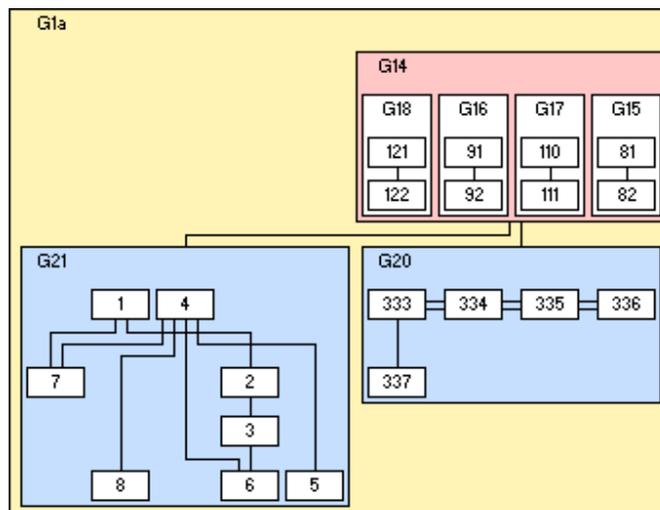


## Stratify 1.5



**Contents**

<i>Stratify</i> concepts.....	5
What are contexts?.....	6
What are stratigraphic relationships?.....	7
What is a Harris diagram?.....	8
Unit Classes: Contexts, groups, and work areas.....	10
<i>Stratify</i> user interface.....	11
Refresh unit and relationship lists.....	11
Toolbar.....	12
Create a new <i>Stratify</i> project.....	13
Project File.....	14
Load an existing <i>Stratify</i> project.....	15
Close a project.....	15
Deleting a project.....	15
Backup or copy the project data.....	16
Add another data set to the current project.....	16
Import stratigraphic data.....	17
Import/Export, CSV options.....	18
Import, set the field concordance.....	19
<i>Harris</i> program list file.....	21
Export stratigraphic data.....	22
Export, Extended Harris List.....	23
Enter a new context, group, or work area.....	26
Excavation name.....	28
Unit name.....	28
Unit entry: other fields.....	29
Border style.....	33
Edit an existing context, group, or work area.....	34
Unit editing functions.....	35
Delete one or several units.....	36
Copy a unit.....	36
Create units with consecutive numbers.....	37
Search and replace.....	39
Set default values for field entries.....	40
Blank field.....	40
Split a unit.....	41
Merging two or more units.....	42
Create groups or work areas by combining units.....	43
Count all or selected units.....	44
Find a unit in the list.....	44
Print a list of units.....	45
HTML reports.....	46
Relationships.....	47
Create a new relationship.....	48
Create chain-like relationships.....	50
Delete one or several relationships.....	51
Change the relationship comment.....	52
Test if two contexts are related.....	52

Creating and maintaining a term file .....	53
Entering new terms .....	54
Changing existing terms .....	55
Term editing functions .....	55
Deleting existing terms .....	56
Copying a term file .....	56
Navigate through the relationships .....	57
Estimate center year .....	59
Phase or period ranges control dialogue .....	62
Layout and check dialogue .....	63
Check coordinates .....	64
Show projection of context coordinates.....	65
Chronology / year checks.....	66
Check for connected components .....	67
Check for cycles.....	68
Delete redundant relationships.....	70
Random number generator seed.....	70
Check and layout report .....	71
Number of colours .....	74
Harris diagram layout .....	75
Layout example.....	76
Check and display phases or periods .....	77
Phase relation count list .....	78
Phase, example layout.....	79
Phase layout example.....	80
Show groups.....	81
Check strict group chronology.....	82
Group layout example.....	83
Combining group and phase layout .....	84
Groups and phases layout example.....	85
The Harris diagram window - after the layout.....	86
DXF export .....	87
HPGL export.....	88
JPEG export .....	89
MapInfo export .....	90
SVG export .....	91
Printing the diagram.....	92
Find a unit in the diagram .....	93
Unit information mode.....	93
Harris diagram preferences .....	94
Contract groups.....	95
Contracted group layout example .....	96
Display Harris diagram.....	97
Colour or border style change.....	97
Thematic box styles - overview .....	98
Thematic box styles - details.....	99
Filtering unit data.....	101
General information on filtering .....	102

