MapInfo:
Introduction

How to Use this Course Book

This handbook accompanies the taught sessions for the course. Each section contains a brief overview of a topic for your reference and then some contain one or more exercises.

Exercises are arranged as follows:

- A title and brief overview of the tasks to be carried out;
- A numbered set of tasks, together with a brief description of each;
- A numbered set of detailed steps that will achieve each task.

Some exercises, particularly those within the same section, assume that you have completed earlier exercises. Your teacher will direct you to the location of files that are needed for the exercises. If you have any problems with the text or the exercises, please ask the teacher or one of the demonstrators for help.

A number of conventions are used to help you to be clear about what you need to do in each step of a task.

- In general, the word **press** indicates you need to press a key on the keyboard. **Click**, **choose** or **select** refer to using the mouse and clicking on items on the screen.
- Names of keys on the keyboard, for example the Enter (or Return) key, are shown like this ENTER.
- Multiple key names linked by a + (for example, CTRL+Z) indicate that the first key should be held down while the remaining keys are pressed; all keys can then be released together.
- Words and commands typed in by the user are shown `like this`.
- Labels and titles on the screen are shown **like this**.
- Drop-down menu options are indicated by the name of the options separated by a vertical bar, for example **File|Print**. In this example you need to select the option **Print** from the **File** menu. To do this, click with the mouse button on the **File** menu name; move the cursor to **Print**; when **Print** is highlighted, click the mouse button again.
- A button to be clicked will look **like this**.
- The names of software packages are identified *like this*, and the names of files to be used **like this**.

Software Used

MapInfo Professional v9.5

Windows XP

Files Used

SRTM_UK_200m_elev_BW1.tab
SRTM_UK_200m_elev_BW1.jpg
dnnet.e00
lcpoly.e00
ponet.e00
pppoint.e00
pppoly.e00
rdline.e00
EU_admin_boundaries.e00
EU_admin_names.e00

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1.0	January 2008	Michael Athanson	Created
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Contents

1 Introduction

Welcome to the course **MapInfo Level 2: Introduction**.

This booklet accompanies the course delivered by Oxford University Computing Services (OUCS), IT Learning Programme. Although the exercises are clearly explained so that you can work through them yourselves, you will find that it will help if you also attend the taught session where you can get advice from the teachers, demonstrators and even each other!

If at any time you are not clear about any aspect of the course, please make sure you ask your teacher or demonstrator for some help. If you are away from the class, you can get help by email from your teacher or from help@oucs.ox.ac.uk

1.1. What You Should Already Know

This session is the first of a series that covers the fundamentals of using *MapInfo,* which is a Geographic Information System (GIS).

We will assume that you already have a basic working knowledge of computers, applications, and files, *e.g.* that you are familiar with opening files from particular folders and saving them, perhaps with a different name, back to the same or a different folder.

The computer network in OUCS may differ slightly from that which you are used to in your College or Department; if you are confused by the differences, ask for help from the teacher or demonstrators.

You do not need to know anything about *MapInfo*!

1.2. What You Will Learn

In this session we will cover the following topics:

- *MapInfo*'s file structure, workspace, and user interface
- Where to look for geographic data
- Opening or importing data in *MapInfo* (Exercise 1)
- Viewing and stylising data (Exercises 2 and 3)
- Creating and editing 'cosmetic' map objects (Exercises 4, 5 and 6)
- Outputting maps and layouts (Exercise 7)

Topics covered in related *MapInfo* sessions, should you be interested, are referenced where applicable.

1.3. What is Geographic Data?

Geographic data can be defined as any data that is spatially referenced to the Earth. A record in a geographic database typically contains two sorts of data: *spatial* data and *attribute* data. Spatial data describes *where* the data refers to, and attribute data describes *what* is located there.

Spatial data can be formatted in one of two ways: as a *vector*, or as a *raster (*or *grid).* A vector is a single point (represented as a coordinate pair), a line or curve (a series of points), or a region (a curve that is enclosed, forming a polygon). For example, using vector data a set of cities might be represented as points, or alternatively the extents of the cities might be represented as regions. Rivers would be more likely to be represented as curves. Political boundaries, on the other hand, might be represented as either curves or regions, depending on the circumstances.

Rasters or grids, on the other hand, represent continuous portions of the Earth's surface. Data points (or cells) are arranged in rows and columns, at fixed intervals, and each location in the grid or raster has attribute data associated with it. In a grid, the attribute value may be a *numerical* value, *e.g.* the height of the ground at that point or average rainfall; or a *categorical* value, *e.g.* a classification of the land cover as 'wooded' or 'grassland.' In a raster, the attributes of each location are colour values, *e.g.* a greyscale value, or separate red/blue/green values. Each location can then be presented as a pixel on the screen, forming an image. Typical examples of rasters include aerial photography, scanned maps, or any geographic data that has been 'rasterised' (rendered as a pixel image).

1.4. What is MapInfo?

MapInfo is a geographic information system (GIS) that is very popular among entry-level users due to its low cost and ease of use.

GIS is software that is designed to store, query, analyse, process, and visualise geographic data. *MapInfo* can be used, for example, to plot distributions onto base maps; to create colour coded or other 'thematic' maps; to extract data from printed maps or aerial imagery; to model, analyse, and visualise elevation data; or to calculate correlation statistics between spatial datasets.

A key feature of GIS is its capability to associate spatial and attribute data. It is perhaps useful to think of it as being partly like a database management system (*e.g. Excel* or *Access*) and partly like an image processor (*e.g. Photoshop*).

1.5. Where Can I Get A Copy?

If you are a student or member of staff, you can access copies of *MapInfo Professional* in several places around the university, including the Map Room in the New Bodleian Library and computer labs in various departments. *MapInfo Professional* is also available for purchase from the OUCS shop under the CHEST licence.

2 File Structure, Workspace, and User Interface

2.1. MapInfo's File Structure

Unlike most computer applications, where an entire document or session is stored in a single file, in *MapInfo* a single session will typically require data from several different files, and different file types. This is standard for GIS, and the main reason behind this fragmented file structure is that it is the most economical in terms of keeping file sizes small and avoiding redundancy.

A key distinction to make is the difference between ASCII and binary data formats. ASCII data can be opened and read as text, *e.g.* in *Notepad* or *Word*. The advantage is that it can then be edited directly by the user – the disadvantage is that ASCII files are relatively large and not very efficient at storing data. Binary data, on the other hand, is represented as '1's and '0's, and it can be read only by the computer, using specific applications. The advantage is that binary data is very compact and space-efficient.

MapInfo uses both ASCII and binary formats. Short files that contain only preferences, definitions, style values, and metadata – but no actual *content* – are formatted as ASCII. Examples include the workspace (.wor) and table definition (.tab) file types. The longer files, which contain the geographic data itself, are formatted as binary. To determine whether a file is ASCII or binary, try opening it in *Notepad*. If it comes out as gobbledy-gook, it's binary!

```
!table
!version 300
!charset WindowsLatin1

Definition Table
  Type NATIVE Charset "WindowsLatin1"
  Fields 22
    AREA Float ;
    PERIMETER Float ;
    EUADMLL_ Integer ;
    EUADMLL_ID Integer ;
    ARRGCD Char (6) ;
    NURGCD Char (4) ;
    ARRGCTCD Char (2) ;
    ARRGLBLV Integer ;
    TOTAREA Float ;
    POP80 Integer ;
    POP85 Integer ;
    POP87 Integer ;
```

Figure 1 Data formatted as ASCII (left) and binary (right), as viewed in Notepad

MapInfo is session-oriented. Rather than simply opening and closing documents, in MapInfo you work in a session. It's a bit like having a *MapInfo* desktop or workspace. You can have multiple files 'open' in the workspace, and any of those that are open may (or may not be) viewed in a map window, browser window, or graph window. You can have as many of these maps, tables, and graphs as you like, and as for the maps, you can add as many files as you like to any of them, in pretty much any combination. So depending on what files you have open, what maps or browsers they're added to, and so on, the session and the workspace can get very complex.

To help keep track of it, at the top level of the file structure is the *workspace* file. This is an ASCII-formatted file, and it is essentially like a bookmark for the session. The workspace contains a list of the files that were open and various settings for how the files were being viewed: what maps, graphs, and browsers were open; where the maps were looking geographically; what files had been added to each; and how the files were stylised. In a nutshell, the workspace is all

of the viewing preferences. It doesn't contain any geographic content. Saving your workspace is not strictly necessary – you won't lose any content if you don't – but it will save time if you might later want a shortcut back to where you left off.

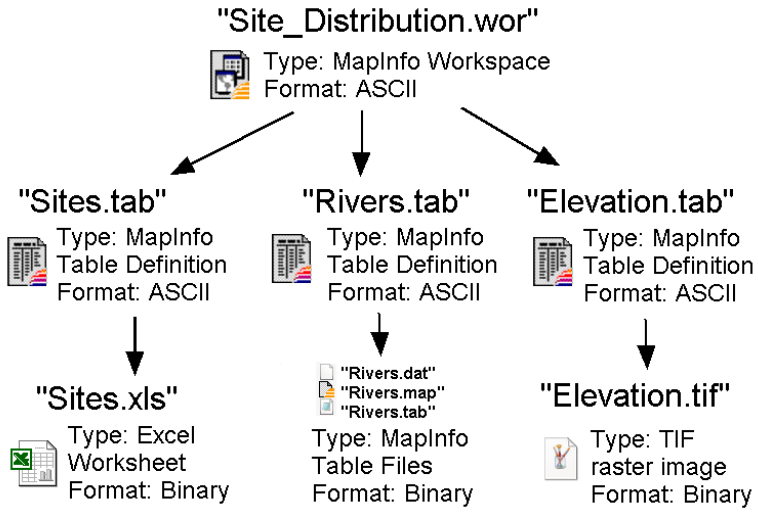

Figure 2 An example of a MapInfo file structure

At the lower levels of the structure, the actual geographic data content is stored in several different types of files. *MapInfo* can store data in its own 'native' formats: vectors are kept in *MapInfo* table formats (including **.tab**, **.map**, **.dat**), and grids are kept in a *MapInfo* grid format (**.grd**). However, *MapInfo* can also read data from many 'non-native' formats, such as *Excel* and *Access* databases, text files, raster image files, and other GIS's file formats. Content is most often formatted as binary.

