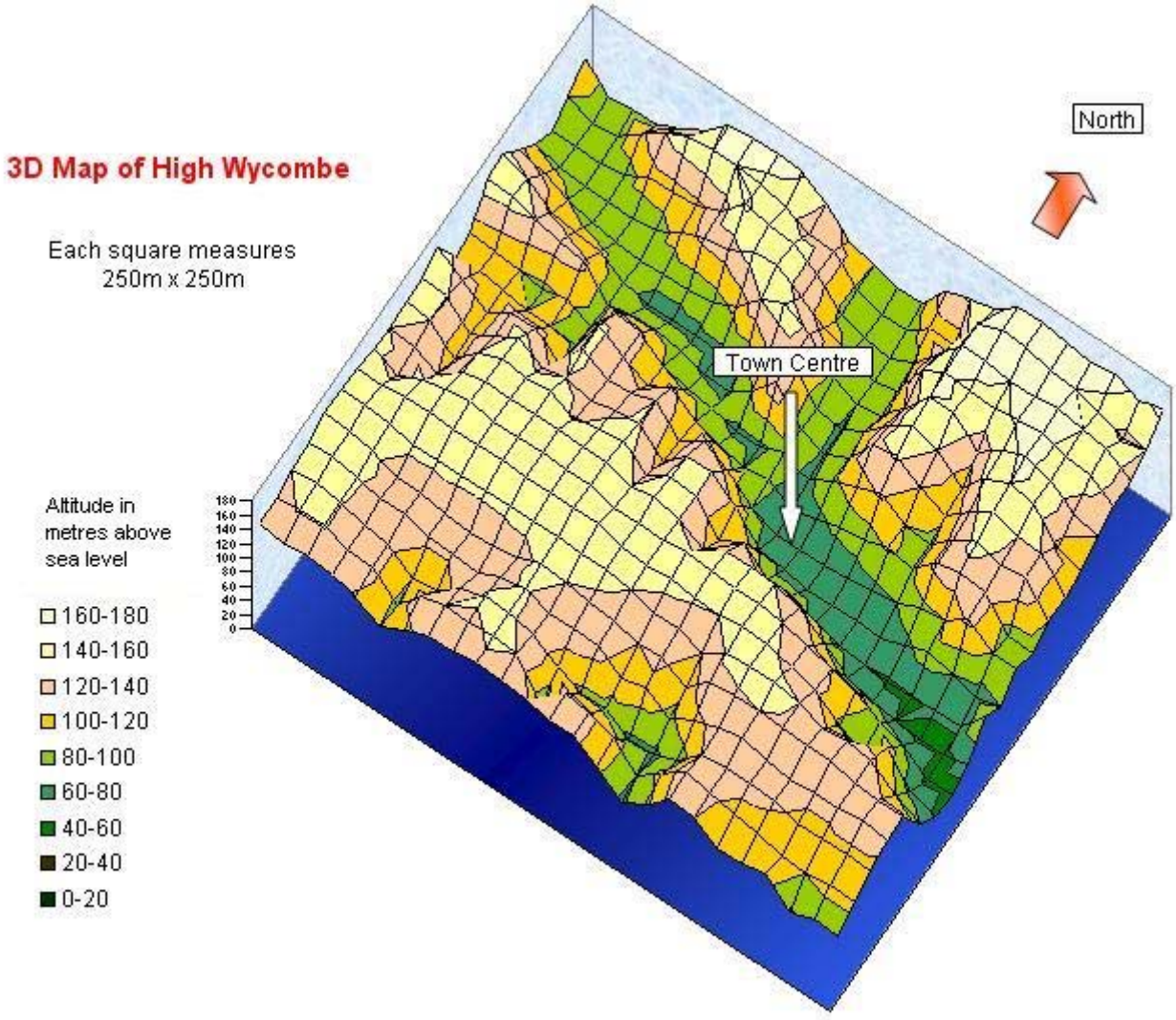
   a. **Highlight a single row or column of data**. Choose a row or column that crosses landscape features such as hills or valleys.
   b. From the menus or by clicking on the icon, select **Chart Wizard**.
   c. Follow the step-by-step instructions for producing a graph. In **Step 1** (select graph) select '**XY Scatter**' (not Line) then '**Scatter connected by smoothed lines..."**
   d. To **change the colours**, click carefully (and slowly) on the squares within the legend (key). This is fiddly, but once you have achieved it, you can change the colours in the legend and the colours on your map will automatically change too.
   e. To add labels using **Insert... Picture....Autoshapes...** You can add text, colour etc. to the shapes. Try playing with the different options.