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## Stratify 1.5

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List all units belonging to a specific excavation.....	103
List all units of a specific unit class.....	103
List all units with a specific field condition.....	103
List all units with a specific field value.....	104
List all units with an empty field value (or with a non-empty entry).....	104
List all units with a number or date within a specific range.....	105
List all unrelated units.....	106
List all unrelated contexts.....	106
List all contexts which are not part of any group.....	106
List all contexts at the top.....	107
List all contexts at the bottom.....	107
List all contexts earlier than a specific context.....	108
List all contexts later than current context.....	108
List all members of a specific group or work area.....	109
List all groups or work areas without members.....	109
Show relationships for currently selected unit(s) only.....	109
Set default excavation name.....	110
Two or more excavations.....	110
Select fields for display in list view and form view.....	111
Set the path and prefix of photos and drawings.....	112
<i>Photos/Drawings</i> button.....	113
Show group hierarchy / Show unit list.....	114
Group hierarchy example.....	116
Group hierarchy example showing phases.....	117
Simulating stratigraphic data.....	118
Data base structure.....	121
Why automatic layout?.....	123
Why additional information?.....	124
What kind of additional information may be available?.....	125
Bibliography.....	127

## **Stratify concepts**

Stratigraphy is a method for relative dating of archaeological contexts. The Harris diagram visualises the relative chronology of a site with a diagram that shows the contexts and their stratigraphic relationships. The aim of *Stratify* is to lay out the Harris diagram automatically, taking all the available information on chronology and groupings into account. *Stratify* stores the data of the contexts and their stratigraphic relationships in a data base. Interactive and automatic checks are also supported in order to detect inconsistent or contradictory relationships.

- What are contexts?
- What are stratigraphic relationships?
- What is a Harris diagram?
- Why should additional information be taken into account?
- What additional information may be available?
- Contexts, groups, and work areas
- Data base structure
- Thematic box styles
- Why automatic layout?

## What are contexts?

The term “context” is used as a short name for “stratigraphic unit” as described by Edward Harris.

A context may be a stratum formed by agencies of nature, for example flooding or volcanic eruption. In this case, there is no difference between geological and archaeological stratification. In addition, Harris defines stratigraphic units which are uniquely human: pits, banks, trenches, any man-made disturbance of the soil. It is important to record not only solid forms like walls, layers, woodwork or fill soils, but also hollow forms or interfaces such as trenches, ditches, or pits.

Each unit must have a unique name to ensure that the matrix diagram, error lists, or reports are unambiguous. Most stratigraphic excavations use only one numbering system, but in some situations additional letters are helpful. For example graves may be labeled G1, G2 etc., or a layer which is found to consist of two parts may be split into contexts 12a and 12b (12 being the original name of the layer).

The aim of the Harris diagram is to visualize a reconstruction of the relative order of deposition of all contexts recorded during excavation.

For a full discussion of the principles underlying the Harris diagram refer to the publications of Edward Harris (see Bibliography).

## What are stratigraphic relationships?

The following time relationships may exist between two contexts 1 and 2:

- a) 1 is later than 2
- b) 1 is earlier than 2
- c) 1 and 2 are contemporary
- d) 1 and 2 are equal.

It is also possible that no direct relationship exists between 1 and 2.

Edward Harris does not differentiate between equal and contemporary relations. In *Stratify*, a contemporary relation is based on dating evidence other than stratigraphy. For example, all the postholes belonging to a building may be considered contemporary. The *relationship comment* field may be used to store a short note explaining why two contexts are set contemporary.

Equal relations should be established only where two or more context numbers refer to one stratigraphic unit, for example the two context numbers of a wall that has been observed in two different trenches.

See also:

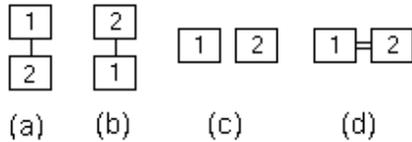
What is a Harris diagram?

Relationships supported by *Stratify*

Relationship table

## What is a Harris diagram?

The Harris diagram visualises the time relationships that may exist between two contexts 1 and 2:



- a) 1 is later than 2
- b) 1 is earlier than 2
- c) 1 and 2 are contemporary
- d) 1 and 2 are equal.