Regardless of what form the geographic content is in, for each file of geographic data that you bring into *MapInfo*, and for those that you create from scratch within *MapInfo*, there is a table definition (**.tab**) file. This is a small ASCII file that tells *MapInfo* everything it needs to know about the content file that the definition refers to: a pointer to its location on the computer, and how to interpret it and integrate it into the session. For example, if the content file is a database, the definition includes the names of each field (column) in the database. If the content is an image, the definition may specify its registration (the geographic locations where the image corners should go).

MapInfo does occasionally store data using other file types, such as colour profiles (**.vcp**). However, workspaces, table definitions, and content files form the basis of the file structure.

For this file structure to work, *MapInfo* relies on pointers between the files. Pointers are essentially filepaths that tell *MapInfo* where to look for the data it needs. If one of the files has been moved, deleted, or re-named, the pointer will no longer work, and next time *MapInfo* tries to load that file, it will generate an error and prompt the user to browse for it and locate it. To avoid pointer-related problems, a few rules of thumb are:

- Before you start creating *MapInfo* tables, plan ahead and devise a set of folders for your project. How you organise it is entirely up to you. For example, a sensible set might be:

I. Mapping Project

A. Elevation Data

B. Topographic Data

C. Archaeological Sites

D. Finished Maps

- Put data where it belongs before you bring it into *MapInfo*.
- Once a file has been opened in *MapInfo* and the table definition has been created, avoid renaming these files, or moving them *relative to each other*.

If you need to rename them, you can do so through *MapInfo* (go to **Table | Maintenance | Rename Table**). If you need to move them, move the entire project folder. The key thing is to avoid changing the relative filepaths between your files.

2.2. MapInfo's Workspace and User Interface

MapInfo is session-oriented. The user interface is based on a virtual workspace. The general process you follow is:

1. Open the workspace (by starting *MapInfo* and, if desirable, loading a saved session from a workspace file)
2. Open geographic data files ('tables') within the workspace
3. Add the data files to any viewing window (*e.g.* a map window, browser window, graph window)

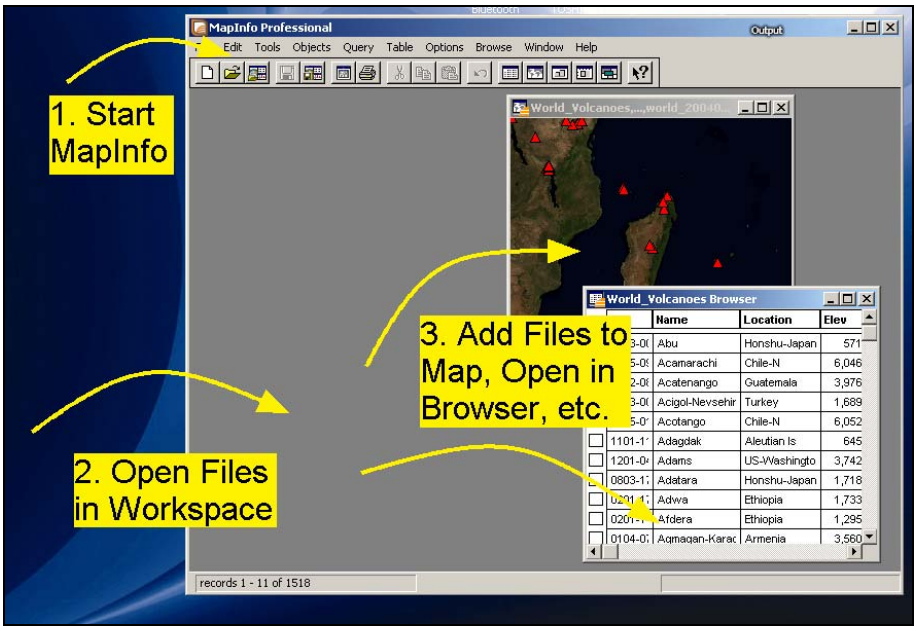

Figure 3 The general process of opening files in MapInfo

MapInfo can be started by any of the usual Windows methods: for instance double-click on an icon that may be provided on the Windows Desktop, or look in the **Programs** menu from the Windows Start button Start. Also, if you already

have *MapInfo* workspace files or table definition files, you can simply double-click on one of these.

Once *MapInfo* loads, a **Quick Start** window will appear, asking you whether you want to restore the previous session, open the last used workspace, open a saved workspace, or open a table. Alternatively, you can just click **Cancel** and you will enter an 'empty' workspace.

Once you are in the workspace, most elements of the interface should be reasonably familiar. Along the top of the workspace window is a conventional 'drag and drop' toolbar, and below this is a set of shortcut icons. These icons are shortcuts in the sense that they are redundant – all of these functions are contained in the drag and drop menus.

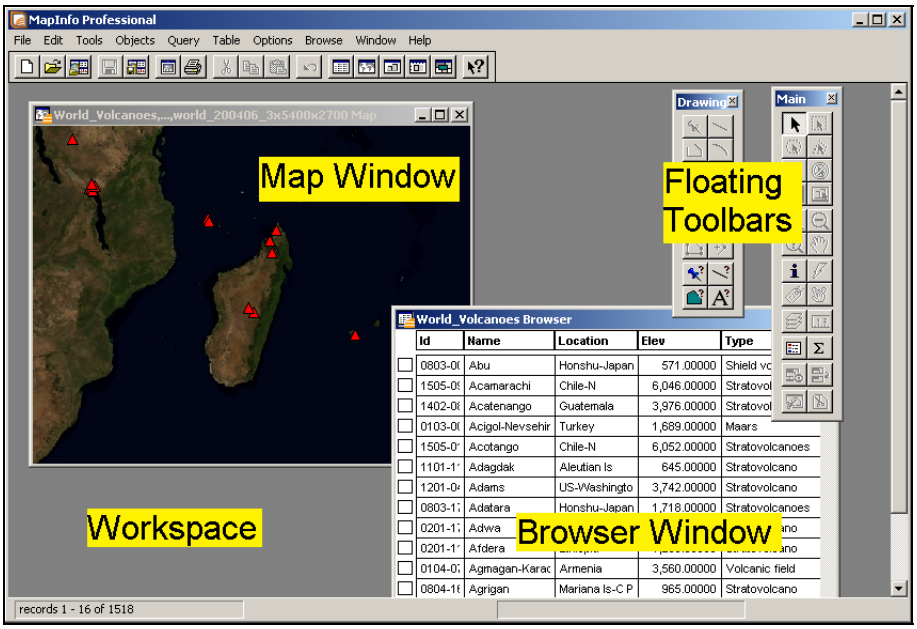

Figure 4 The MapInfo workspace and user interface

On the right of the window are three 'floating' toolbars. You can open and close these independently by going to **Options | Toolbars.** You can also drag and drop them into the shortcut toolbar across the top of the workspace. Unlike the shortcut icons, these toolbars are mostly not redundant parts of the interface.

The best way to familiarise yourself with the workspace and interface is simply to snoop around and explore it. For the most part, the **File, Edit, Window,** and **Help** menus contain the sorts of things they do in other programs. As usual, if you hover the mouse over an icon, a label will pop up explaining what the icon does.

As you work in *MapInfo*, inset windows containing maps, browsers, graphs, and so on will be added to the workspace. These can be moved, resized, minimised, maximised, and closed independently of the *MapInfo* workspace.

Two other features are worth introducing. The first is the **Layer Control** window. The **Layer Control** is really a crucial part of the *MapInfo* interface, at least as far as the map windows are concerned. In the **Layer Control**, you can add and remove layers from the map; control the layers' visibility, editing status, selectability status, and labelling; and edit each layer's visual style. When a map

window is open, you can right-click anywhere inside it to open the **Layer Control**.

The second is the **Tool Manager**. In addition to the tools that are inherently part of the *MapInfo* workspace, it is possible to extend *MapInfo*'s functionality by loading extra tools or running 'plug-in' *MapBasic* programs. This is all done via the **Tools** menu. If you go to **Tools | Tool Manager**, you will have the option of loading any from a library of tools. You may also choose the **autoload** option, in which case *MapInfo* will automatically load that tool when it starts up a session. Once a tool is loaded, it will appear at the bottom of the **Tools** menu, and a shortcut icon will appear in the **Tools** floating toolbar.

3 Finding Geographic Data

In the classroom exercises, you will be working from a pre-selected set of data that has been distributed to each machine in the room. However, in your own work, finding available data will be one of the first things you need to do. You will need to not only find the data (assuming that it exists), but get access to it, get permission to publish it (if applicable), and in some cases figure out how to re-format it to get it into *MapInfo*.

Typically, you will need to think about both your 'base map' and your 'overlays.' The base map is essentially the background mapping, and the purpose of it is mainly to orient the viewer, but also in some circumstances to provide contextual geographic information. The overlay, as the name suggests, is information that is superimposed on the base map. Overlays are normally vectors (points, lines, polygons), but there is nothing to keep you from layering a raster onto your base map. The overlay is the focus of the map in the sense that it normally represents the map's subject matter. Of course, this model of *base map vs. overlay* does not always apply.