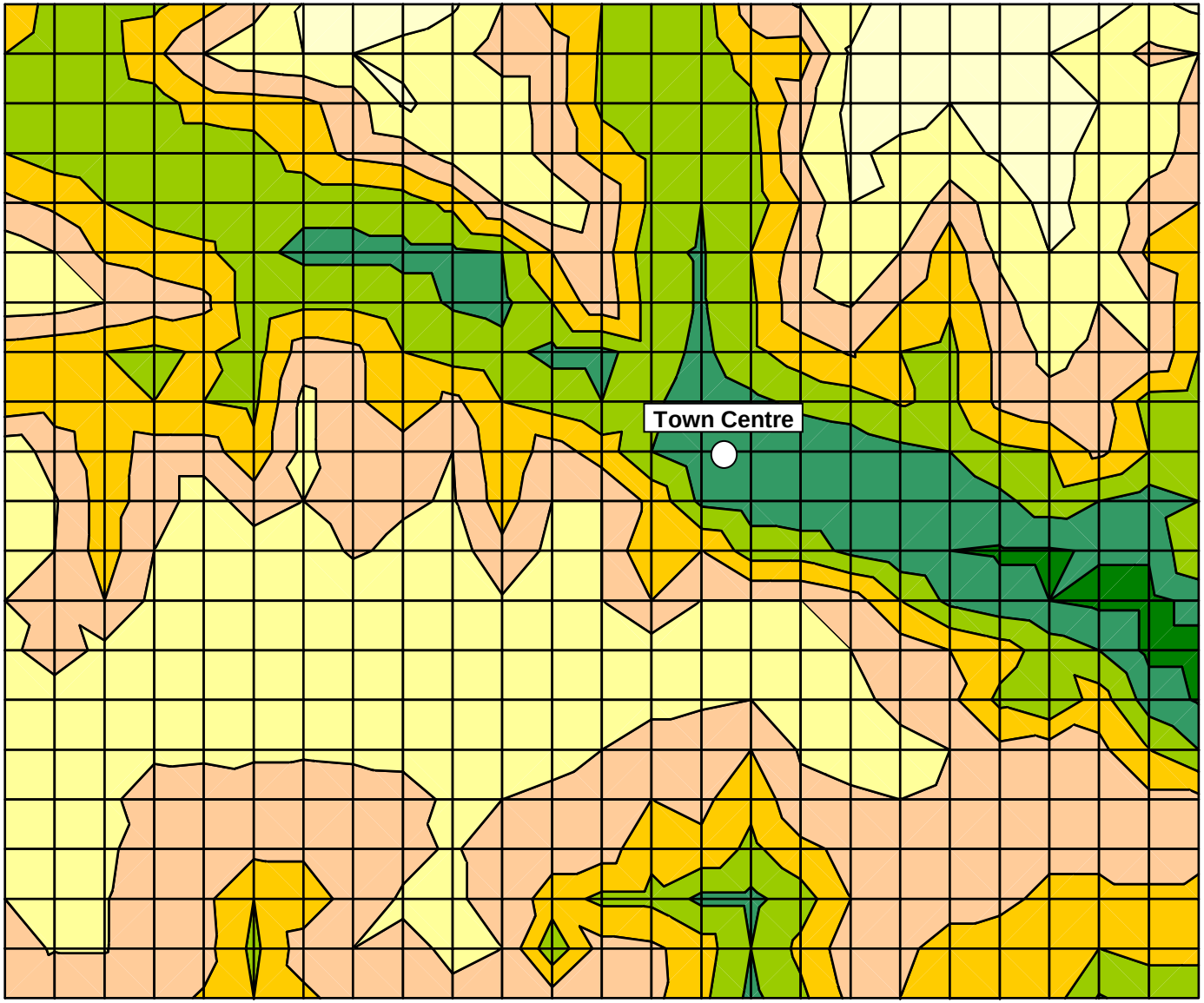
With thanks to Mike Walton (King Edward VI School) and Richard Roberts (Education Inspector, Lincolnshire) for their initial ideas described in Teaching Geography Vol. 29 Number 3 October 2004.

Virtual landscapes in High Wycombe, Buckinghamshire

North - South Cross-section along easting 86 through High Wycombe







3D Colour Layer Map

Each square measures 250m x 250m

- 160-180
- 140-160
- 120-140
- 100-120
- 80-100
- 60-80
- 40-60