Each context is represented by a rectangular box displaying the unique name of the context. All boxes are of equal size irrespective of the context size.

If two contexts are displayed on the same horizontal level (c), they are either explicitly contemporary, or there is no stratigraphic connection between them, and they might have been created at approximately the same time.

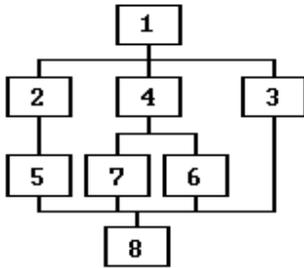
### Paths between two contexts

If one follows the downward strands from a particular context, all context boxes through which one passes are provably earlier than this context. If there is a connecting path along horizontal and vertical lines from one context up to another one, then the context at the bottom is provably later than the context at the top of this path. Often, there is no connecting path between two contexts, i.e. there is no proven stratigraphic relationship. Therefore, the stratigraphic relationships form a partially ordered set: For some, but not for all context pairs a time relationship exists.

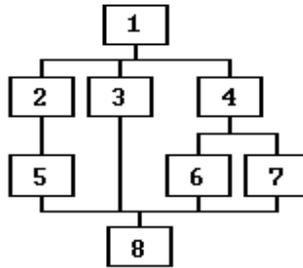
### Redundant relationships

If context 1 is later than 2 and 2 is later than 3, it follows that 1 is later than 3. In this case the relationship '1 is later than 3' is called indirect because it is not based on direct observation. If a direct later- or earlier-relation can also be established indirectly, this relation is called redundant, and for reasons of clarity it is normally not included in the Harris diagram.

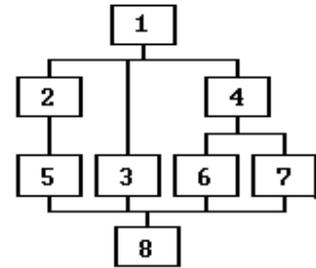
Examples:



(a)

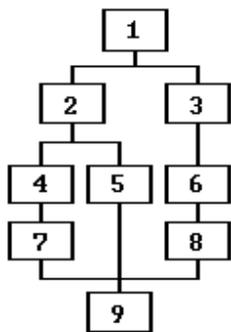


(b)

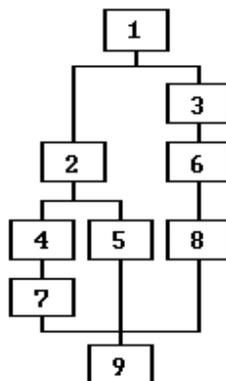


(c)

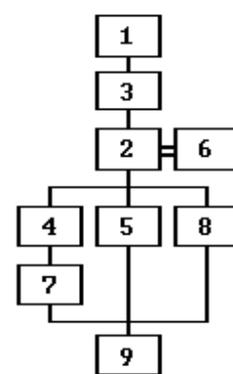
- (a) The Harris diagram shows the stratigraphic relations of eight contexts numbered 1 to 8. Context 1 is the latest, 8 is the earliest context in this diagram. Context 1 is later than 2, 3 and 4. These three contexts may be contemporary. Context 2 is later than 5, 4 is later than 6 and 7. Finally, 3, 5, 6 and 7 are later than 8. There is no stratigraphic relationship between contexts 5 and 7 (they might be contemporary, or one of them is earlier than the other).
- (b) same relationships as in (a), but different horizontal sequences of the contexts.
- (c) same relationships as in (a), but depth of context 3 changed (so context 6 appears to be contemporary with 5, 6, and 7).



(a)



(b)



(c)

- (a) small Harris diagram without contemporary or equal relations.
- (b) diagram as in (a), but contexts 2 and 6 are set contemporary.
- (c) diagram as in (a), but contexts 2 and 6 are set equal.

## Unit Classes: Contexts, groups, and work areas

Three unit classes are supported by *Stratify*: contexts, groups, and work areas.

The term “context” is used as a short name for “stratigraphic unit” as described by Edward Harris.

### Groups

A group on the lowest level consists of several contexts. Contexts in a group are blocked together vertically and horizontally in the Harris diagram if the *Show groups* layout option is selected. A higher level group may consist of both lower level groups and contexts. The hierarchy of groups can be displayed instead of the unit list on the left-hand side of the main window.