The base map may be something as simple as an outline or polygon of a landmass or a political boundary. It may be something much more rich, showing land cover, relief shading, elevation, *etc.* As a general rule, if your map is at the 'national' scale (roughly the scale of the UK, or similar sized area) or larger, then most of the data you could want for a typical base map is openly available as GIS-formatted data, and is in the public domain. On the other hand, if your map's area of interest is the size of a British county or smaller, then you will have fewer 'public domain' options and will probably have to rely on licencing data from a private or government source. The availability and format of geographic data will vary widely by country. Depending on the circumstances, in some cases you will need to pay for access to the data, and in some cases there will be restrictions on publishing map images containing the data.

The overlay data, on the other hand, is much more likely to come from a source related your discipline. The requirements for your overlay depend entirely on what kind of mapping and analysis you're trying to achieve. While most data for base maps is available off-the-shelf, you will often need to create data for the overlays yourself, and you can do this in any number of ways. Printed maps can be scanned in and geographically registered in GIS. Any kind of database can be brought into GIS, and provided that there is some kind of spatial referencing to it (*e.g.* coordinates, place names, regions) there will be some way of plotting the data onto a map. These topics are covered in greater detail in the MapInfo Level 3 courses.

Various sources for geographic data are listed in Appendix A.

People whose area of interest is within the UK should take note of the Digimap service, which provides access to all current and historic Ordnance Survey (OS) data (see Appendix A). Oxford subscribes to the Digimap service, and all members of the university can use it by obtaining an ATHENS account. However, users should also make themselves aware of the terms of the Digimap licence, especially where it pertains to limitations on publishing data. Generally speaking, the allowances for publishing maps containing OS data are low.

4 Opening or Importing Data in MapInfo

Generally speaking there are four ways of getting data into *MapInfo*. *MapInfo* can directly read a reasonably wide variety of file formats (look at **File | Open | Files of type** for a list). *MapInfo* can also 'import' many more file types, either by using the built-in function (**Table | Import**), or the plug-in *Universal Translator* (see below). When *MapInfo* imports a file, it creates a copy in one of its own native formats (**.tab** or **.mif**). However, there are some file formats that are not supported by any of these methods, *e.g.* none of these methods will work for any data in a grid format. In this case, it is necessary to use another program to 'translate' the file into a format that *MapInfo* can either read directly or import. This other program may be another GIS (*e.g. MicroDEM*) or it may simply be a translation utility (*e.g. NTF2MIF*). The fourth method, which applies mainly if your data is not in any kind of digital format at all, is to create a file from scratch from within *MapInfo*, design your own database, and input the data *via* the keyboard or mouse. This last method will be covered in the MapInfo level 3 course on databases.

Exercise 1 Opening or Importing Data in MapInfo • *In this exercise, you will practice opening MapInfo files and importing data into MapInfo using the Universal Translator plug-in*	
Task 1 Ensure that the file permissions on all of your files are set to both 'Read' and 'Write' You will not normally need to do this when you are working on your own machine, but on the classroom network it is likely to cause problems. *MapInfo* automatically re-writes some files after certain processes, and it will generate an error if it is not able to do so	**Step 1** Browse to the directory containing the **MapInfo_Introduction** directory
	Step 2 Right-click on the **MapInfo_Introduction** directory and click on **Properties** in the pop-up box
	Step 3 Under **Attributes**, ensure that **Read Only** is NOT checked
	Step 4 Click **Apply**
	Step 5 Check **Apply changes to this folder, subfolders and files** and click **OK**.
	Step 6 Click **OK**
	Step 7 Browse down to some of the content files, *e.g.* in **MapInfo_Introduction\SRTM** and confirm that the changes have been applied to the files themselves (**Read Only** should not be checked). If not, it may be necessary to change the attributes on the files themselves, rather than the folders. Note that any folders you try to change may automatically revert to a 'read only' status. This will not normally cause problems.
Task 2	**Step 1** Browse to the data in **MapInfo_Introduction\DCW**

Check your data's file types	**Step 2** Click on **View | Details** in your file browser window. This will show an overview of the directory contents, including the file type (in *Vista* you may need to go to **View | Choose Details** and select **Type**). The file type determines how it can be imported in *MapInfo*.
	Step 3 Repeat this for **UNEP**, **Volcanoes**, and then a few other folders in **MapInfo_Introduction**. You can ignore the folder named **TAB_Backup**.
	Step 4 Close this window when you are done
Task 3 If needed, translate the files into a format that can be read by MapInfo In the classroom exercise this is not necessary -- all of the files you will use are in a format that can either be read directly or imported from within *MapInfo*. However, in your own work, if you are using GIS data provided off-the-shelf, you will sometimes need to translate it using another program. For example, if you use OS data provided by Digimap, you will need a utility called *NTF2MIF* to translate it from NTF to MIF format, which can then be read by *MapInfo*. Also, if you do not have the *VerticalMapper* plug-in for *MapInfo* (which unfortunately is not currently available through OUCS), in order to bring in any kind of grid data you will need to render it as a raster image using another program, such as *MicroDEM*.	
Task 4 Start *MapInfo*	**Step 1** Browse to the *MapInfo* program. In the OUCS classroom, this can be found in the **Novell-delivered Applications** window, in the **GIS** directory. Double-click on the program icon. The *MapInfo* workspace window will open and the **Quick Start** window will appear, giving you several options.
	Step 2 In **Quick Start**, click **Cancel**. By doing so you will effectively enter an empty workspace. The only option on **Quick Start** that really saves any time is the option to re-open your last workspace.
Task 5 Open your raster base map	**Step 1** In the workspace window, click on **File | Open** A file browser window will open
	Step 2 Browse to **MapInfo_Introduction\SRTM**

	Step 3 Drag down the **Files of Type** menu and click on **Raster Image**. All of the rasters *MapInfo* can read from that directory will appear in the file browser. However, unless they are GeoTIFF files (a special image format that has embedded georeferencing data), the images themselves will not be georeferenced. If you try to open a GeoTIFF directly, *MapInfo* will ask you for the projection system. If you try to open an image that is not georeferenced, *MapInfo* will ask you whether you want to display it (unreferenced) or register it (*i.e.* add georeferencing, which is covered in the MapInfo Level 3 course on raster imagery). In this case, these are plain JPGs, but we already have the georeferencing in an accompanying *MapInfo* table. Normally, you should avoid saving map data as JPGs if possible -- 'lossy' file compression can have undesirable effects on image quality and result in partial loss of colour-coded information. However, for the purposes of this exercise they're fine.
	Step 4 Drag down the **Files of Type** menu and select **MapInfo (.tab).** You don't want to open the image directly -- you want to open it via the table definition.
	Step 5 Click on **SRTM_UK_200m_elev_BW1**. The browser window will close. *MapInfo* will then look for the image file referred to in the table file and open it. A map window will immediately appear. If the map window is blank, it may be because the scale is above or below the zoom range for that image.
Task 6 Maximise the map window	**Step 1** Click on the 'maximise' icon in the upper-right corner of the inset map window, so that it fills the workspace.
Task 7 Zoom in on the map	**Step 1** Choose the 'zoom-in' icon on the Main Toolbar (which is probably floating on the right of the workspace). The icon looks like a magnifying glass with a '+' inside. Draw a box in the map window.
	Step 2 Draw another box to zoom in again. Note that, depending on the height/width ratio of the box you draw with the tool, *MapInfo* will attempt to achieve the 'best fit' zoom that it can without resizing the map window itself. You can also simply click with the tool, without drawing a box.
	Step 3 As an alternative to using the zoom tools, if your mouse has a roller button you can roll up/down to zoom in/out on a map window. You can also go to **Map|Change View** and specify an explicit value in the **Zoom (Window Width)** field.

Task 8 Zoom out from the map	**Step 1** Choose the 'zoom out' icon from the toolbar and zoom out until the map image disappears. It disappears because you have zoomed out beyond the zoom range for that image. The same applies if you zoom in too far. Stay zoomed out at this scale.
Task 9 Disable the zoom range option	**Step 1** Right-click in the map window and select **Layer Control**. The **Layer Control** window will open. It will show you all of the layers currently added to the map and give you options for style and display. At the moment there are only two layers -- the Cosmetic Layer and your raster. The visibility option next to the map raster will be checked (enabled), but it will be pink if the map is out of zoom range.
	Step 2 Click on the raster map layer to highlight it, then click **Display**. The **Display Options** window will appear, giving you options to override certain display parameters for that layer.
	Step 3 Disable the **Display within Zoom Range** option. Nothing will happen yet.
	Step 4 Click **OK** in the **Display Options** window. It will close.
	Step 5 Click **OK** in the **Layer Control**. It will close, and whatever changes you have made from within it will be applied to the map. In this case, the zoom range will be disabled, so the map will now draw the raster no matter how far zoomed in/out you are. If the map is still not visible, it is because you are off the 'edge' of the data coverage. In this case, right-click, select **View Entire Layer**, then **All Layers**, then **OK**.
Task 10 Pan around the map	**Step 1** Select the 'grabber' icon (it looks like a hand) from the toolbar, grab the map, and move the viewpoint. Alternatively, you can simply use the arrow keys on your keyboard to pan. Also, depending on what tool you have selected, if you drag the mouse off the edge of the screen while holding the left button down, the viewpoint will often follow.
Task 11 Switch off the visibility of the raster, then switch it back on	**Step 1** Right-click, go into **Layer Control**, and disable the visibility check box next to the map layer. This is the box beneath the 'eye' icon.
	Step 2 Then click **OK** to apply the change. The raster will disappear from the map window.

	Step 3 Now switch it back on.
Task 12 Save your workspace, close *MapInfo*, then open it again by double-clicking on the workspace file. You will not normally need to do this when you are working on your own machine, but on the OUCS network a peculiar error seems to occur when trying to run certain plug-in programs (next few tasks) during a session that was not started from a saved workspace.	**Step 1** Click on **File | Save Workspace**. A **Save Workspace** window will open.
	Step 2 Save the workspace in the **MapInfo_Introduction\Workspaces** folder. Name it **Exercise 1 Task 12**. Click **Save**.
	Step 3 Close *MapInfo*. You can do this either by clicking on the 'close' icon of the workspace window (not the map window), or by going to **File | Exit**.
	Step 4 Browse to the workspace file you just created, and double-click on it. *MapInfo* should launch again and restore the map window you just had open.
Task 13 Load the *Universal Translator*. In this exercise some of your vector data is in ArcInfo Export (EOO) format, which is not directly readable by *MapInfo*. You will need to import them using a plug-in program called the *Universal Translator*. Before you can use the UT, you need to make sure that it is loaded.	**Step 1** Drag down the **Tools** menu in the workspace. This has several items, including *MapBasic* programs (you can write your own programs and run them from here), the **Tool Manager** (which manages the library of *MapInfo* tools) and a list of all of the currently loaded tools. The *Universal Translator* may already be loaded, in which case you don't need to add it again, but for the purposes of this exercise carry on with the next step anyway.
	Step 2 Click on **Tool Manager**. This opens the **Tool Manager** window, which lists all of the tools that may be loaded during your session. Several items will appear under the **Tools** menu, and their loading status will be shown (loaded and autoload). *Universal Translator* may already be there, but in any case carry on with the next step.
	Step 3 Click on **Add Tool** and then on **...** This will open the **Select MapBasic Program** window. It should by default take you to the library of *MapBasic* programs, and the *Universal Translator* may be among them. If it's not, then browse up one level to the UT directory and find it in there. It's probably named something like **MUT.mbx**.
	Step 4 Double-click on the **MUT** file. This will return you to the **Add Tools** window. Type in the title **Universal Translator copy 2** and click **OK**. The tool you selected will then be added to the **Tool Manager** list.

	Step 5 In the **Tool Manager** list, ensure that the 'loaded' status of *Universal Translator* is enabled. If you wish, enable 'autoload' as well, and it will be automatically loaded the next time you start *MapInfo*.
	Step 6 Click **OK** to leave the **Tool Manager** and return to the workspace.
Task 14 Run the *Universal Translator* and translate the UK DCW vectors	**Step 1** Click on **Tools | Universal Translator | Universal Translator**. This will open the **Universal Translator** window.
	Step 2 Drag down the **Source: Format** menu. This lists all of the file formats the UT can read. Select **ESRI ArcInfo Export (E00).**
	Step 3 Next to **Source: File(s)** click on **...** This will open a file browser window called **Select Input ESRI,** etc.
	Step 4 Browse to **MapInfo_Introduction\DCW**, and shift-click on all the files in that folder.. In other words, click once on the first item in the list to highlight it, then hold down SHIFT, click once on the last item, and release SHIFT. The entire list will be highlighted. Then click **Open**. The file browser will close and you'll return to the UT window.
	Step 5 Click on **Projection**. This will open the **Choose Projection** window.
	Step 6 Choose the projection. Under **Category** scroll up to **Longitude/Latitude** and under **Category Members** scroll down to **Longitude/Latitude (WGS 84).** Click **OK**. The window will close.
	Step 7 Next to **Destination: Format** select **MapInfo TAB**. In this case TAB means table.
	Step 8 Next to **Destination: Directory** click **...** . A **Select Directory** window will open. Browse to the **DCW** directory (On the OUCS network, pull down the **Drives** menu and switch to your H: drive). This is where it will put the files after the translation. Click **OK**. The window will close.
	Step 9 Disable the **Log to File** and **Append to Log** options. These allow you to create a log of the process, including any errors encountered. You don't need them.

	Step 10 Click OK. The UT will run the translation, during which time you will be entertained by a small animated globe graphic. When it says 'Translation Successful,' the process is complete. Click OK. By default it will take you back to the *Universal Translator* window. If you want to translate more files, then repeat the process. If you are done, click Cancel. In this case, you want to do more.
Task 15 Repeat Steps 2 – 10 of Task 14 for the contents of the UNEP directory	**Step 1** Repeat Task 14, except this time, under Source: File(s) you will load the contents of the UNEP directory. Also, change the destination to the UNEP directory.
	Step 2 When you are done with the *Universal Translator*, click Cancel to exit
Task 16 Open the EUADMLL_arc vector layer	**Step 1** Click on File | Open A file browser will appear.
	Step 2 Browse to MapInfo_Introduction\UNEP and double-click on EUADMLL_arc The file browser will close and the vector layer should be added to the current map window as a set of black lines. This particular layer is all of the major administrative boundaries in the EU. If you cannot see any black lines, your map window may be zoomed in too far to see anything, or panned too far to one side. If so, right-click in the map window, select View Entire Layer, and select EUADMLL_arc. This will zoom out to view the entire layer
	Step 3 Open the Layer Control and confirm that the layer is open. Note that the vector has been added beneath the Cosmetic Layer (which is always on top) and above the SRTM raster. Close the Layer Control.
	Step 4 Click on File | Close Table. The Close Table window will appear, containing a list of tables that are currently open. This is simply one convenient way of seeing what tables are currently open (remember: not every table that is open in the workspace is necessarily visible in a map or browser).
	Step 5 Since you don't actually want to close anything, click Cancel.
Task 17 Save your workspace as End of Exercise 1. Leave the map window open – when you save the	**Step 1** Click on File | Save Workspace. The Save Workspace window will open.
	Step 2 Browse to MapInfo_Introduction\Workspaces

workspace, the map window's viewing preferences will be saved	**Step 3** Type a name for this workspace, such as **`End of Exercise 1`**
	Step 4 Click **Save**

Task 18

Close *MapInfo*

Like most good software, if you attempt to close *MapInfo* while there are still unsaved edits in the files you have been working on, *MapInfo* will alert you to this and give you the option of saving the changes to the files. Of course, with *MapInfo*'s file structure, you have to save edits to *each file* you're working on. If you don't know whether you have any unsaved changes, drag down the **File** menu. If **Save Table..** appears in black, there are unsaved changes, and by clicking on this you can save each file or shift-click and save all of them. If there are no unsaved changes, **Save Table..** will appear light grey (*i.e.* disabled). In this case, since you have not made any edits to the file content, **Save Table..** will not apply. Moving the map viewpoints around did not change any of the underlying content (just the viewing preferences, which were stored in the workspace). Also, although you went through a process to import data into *MapInfo*, that data was saved as a table automatically as a part of that process. After some types of processes, *MapInfo* will save the changes automatically. At other times, you need to save the changes manually – if in doubt, check the **File | Save Table** status.

You can close *MapInfo* either by clicking on **File | Exit** or by clicking on the 'close' icon on the *MapInfo* workspace window.

5 Viewing and Stylising Data

Part of the power of GIS is its capability to display and stylise geographic content in many different ways. Working in layers, users can, for example, edit the colour scheme and symbology of their data very easily. They can change the brightness, contrast, and transparency of raster images. They can generate labels for their objects according to their attributes. For the most part these sorts of stylistic processes are 'non-destructive.' They don't change the underlying geographic data in any way – they just create new ways of viewing the data. These preferences are generally stored in the workspace files, rather than the tables themselves. In this way, the same table of polyline data may be stylised as solid blue lines in one workspace and dotted red lines in another.

A key consideration in planning your map's style is the restrictions imposed by the final output medium. Is this map going to be printed or displayed on screen? If printed, can it be in colour? How large can it be? How many maps are you allowed? What information do you want to convey and emphasise? The answers to questions like these should guide your decisions about what you're able to include in each map, how it can be symbolised or colour-coded, the output resolution (numbers of pixels), and so on. There's little point in spending ages getting a map *just right* in colour, then printing it in black and white!