*Stratify* deduces the relationships between the groups from the relationships between members of these groups: for example, if a context, which is part of group 1, is later than a context belonging to group 2, then group 1 is later than group 2. You may only enter "part of" relationships for groups.

### Work Areas

A work area may be a section, a top plan, or any other well-defined area of the excavation. The concept of work areas may help those archaeologists who try to analyse pre-matrix sites. Work areas are only used for lists and do not influence the Harris diagram layout.

A work area has no relationships except that a context may be part of a work area.

Contexts, groups, and work areas are all stored together in the unit table. Each unit must be assigned a unique identifier, therefore a group must not have the same name as a context or a work area.

## **Stratify user interface**

When a project is open, *Stratify* will show two lists side by side. On the left hand side, the unit list and on the right hand side, the relationship list is displayed.

Whenever you click on a unit in the unit list, the cursor in the relationship list will move to the first relationship of this unit.

You may configure which data base fields are used in a project and displayed in the lists by selecting *Configure | Configure fields* from the main menu.

The unit list and the relationship list are separated by a so-called splitter which can be moved to the right or left by dragging it with the mouse (click and while the mouse button is pressed, move the mouse). If you increase the breadth of the unit list by moving the splitter to the right, the breadth of the relationship list is reduced accordingly. The breadth of each list cannot be decreased beyond a minimum set by the program.

The main window size and the splitter position are stored on leaving *Stratify* and will be restored when starting the program again.

The unit and relationship lists in the main window cannot be edited directly but may only be modified by selecting commands from the menu, by using toolbar buttons, or by double-clicking on a line. This way the consistency of the project data is ensured.

You may edit a unit by double-clicking on the appropriate row in the unit list.

To change a *relationship comment*, double-click on the appropriate row in the relationship list.

When working with groups, you may replace the unit list display by a hierarchy tree of groups like the directories listed in the Windows Explorer.

### **The status bar**

At the bottom of the application window, the status bar is displayed. After opening an existing project, the status bar will indicate the total number of units in this project. When you move the mouse to a menu item, the status bar will show a short explanation of this menu item. If a filter condition is active, this condition will also be shown in the status bar. Whenever necessary, both the menu item information and the filter condition will appear in the status bar, separated by a short vertical line.

See also:

Toolbar

## **Refresh unit and relationship lists**

File | Refresh

If the record selections in the “Units” and “Relations” list views cease to work, the *Refresh* menu option fixes this problem. Most of the errors which caused this problem have been identified and fixed, but this freezing effect may still be seen in rare cases. An alternative to deal with this problem is to close the project and to reopen it.

## Toolbar



When the main window is displayed, the toolbar is shown below the main menu. If you move the mouse pointer to one of the toolbar symbols, a short hint will be shown. Note that this toolbar cannot be hidden or moved.

The buttons on the toolbar perform the following functions:

-  Create a new project
-  Open a project
-  Close project
-  Print a list of units
-  Find a unit in the list
-  Show term list
-  Navigate through the relationships
-  Create a new unit
-  Edit unit data
-  Delete one or several units
-  Add a new relationship
-  Create chain-like relationships
-  Delete one or several relationships
-  Check relationships; layout diagram
-  Display Harris diagram

## Create a new *Stratify* project

File | New project

If you want to create a new stratigraphic data set, select *File | New project* from the main menu or the corresponding toolbar button. If another project is still open, close it before creating the new project. Enter the name of the project file and other options in the project control form.

### Parameters of the project control form:

#### Project file

The project file controls the project configuration. It is obligatory to enter a project file name for each project. Using the *Search* button to the right of the project file edit box, you open a standard dialogue box for creating a project file. If you prefer to type in the name in the edit box, please enter the full path of the file, otherwise *Stratify* will create the file in the current directory, which is displayed in the first line of the form.

#### Term file

The term file allows you to store for each text field a list of terms and their descriptions. The use of a term file is optional. It is possible to load or create a term file later, if this becomes necessary. Using the *Search* button to the right of the term file edit box, you open a standard dialogue box for loading or creating a term file. If you enter the name of a file that does not yet exist, the program asks you to confirm term file creation.