Exercise 2 Viewing and Stylising Data

- *In this exercise, you will apply different display styles to the geographic content that you opened and imported in Exercise 1.*

Task 1 Start *MapInfo* and open your workspace from the end of Exercise 1	**Step 1** There are several ways of doing this. You could browse to the workspace file on your hard drive and simply double-click on it. You could start *MapInfo* (*e.g.* from the Windows Start menu or the hard drive) and open your workspace from the **Quick Start** window. If you don't like Quick Start, you could open an empty workspace, go to **File | Open**, change **Files of type** to **Workspace (*.wor)**, and browse to it from there. Regardless of how you do it, when you open your workspace, your session should be restored as it was at the end of Exercise 1. However, note two things. First, if you had moved, deleted, or renamed any of the files that were open in that session (since the time you last saved the workspace), you would be prompted by *MapInfo* to **Please locate file...** Second, if you had updated any of those files since the session was last open (say you'd had another *MapInfo* session in the meantime and edited a file, or even gone into *Photoshop* and tweaked a raster image that was used in the session) then *MapInfo* will load the *current* version of the file, provided that the name is the same.
Task 2 Stylise the **EUADMLL_arc**	**Step 1** In the **Layer Control**, highlight the layer you want to stylise (in this case **EUADMLL_arc**)

layer as 2-pixel red line	**Step 2** Click on **Display**. This will open the display parameters for this layer. When the **Display Options** window opens, note that the zoom range is disabled. *MapInfo* does this by default for vector layers. Leave it disabled.
	Step 3 Check the **Style Override** option. This will allow you to override the default styles for whatever points, lines (polylines), and regions (polygons) are in this specific layer. In this case, because there are only lines in **EUADMLL_arc** you will only get a lines icon. If there were also points in this layer, you would get a points icon too. Note that when you overrode the default style, the icon with the crossed lines in it became active.
	Step 4 Click on the icon with the crossed lines. This will open the appropriate style window (in this case, the **Line Style** window). The style window contains all of the parameters you can modify.
	Step 5 Drag down the **Style** menu and scroll down, noting all the groovy patterns you can make your line features. Scroll down - there are quite a lot. If you want to be sensible, leave it as a solid line. If you want to be a rebel, go for something else. Note that, in a menu like this, whenever you see **N** or **None** that means it will apply the style in a blank pattern, *i.e.* it won't draw the feature.
	Step 6 Drag down the **Colour** menu. A colour palette will appear with a few convenient colours. If you don't see one you like, scroll to the lower-right corner and click on the tiny **...** button. Another window will open allowing you to specify any colour of the rainbow. You can choose red, or go with a different colour (don't use blue).
	Step 7 Drag down the **Width: Pixels** menu. This will show you different line thickness options. Choose the second one down (two-pixel thickness).
	Step 8 Click **OK** to enter those style parameters for lines in this layer. The **Line Style** window will close and you'll go back to **Display Options**. A small preview of the style you have selected will appear in the crossed lines icon. Note that there is a slider control labelled **Enhanced Rendering: Translucency**. This is a new feature in version 9.5 -- you can use this to make your vector layer semi-transparent! This is potentially very useful in blending the layer with what's underneath, *i.e.* if you have several overlapping layers. It is also a handy way of de-emphasising the vector, which is important if you want to draw attention to other things in the map. Try out the semi-transparency if you want, but don't go over about 60%

	Step 9 Click OK in **Display Options** to enter the display parameters for this layer. **Display Options** will close and you'll go back to **Layer Control**.
	Step 10 Click OK in **Layer Control**. Now (finally) the changes you made will be applied in the map window. Piece of cake. Note that all of the lines in this layer will appear the same regardless of their status as international, regional, or sub-regional boundaries. In practice, you'll want to stylise them differently. There are two alternative approaches to doing this. The first (which will be covered in MapInfo Level 3) is to create a thematic map of them based on the attribute that represents the boundary status. The second (which will also be covered in MapInfo Level 3) is to run a set of queries on the dataset that breaks it up into separate tables, *i.e.* one table for international boundaries, one for regional, and so on. They can then be added and stylised independently
Task 3 Open the **EUADMLL_poly** layer from the **UNEP** directory (**File | Open**)	
Task 4 Stylise the **EUADMLL_poly** layer	**Step 1** Go into **Layer Control**, highlight this layer, and open the **Display Options**. Note that this layer contains regions. Override the default style. Then open the **Region Style** window by clicking on the icon with the polygon (*i.e.* region) in it. As you might expect, polygons have display parameters that are different to those for lines. You will see two sets of parameters, one for **Fill**, which is in effect the inside of the polygon, and one for **Border** which is the line going around the polygon edges. You can control these independently.
	Step 2 Drag down **Fill: Pattern**. As with the line pattern, you will get several options for the fill pattern. Note that, although these are shown in black, they will be rendered in whatever colour you choose, *i.e.* the first option looks like solid black but will become solid blue, solid red, etc depending on the fill colour you choose. Pick whatever pattern you like, or stick with solid.

	Step 3 Drag down the **Foreground: Color** menu and pick a colour. This is what will be applied to the inside of the polygon. Note that if you chose a fill pattern such as vertical lines, horizontal lines, etc, then the **Background Color** option will also become active, allowing you to enable this and select a background colour for the fill. If you leave the background colour disabled, it will leave the background transparent (this can be good if you have several overlapping layers of polygons, as it achieves a semi-transparent effect). If you're thoroughly confused by this, just experiment and keep an eye on the little sample you get at the bottom of the **Region Style** window -- all will soon become clear.
	Step 4 Stylise the borders of the polygons however you like. If you don't want borders, select **N** from the **Border: Style** parameters.
	Step 5 When you're done, click **OK** to return to the **Display Options** window, then **OK** to return to the **Layer Control**, then **OK** to apply the changes.
Task 5 Switch off the visibility of **EUADMLL_poly**	**Step 1** Switch off the visibility via the Layer Control.
Task 6 Open the **DNNET_arc** layer from the **DCW** directory	**Step 1** This layer contains all of the major drainage features in the UK as lines. Stylise these as blue lines.
Task 7 Open the **PPPOINT_point** layer from the **DCW** directory This contains all of the populated places in UK as points.	**Step 1** Open the **Display Options** for this layer. Again, points have different display parameters.
	Step 2 In the **Display Options** window, drag down the **Symbol** menu. This shows all of the symbols available in the currently selected font library.
	Step 3 Drag down the **Font** menu and select a different library. Then go back down to the **Symbol** menu and you will see a different set of symbols to choose from. In all of the libraries there are hundreds of possible symbols you can use. Go to the **MapInfo 3.0 Compatible** library, and choose the black dot symbol. The little number in the upper-right corner is the point size (it should be 12 by default). Change this to change the size. You will get a preview in the **Sample** box. Change the colour if you like.
	Step 4 When you have finished, apply the changes and return to the map window.

Task 8 Create labels for the **PPPOINT_point** layer	**Step 1** Restore the map window to a smaller size by clicking on the box icon in the upper-right corner of the map window (not the *MapInfo* workspace). This will shrink the map window so that it fits within the workspace -- you should see a grey background. You're doing this just so you can see the difference between the map window and the browser window that you will open next.
	Step 2 Before you can make the labels you first need to decide what field to base your layers on. Click **Window | New Browser Window** and select **PPPOINT_point**. This will open the layer in a table format, and it will show you all of the attributes for the features (in this case points) in the layer. Each record in the **PPPOINT_point** database (viewed in the browser) has had a corresponding point created (viewed in the map). We now want to label these points by place name. Scroll down in the browser window. Note that the names of the populated places, where available, are recorded in the field **PPPTNAME**.
	Step 3 Close the browser window by clicking the 'close' icon in the upper-right corner of the browser window (not the *MapInfo* workspace).
	Step 4 Return to the map window (maximise the window if you like) and open the **Layer Control.**
	Step 5 Highlight **PPPOINT_point** and enable the **Labels** option box to the right of it (it looks like a tag). This will enable labelling for that layer.
	Step 6 Click on the **Label** button. This will open the **Label Options** window.
	Step 7 Drag down the **Label with** menu and select the field you want to base the labels on. In this case, it's **PPPTNAME**. Note all of the other parameters for labelling, particularly the positioning the label relative to the point.
	Step 8 Under **Position: Label Offset** change this to about 6 points. This is the distance between the point and the label.
	Step 9 Under **Styles**, click on the **Aa** button. A **Text Style** window will open. Under **Background,** enable the **Halo** option. This will create a white halo around the text, to provide a contrast against the grey SRTM base map. Click **OK** to close the **Text Style** window.

	Step 10 Click OK and OK to apply the changes. The points in PPPOINT_poly will now be labelled according to the chosen parameters.

Task 9

Note that not every point will be labelled. This is for two reasons. First, remember that not every record in the table had a name in the PPPTNAME field. Second, if two points are fairly close together, *MapInfo* will by default not label both of them, since this would cause the labels to overlap. There are two things you can do to fix this. First, you can fix it on a case-by-case basis. If you see that one label is blocking another, you can simply click on it using the select (arrow) tool and drag it somewhere else. The blocked label will then appear. The downside of this is that the label you just moved will then have a line connecting it back to the point it refers to, and this may be undesirable. If so, you can double-click on the label and get a Label Style window - note that this window will pertain to *this specific label only*, not the labels for the entire layer. In this window, to get rid of the line set the Label Line option to None. The second approach to fixing overlapping labels is to change label options for the entire layer. Go back into the Label Options for that layer and enable the Allow Overlapping Text option. This of course will allow the labels to overlap, which may not be desirable. HOWEVER: you should note that the way in which *MapInfo* draws labels depends entirely on the zoom scale of the map window. If you zoom out, the labels will appear closer together, because *MapInfo* will always draw them at the font size specified in the Label Options. Conversely, if you zoom in they will be spaced further apart. As a general rule, *MapInfo* will always draw vectors (including text labels) at the specified size, regardless of how far zoomed in or out you may be.

If you have time, experiment with labels. Try moving some of the labels away from their default positions, then zooming in/out. The labels will change position slightly. Also, try changing the parameters, both for individual labels and for the entire layer.

When you're done, keep the workspace open. Save the workspace if you want – remember that the labelling preferences are stored in the workspace file.

Exercise 3 Layer Management

- *The important distinction to bear in mind here is the difference between having a file* open *in the* MapInfo *workspace (where it's not necessarily being viewed through any browser or added to any map) and having a file* added *to a map.*
- *Since you already have some files open, in this exercise you will practice removing / closing them first, then opening / adding them back.*

Task 1 Remove the SRTM from the current map	**Step 1** Open the Layer Control and select the SRTM raster.
	Step 2 Click Remove button and OK to apply the changes. This will remove it from the map window. However, it is still open in the workspace.
Task 2 Confirm that the SRTM is still open in the workspace	**Step 1** Click on File | Close Table. This will give you a list of what files are open -- you can see that the SRTM is still there. Don't close the SRTM yet. Click Cancel

Task 3 Add the SRTM to a new map window	**Step 1** Click on **Window | New Map Window.** You will get a window asking you what layers you want in the new map. For the moment, just pick the SRTM and click **OK**. Remember, at first the map window may be blank because of the zoom range. Zoom in if you like.
Task 4 Confirm that the SRTM is the only layer added to the new map window	**Step 1** Right-click in the new map window and open the Layer Control. Note that this will show you all of the layers added to this map -- currently just the cosmetic layer and the SRTM. Click **OK** to return to the map. Now close the new map window and return to your original one.
Task 5 Add the SRTM back to your original map window	**Step 1** In your original map window, open the **Layer Control**
	Step 2 Click on **Layers: Add** and select the SRTM. Click **Add** and you will add it back into the map. If *MapInfo* is behaving itself, it will recognise that this is a raster and it will add it beneath the vector layers so that it doesn't block them from view. Bear in mind that the layers in **Layer Control** are arranged in drawing order, *i.e.* the top layers will be drawn 'on top' of the bottom layers.
	Step 3 Try moving a layer up or down in the drawing order using the **Reorder Up** and **Down** buttons.
	Step 4 Click **OK** to close the **Layer Control**
Task 6 Close the SRTM from the workspace	**Step 1** Click on **File | Close Table**. This time you will close the SRTM from the workspace completely.
	Step 2 Select the SRTM layer and click **Close**. The SRTM layer will disappear from any browser or map currently showing it. In management, it is worth closing a layer if you know that you don't want to use it in the set of maps you are working on -- it will only clutter the workspace.
	Step 3 Click on **File | Close Table** to verify that the SRTM is closed, *i.e.* it should no longer appear. Click **Cancel**.
Task 7 Open the SRTM and add it back to the original map window	**Step 1** Click **File | Open** and browse to **SRTM\SRTM_UK_200m_elev_BW1** and open it. Sometimes, when you open a file in *MapInfo* it will appear in a new map window of its own. If this happens, simply close that map window and add it to whichever map window you want.

Task 8

Keep the workspace open. Save the workspace if you want, although you probably haven't made any changes.

6 Creating and Editing 'Cosmetic' Map Objects

MapInfo provides functionality for creating 'cosmetic' map objects, *i.e.* objects that are not part of the map's geographic content. Scale bars, grids, and north arrows are three common examples, and there are tools available in the **Tool Manager** especially for these. In addition, *MapInfo* provides a set of vector-drawing tools. These tools can be used either to draw cosmetic objects, or to create geographic content objects, *i.e.* objects that correspond to records in a table. The latter will be covered in the MapInfo level 3 session on databases.

In the **Layer Control**, *MapInfo* includes the Cosmetic Layer for these objects. The contents of the cosmetic layer are stored in the workspace file. This makes it, in a sense, a temporary storage. If you add something to the Cosmetic Layer or draw in it, and then exit *MapInfo* without saving the workspace, those objects will be lost. *MapInfo* will not prompt you to save the workspace before exiting. You can save the contents of the Cosmetic Layer by saving the workspace, but what is usually a better idea is to save them as a separate table.

Exercise 4 Create a Scale Bar

- *A scale bar is usually a good idea in a map, and* MapInfo *has a plug-in tool that makes drawing them very easy. In this exercise you will create a scale bar in the Cosmetic Layer, then save it as a table.*

Task 1 Measure a line in the map that is the length you want your scale bar	**Step 1** Click on **Map | Options**
	Step 2 Set the **Distance Units** to **kilometers**, and click **OK**
	Step 3 In the Main Toolbar, select the distance measurement tool (the ruler)
	Step 4 Draw a line in the map that is the length you want your scale bar to be. Go with something relatively short, about a fifth of the width of your study area, at most. A little **Ruler** readout will pop up.
	Step 5 Make a note the distance you have measured. Double-click to stop making the measurement. Choose the selector (arrow) tool from the main toolbar.
Task 2 Load the *Scale Bar* plug-in	**Step 1** Click on **Tools | Tool Manager**
	Step 2 Just like loading the *Universal Translator* See Exercise 1, Task 13 if you've forgotten how
Task 3 Run the *Scale Bar* plug-in	**Step 1** Click on **Tools | Scale Bar | Draw Scale Bar**. This will open the **Draw Distance Scale** window. There will be various parameters for your scale bar.

Task 4 Set the parameters for the scale bar	**Step 1** Change the **Units** to **kilometres**
	Step 2 Change the **Width of scale bar** to the distance you just measured. You will get a scale bar that is a desirable width.
	Step 3 Change the **Width to Height Ratio** to something like 30:1
	Step 4 **Click** OK
	Step 5 The plug-in will draw a scale bar in the Cosmetic Layer, and it will probably put it in the lower-left corner. Its size will be determined by the width you specified, and the height:width ratio in the parameters. If you are not happy with it, go into the Cosmetic Layer, enable the edit option for that layer, return to the map window, use the rectangular select tool to select all of the parts of the scale bar, and press BACKSPACE to delete them. Then try again from the start of Task 3.
Task 5 Save the scale bar as a table Although objects in the Cosmetic Layer do get saved within the workspace file when you save the workspace, you have limited control over the Cosmetic Layer contents, and whatever objects you have in the layer will disappear when you close that particular map window. If you have anything useful in the layer, it is best to save it as a table.	**Step 1** Click on **Map | Save Cosmetic Objects**. This will open the **Save Cosmetic Objects** window.
	Step 2 Drag down the menu and select **<New>** to create a new table. Click Save. This will open the **Save Objects to Table** window.
	Step 3 Name it **StudyArea_ScaleBar** or similar and save it in the **Map_Components** directory. You can now treat this as any other *MapInfo* table, *i.e.* add it, change display, *etc.*
Task 6 Move the scale bar. Chances are that the plug-in has not put the bar exactly where you want it.	**Step 1** In **Layer Control**, make the scale bar layer editable (under the pencil symbol) and click OK.
	Step 2 Select the scale bar using the rectangular select tool. Note that, since the scale bar is actually several objects, you must draw the rectangular selection around the *entire* bar and the surrounding text. It should become highlighted.
	Step 3 Choose the arrow selector tool

	Step 4 Hold down the mouse button *inside* the scale bar and drag it to a new location. If you hold down the mouse button outside the scale bar, you won't drag it anywhere!

Exercise 5 Create a Grid

- *The process here is similar to that for creating the scale bar in Exercise 4*

Task 1

Measure a line in the map that is the distance you want between your gridlines

Task 2 Define the northern, southern, eastern, and western extents of your grid	**Step 1** Click on **Map | Options**. This will open the **Map Options** window.
	Step 2 Click on **Projection**. Depending on the circumstances (whether you have any rasters in the map, and if so, whether you have enabled the re-projection option under **Image Processing**) the projection of your map may or may not be constrained. The MapInfo Level 3 course on Raster Images will go into detail about rasters and projections. However, in this case, just make a note of whatever projection your map is currently using. The projection is essentially the system for transforming the Earth's (irregular) spherical surface into a flat image. The projection determines, among other things, what kind of coordinates you're using, *e.g.* latitude/longitude, easting/northing, X/Y, etc
	Step 3 Don't make any changes to the projection. Go back to the **Map Options** window.
	Step 4 Under **Display in Status Bar**, check the **Cursor Location** option. Click **OK**. The **Map Options** window will close and you will return to the map.
	Step 5 Move the cursor around inside the map, and look at the status bar in the bottom-left corner of the *MapInfo* workspace. You will get a readout of a coordinate pair, *i.e.* two ordinates separated by a comma.
	Step 6 Move the cursor to the northernmost point where you want your grid to reach, and make a note of the second ordinate as the 'northern extent''. If it's latitude, it will be between –90 and 90, if it's a Cartesian ordinate (*e.g.* northing), probably in the thousands or millions.

	Step 7 Move the cursor to the southernmost point where you want your grid to reach, and make a note of the second ordinate as the 'southern extent.'
	Step 8 Do the same for the eastern and western extents, this time making a note of the *first* ordinate.
Task 3 Load the *Grid Maker* plug-in	**Step 1** Note that you want to load *Grid Maker*, not *Grid Tools*. Click on **Tools | Tool Manager**. Just like loading the *Universal Translator*. See Exercise 1, Task 13 if you've forgotten how.
Task 4 Run the *Grid Maker* plug-in	**Step 1** Click on **Tools | Grid Maker | Make Grid**. This will open the **Grid Maker** window. There will be various parameters for your grid.
Task 5 Enter the parameters for your grid	**Step 1** The **Object Types** is entirely up to you. You could use **Closed Regions**, and in **Object Styles** specify transparent fills (interiors) for the regions, so that the grid doesn't completely block out your map. However, opting for **Straight Polylines** is probably preferable. You can specify styles for the gridlines now, but you can always re-style them later too.
	Step 2 Enter the **Extents** in the corresponding boxes.
	Step 3 Enter the distance you measured as the **Spacing between lines**.
	Step 4 Click **Browse**. The **New Table To Store Grid** window will open. Browse to the location where you want the grid table to go. In this case, name it something like **StudyArea_Grid**, and put it in the **Map_Components** directory. Click **Save**. The window will close. Unlike the scale bar tool, which writes to the Cosmetic Layer, this plug-in will automatically write and save a table.
	Step 5 In the **Grid Maker** window, click **Projection**. A **Choose Projection** window will open. This should match the projection of the map you're creating the grid for. Click **OK** to return to the **Grid Maker** window.

Step 6

In the **Grid Maker** window, click **OK**. The window will close, and a *MapInfo* dialog box will appear asking you to confirm creating a grid with X number of cells. This is a nice feature – it keeps you from accidentally creating absurdly large grids! There is no upper limit. *MapInfo* will attempt to create whatever grid you like. However, if your grid has more than, say, 10,000 cells (*i.e.* equivalent to a 300 x 300 grid), then you may want to re-think your approach. There's nothing to keep you from creating multiple grids, over different areas, and different scales, *etc*

Step 7

If you're comfortable with the number of cells, click **OK**. If not, click **Cancel**, go back to the **Grid Maker** window, and increase the **Spacing between lines** parameter. Increasing this distance will effectively decrease the number of cells in your grid, at a geometric rate. Then, try again. When it runs, **Grid Maker** will create the grid as a table. It may add the grid to the existing map, or open a new map window.

Task 6

Close the new map showing the grid (if it was added to a new map), and add it to your current working map.

Have a look at it. If you like it, keep it there. There may be some instances where you want to be able to edit a grid once you've created it. For example, if you are trying to create an arbitrary survey grid (rather than show a geographic reference grid) you may want to be able to move it, rotate it, or selectively delete cells etc. To do this, you would proceed exactly as you did with the scale bar. In this case, of course, you would need to zoom out far enough to be able to rectangle-select the entire grid. HINT: instead of going to the trouble of noting the northern, southern , eastern, and western extents, it is possible to take a shortcut. Load the *Grid Maker* plug-in as normal, but instead of running it from **Tools | Grid Maker**, find the icon on the floating Tools toolbar. It's shaped like a globe. Click on the icon, then go back to the map window and draw a rectangle around the exact area you want the grid to cover. *Grid Maker* will then run, but *MapInfo* will have automatically extracted the extents from your rectangle.

Exercise 6 Create a Cosmetic Drawing

- *You may find that you want to draw a line or an arrow or a box on the map simply as a convenient cosmetic object.* MapInfo *has some functionality for creating and editing vector drawings, but it won't do freehand, 'paintbrush' style drawings. Generally speaking, it doesn't have anywhere near the functionality of a dedicated graphics program, and you may find that, depending on your requirements, you're better off exporting your map images from MapInfo then loading them into e.g.* Photoshop *for the final graphical tweaks. However, it's certainly worth having a look at what* MapInfo *can do first.*

Task 1 In your current working map, open the Layer Control and make the Cosmetic Layer editable	
Task 2 Draw a couple of polylines	**Step 1** Find the Drawing Toolbar. It's probably floating on the right side of the workspace. If you closed it, you can open it again by going to **Options | Toolbars**.
	Step 2 Select the Polyline tool. It's the second icon down on the left, and it looks like a four-sided open figure. If in doubt, hover your mouse over it to get the pop-up label.
	Step 3 Move the cursor into the map window and start drawing! Single-click to start a polyline, then single-click at each vertex, then double-click to finish the polyline.. you'll soon get the hang of it!
	Step 4 Using the roller button, you can zoom in/out while you're in the middle of drawing a line. You can also drag the cursor off the screen whilst drawing.
	Step 5 If you make a mistake and want to draw the entire line over again, you can use the normal Windows trick of pressing CTRL+Z to step backwards and undo the previous operation. Otherwise, you could also use the selector tool to highlight the problematic line and simply press BACKSPACE.
Task 3 Edit your polylines	**Step 1** Once you've completed a few polylines, highlight one and click on the Reshape tool in the Drawing Toolbar. It's the sixth down on the left. Using Reshape, you can move individual vertices on your polyline.
	Step 2 Continue to experiment with the other drawing tools in the menu.
	Step 3 Try using the SNAP function. You can toggle this on and off by pressing S at any time. In the centre of the status bar at the bottom of the *MapInfo* workspace, the word SNAP will appear when the function is enabled. The SNAP function will make your cursor 'snap' to the nearest point or vertex in the map window, if it's within a certain range. This has the advantage that your drawings will appear nice and neat if you intend to have *e.g.* two lines joined up together, two neighbouring regions fitted together, etc. Try it out – it's very handy. The catch is that, when SNAP is enabled, the cursor will only snap to objects in layers where the 'selectable' option is enabled (in **Layer Control**). In effect this allows you to control which layers you want to 'snap' to.

	Step 4 Try re-styling the lines you have created – there are plenty of interesting line styles to choose from. While they are kept in the Cosmetic Layer, you can do this only on a case-by-case basis, by double-clicking on them using the selector (arrow) tool. If you like your cosmetic objects, save them to a table (**Map | Save Cosmetic Objects**). You can then stylise the layer as a whole.

7 Outputting Maps and Layouts

There are essentially two ways of outputting maps from *MapInfo*. The first, which is very quick and easy, is to simply save the contents of a map window as an image. The second, which takes a bit more getting used to but is probably better for complex mapping, is to use a layout window. In a layout window, you work on an A4-sized composition, where you can integrate different map components (*e.g.* main map, context map, legend, title block), move and resize them independently, and align them on each other.

Exercise 7 Outputting Maps and Layouts

- *In this exercise, you will practice outputting from MapInfo in two ways: saving the contents of a map window as a simple raster image, and integrating several windows in a layout composition and saving that.*

Task 1 Edit your map	**Step 1** Switch on a few layers.
	Step 2 Zoom in or out until you have a reasonably interesting area in view.
	Step 3 Move the map window to the upper-left corner of the workspace, and re-size it so that it fits within the upper-left quarter of the workspace.
Task 2 Save the map window as an image	**Step 1** Click **File | Save Window As**. The **Save Window to File** window will open.
	Step 2 Browse to the directory **MapInfo_Introduction\Finished_Maps**.
	Step 3 Give the map a sensible name. If you call it **map,** I will be very upset... At least call it something like **UK_Study_Area_01**. It's usually worth putting a version number like '01' '02' '03' on the end of your file names.

	Step 4 Choose an uncompressed file format such as Bitmap (**.bmp**) or TIFF (**.tif**). An uncompressed image will be a larger file size than a compressed one (e.g. JPEG) but it will retain its image quality better, and this is important especially if you want to post-process it. You can always compress it later to make it a smaller file size. As a general rule, TIFF is the way forward – specifically a TIFF with LZW compression, if you have the option. LZW is a 'lossless' compression. You don't lose any image quality with LZW, because it eliminates only information that is redundant. Using LZW you get the best economy in images where the same colours are repeated, *e.g.* an image with a white background, because the 'white' data is recorded only once, rather than thousands of times.
	Step 5 Click **Save**. This will open the **Save Window As** window, which asks you to specify the resolution. You have two choices here. The first is to use the same resolution as the screen, which is okay if you are only going to display this on a monitor, but probably too coarse if you want to print it out. If you select **Custom Size**, you can specify a different resolution, either by specifying the height (or width) in pixels, or by specifying a resolution as 'dots per inch' (dpi) and a real image size. A good print resolution is 200 to 300 dpi. In this case, go with 200. Make a note of the resolution you use – it's useful information if you want to make more maps later.
	Step 6 You will see an option to **Use Antialiasing**. Antialiasing is a process sometimes used in digital image processing to make the lines and edges in an image seem sharper or smoother. Antialiasing works by applying a slight blur to the edge between an object and what's behind it (the blurred zone is often one or two pixels in width). This reduces the 'jaggedness' of the image. In GIS, it can be especially useful when you're dealing with a map that has lots of lines, curves, and text that contrasts highly against its backdrop. HOWEVER, in some cases using antialiasing can be a *bad* idea. Maintaining unblurred edges in the map can be desirable, especially if you want to later take that image into *e.g. Photoshop* and apply further processes to it, such as colour replacement, flood filling, or transparency masking. In this exercise, if you have time, save two versions of your map: one with and one without antialiasing. Then compare them. Zoom right in on them, and you will see what the difference is. It's a lot more noticeable in print than on a screen. So the rule of thumb is: if you know that you won't want to do any more image processing after *MapInfo*, then go ahead and use it. If you don't know that, then you might want to save two versions, or at least save your workspace so you can get back to this point easily.

	Step 7 You will also see an option to **Create a Geographically Referenced Tab File**. This is an option to export a table definition file that includes georeferencing for the image. It's worth bearing in mind that this option exists, especially if you ever want to re-project a raster image. Re-projecting images will be covered in the *MapInfo* level 3 course on raster imagery. In this case, however, you don't need it.
	Step 8 Click **OK**. *MapInfo* will save the contents of the map window as an image in the specified location.
	Step 9 Minimise the *MapInfo* window for a moment (don't close it down).
	Step 10 Browse to the map image you just created in **Finished_Maps**. Normally, you will be able to view the image immediately, without having to close *MapInfo* first. If so, have a look at it and make sure that you are happy with how it turned out. If there is a problem, such as the labels are too small, go back and make changes to the map (make the font size of the labels larger) and then save the map window again.
Task 3 Clone the map window	**Step 1** Click on **Map | Clone View**. A new map window will appear that is identical to the first in every way except that the title of the new window will have a '**:2**' appended to the end of it, and the original window will have a '**:1**'appended. This is simply to give each window a unique name.
	Step 2 Move the cloned map (:2) to the lower-left quarter of the workspace. If you go into the **Layer Control** of the new map, you can change things around without affecting the original map, and *vice versa*.
	Step 3 Zoom in on the cloned map, so that the view is now different to version :1

Task 4 Create a layout window	**Step 1** Click on **Window	New Layout Window**. A **New Layout Window** window will open, asking you how many frames you want. A frame is a rectangular section of the layout that gives a view of the contents of another window currently open the in workspace. At this point, you can choose either a one-frame layout (showing one particular window), a layout with one frame for each currently open window, or a blank layout with no frames. These options are really just convenient shortcuts. Once it's open, you can added and delete frames in your layout as much as you like. In this case, check the **Frames for All Currently Open Windows** option. Then click **OK**. A new layout window will open.
	Step 2 Move the layout window to the right half of the workspace, and resize it so that it roughly fills up the available space, and zoom in a bit. You'll notice that it shows an A4-size composition, in 'portrait' orientation. There are rulers along the top and left edges, graduated in centimetres. There should be two frames of the same size, one showing each of the two maps' views.
Task 5 Edit the layout	**Step 1** Click on one of the frames using the select (arrow) tool. Once it's highlighted, try moving it around (by dragging) and resizing it (by dragging a corner). Note that there this does not affect the views in the original map windows – the layout is in this sense 'downstream' of the maps. Also, although the frames originally had the same 'aspect ratio' (height:width ratio), it is possible to resize them in either axis, so you can end up with a frame that is proportionately wider or narrower than the map window that it corresponds to. In this case, *MapInfo* will re-scale to accommodate the full width of the map view. Try making the frames narrower/wider, and you will get the idea.
	Step 2 Using the grabber tool, pan the view in one of the two original map windows (using the arrow keys on your keyboard, or the hand-shaped icon). Notice that as soon as you make a change here, one or more of the frames in the layout will go blue. This means that there is a pending change in that frame. If you click back inside the layout window, the frame will update and whatever changes you have made to the view will be applied. By default, the frames will only be re-drawn when you re-enter the layout. If you want them to update constantly, go to **Layout	Options** and change **Show Frame Contents** to **Always**. Then try moving one of the viewpoints again.

	Step 3 Try re-sizing one of the original map windows to make it narrower/wider. Notice that there is a corresponding change in the layout frames. You could also minimise/restore the map window, and there would be a similar update. If you were to close one of the map windows, any corresponding frames in the layout would become empty. But don't do that..
	Step 4 Using the arrow selector tool, double-click on any of the frames in the layout. A **Frame Object** window will open, giving you various editing options for that frame. Under **Window** you can change the contents of the frame, not unlike changing the channel on a TV set. The **Bounds, Center, Height**, and **Width** values are not geographic – they refer to the space on the page, as demarcated by the rulers. Try changing the **Map Scale** options. Try changing the **Map Scale 1 cm =** value a *little* bit, say by about 25%. If you select the **Resize Frame** option, only the frame on the layout will change, and it will re-size according to the new scale. If you select the **Change Map Zoom** option, then the map view in the corresponding window will also zoom in/out to accommodate the change. This is one of the few cases where a change made in the layout window can affect the map window. As usual, the changes will not be applied until you click OK.
	Step 5 Add a new frame to the layout, by choosing the Frame tool (the yellow rectangle in the floating Drawing Tools menu). The click inside the layout window and draw a rectangle the size and shape you want the new frame to be. When you release the mouse button, a **Frame Object** window will open, asking you for the parameters. This is effectively the same window that you saw in the last step. Add any frame you like, although at this point only the maps will have any content.
	Step 6 Align two or more frames. To do this, using the select tool, click on one frame to highlight it, then shift-click on a second to highlight it as well. Then go to **Layout | Align Objects**. The **Align Objects** window will open. You have the choice of aligning the objects horizontally and/or vertically, and in each axis you can align any of the frames' edges, or their centres, with respect to each other or the edges of the layout. Try for yourself – it's not too difficult to get the hang of it!
Task 6 Save the layout window as an image	**Step 1** Follow the steps in Task 2 of this exercise. Use whatever settings you like. Then, have a look at the saved image. At OUCS, you may need to close *MapInfo* before you can view the image.

8 Appendix A: GIS Data Resources

[Last accessed 1/1/08]

Bodleian Map Room
http://www.bodley.ox.ac.uk/guides/maps/maproom.htm

The Map Room at the Bodleian has some excellent resources for GIS, including:

http://www.bodley.ox.ac.uk/guides/maps/mihowto.htm
An online 'How To' guide for *MapInfo* – very useful!

http://www.bodley.ox.ac.uk/guides/maps/mi_data.htm
Links to online GIS data that you can download and use in *MapInfo*

http://www.bodley.ox.ac.uk/guides/maps/linkfrme.htm
A more general set of links to online geographic data, include online map collections, gazetteers, portals, etc.

Global / Continental Resources

Digital Chart of the World (DCW), hosted at Penn State University Map Room
http://www.maproom.psu.edu/dcw/
Vector datasets for the entire world. Organised by country, then by theme (political, transport, drainage, hypsography, etc). Probably the most relevant layers for most users are Political/Ocean, Populated Places, and Drainage. You can either download the data for use in GIS, or view layers online and save them as GIF image files. DCW is easy and quick to use, but it has been superseded by VMAP (see below)

Vector Map (VMAP), hosted by the US National Geospatial Intelligence Agency
http://geoengine.nga.mil/muse-cgi-bin/rast_roam.cgi
Vector datasets for the entire world. Organised roughly by continent, rather than by country (as DCW is). In terms of content, VMAP is similar to DCW, but slightly more detailed.

United Nations Environment Programme (UNEP) Global Resource Information Database (GRID)
http://www.grid.unep.ch/data/data.php?category=human_related
A portal to miscellaneous datasets for various parts of the world. Organised by theme (atmosphere, biosphere, human-related, etc). An especially useful dataset is Administrative Regions/Boundaries of Europe.

NASA Shuttle Radar Topography Mission (SRTM) elevation data, hosted by the CGIAR Consortium for Spatial Information (CSI)
http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp
SRTM data is an elevation dataset covering nearly the entire world, available at 90-metre resolution. Distributed in tiles, as either GeoTIFF image files or ASCII DEM data. Note that the DEM data cannot be read by *MapInfo* without the *VerticalMapper* module. Alternatively,

you can load DEM data into *MicroDEM*, work with it there, and then output it as a GeoTIFF, in which case you don't need *VerticalMapper*.

Earth Resources Observation and Science (EROS) GTOPO-30 download page
http://edc.usgs.gov/products/elevation/gtopo30/gtopo30.html
GTOPO-30 is similar to SRTM but lower resolution – better for larger scale mapping

Global Land Cover Facility, hosted at the University of Maryland
http://glcf.umiacs.umd.edu/data/
Several different land cover datasets

Goddard Earth Sciences Data Center
http://disc.sci.gsfc.nasa.gov/

Blue Marble: Next Generation, hosted at NASA Visible Earth
http://earthobservatory.nasa.gov/Newsroom/BlueMarble/
Satellite raster imagery for the entire Earth, for different seasons and months. It's visually very appealing, and useful for a basemap 'as is' or faded out. Users would need to georeference it to use it in GIS. Unfortunately it is projected in a way that distorts areas in northern and southern latitudes. If you are working in these areas, you will want to re-project the imagery (**Map | Options | Projection**), then save a copy of it, then open the re-projected version

Natural Earth
http://www.shadedrelief.com/natural/
Excellent raster imagery of the entire Earth, showing elevation and land cover. Like Blue Marble, however, it uses plate carre projection, which distorts northern and southern latitudes.

Google Earth
http://earth.google.com/index.html
View raster satellite images of the Earth online in real-time, with vector overlays. Some amazingly detailed imagery. To use any of it in GIS you would need to do a screen grab and georeference the images, but this is a very handy tool for having a look at things quickly.

Non-UK National Resources

UNESCO list of national mapping agencies
http://whc.unesco.org/en/mapagencies
A portal listing the national mapping agencies of virtually every country in the world, including websites where applicable.

Second Administrative Level Boundaries (SALB) project by the UN Geographic Information Working Group (UNGIWG)
http://www.who.int/whosis/database/gis/salb/salb_home.htm
Various subnational vector datasets contributed mainly by national agencies.

UK National Resources

Digimap Collections, hosted by EDINA
http://edina.ac.uk/digimap/
Digimap is a download service for UK Ordnance Survey (OS) data. You will need to register with EDINA for an Athens username (e.g. 'oxuscro1234') and password by going to http://www.bodley.ox.ac.uk/guides/maps/dmapht.htm. The Digimap collection includes extensive vector, raster, and elevation data for the UK at multiple scales, and is downloadable in tiles. Oxford has also recently subscribed to Historic Digimap, which provides 19th and early 20th Century OS maps.

UK Archaeological Resources

Pastscape, hosted by English Heritage
http://www.pastscape.org.uk/TextPage.aspx
Searchable online database of English NMR entries. The search results include a National Grid reference for each entry, which you can copy into a table (*e.g.* Excel), convert into National Grid coordinates and create points from. Note that the precision of these references varies from 10 meters to 1 kilometer. Note that each entry may have multiple site types – if you are going to create a thematic map from these, you will need to think through how to manage them.

CANMORE, hosted by the RCAHMS
http://www.rcahms.gov.uk/
Searchable online database of Scottish NMR entries, with National Grid references.

PASTMAP, hosted by the RCAHMS
http://jura.rcahms.gov.uk/PASTMAP/login
Online map viewer for the CANMORE database.

Miscellaneous

FreeGIS.org
http://freegis.org/
Click on Geo-Data in the menu on the right. An excellent portal for free geographic data.

David Rumsey Historical Map Collection
http://www.davidrumsey.com/
Collection of map raster images. These are mainly historical.

Perry-Castaneda Library Map Collection
http://www.lib.utexas.edu/maps/
Collection of map raster images, mostly in the public domain. Very handy!

Geological vector data for Africa
http://www.uni-koeln.de/sfb389/e/e1/e1_download_e.htm