#### Excavation

Set the initial value of the default excavation name. This entry is obligatory. You may later change the default excavation name by selecting *Configure | Change excavation* from the main menu.

#### Configure fields button

Using this button, you may select which fields are displayed in the unit list and in the unit entry form. In addition, you may choose if one or more excavations are to be stored in the project. These options may be set later as well by selecting *Configure | Configure Fields* from the main menu.

#### OK / Cancel buttons

With the *OK* button the unit and relationship tables are created, and the corresponding lists will be displayed automatically (see *Stratify* user interface). In addition, menu entries for entering, checking, and displaying stratigraphic data will appear, and the corresponding toolbar buttons will become active.

With the *Cancel* button, all entries are discarded and no project is created.

## Project File

The project file controls the project configuration. It is obligatory to enter a project file name for each project.

The names of the unit table and the relationship table begin with the project file name. Both tables will be stored in the project file directory. The project file stores the full file name of the term table if present, the field configuration set by the menu option *Configure | Fields*, the default excavation name, and a flag indicating if a Harris diagram was created for this project. On opening an existing project, *Stratify* checks if the term table can be opened. If this file was moved to another disk or directory, you may load another term file (or the moved term file) or you may decide not to reference a term file any more.

When you enter a photo or drawing path and a separator (and optional image prefixes) to create a link to the digital images referenced by the *photos* and *drawings* fields, this data is stored in the project file as well.

Note that the project file is essential for opening an existing *Stratify* data set. But the data is stored in the unit table and the relationship table, so that you have to copy all three if you want to move a project to a different directory or another computer. The easiest way to create a backup of a project is by selecting *File | Save copy as* from the main menu. This menu item creates a copy of the relationship and the unit table, but the new project file references still the original term file, i.e. the term file is not copied.

### Associating *Stratify* project files with the program

The standard file extension for a project file is *.syp* (*S*tratify project file). If you want to associate *syp*-files with the *Stratify* program, open the MS Windows Explorer, right-click a *syp*-file and choose to open it with *Stratify*. Check the option to associate these file types permanently with *Stratify*. Afterwards, on double-clicking a project file in the Windows Explorer file list, *Stratify* will be started and the project selected will be opened.

## Load an existing *Stratify* project

File | Open project

After selection *File | Open project* from the main menu or the corresponding toolbar button, *Stratify* prompts you to enter the project file name. Only one project may be open, therefore close an open project before opening another one. After successfully opening an existing project, the appropriate unit and relationship lists are displayed. In addition, menu entries for entering, checking, and displaying stratigraphic data will appear, and the corresponding toolbar buttons will become active. The number of units stored in the project's unit table appears in the status bar at the bottom of the application window.

Opening a project fails if the unit and relationship tables are not in the same directory as the project file name.

Alternatively, you may open a project file by double-clicking on it in the Windows Explorer, after associating the project file type with the *Stratify* program. You may also choose one of the project files most recently used which are listed in the last section of the *File* menu.

See also:

*Stratify* user interface

## Close a project

File | Close project

You are asked to explicitly close a project before opening or creating another one. On closing a project, the project file is saved, menu entries for entering, checking, and displaying stratigraphic data will disappear, and the corresponding toolbar buttons will become inactive.

See also:

Create a new project

Open an existing project

Deleting a project

## Deleting a project

File | Delete project

A *Stratify* project consists of several files, and it is tedious to delete all these files, if necessary. This menu option ensures, that all files belonging to the currently open project are deleted, and no other files. After deletion, no project is open.

But note: There is no undo function, the project data is gone and lost forever, if you do not have a backup version.

## Backup or copy the project data

File | Save copy as

It is recommended to backup the project data you are working with at regular intervals. *Stratify* allows you to create a copy of your project data. After selecting *File | Save copy as* from the main menu, the standard dialogue box for creating a project file is displayed, so that you may choose or create the directory of the new project, and you can enter a file name for the project file. The unit and relationship tables are copied as well. Note that the layout files and the optional term table are not copied with this procedure. After copying, the original project is still open. If you want to backup your data or move a project to another computer, please ensure that the term file (if present) is copied as well.

Backups are important! Please make sure that you backup not only to one hard disk, but that the most important data is saved to several media.

See also:

Copying the term file

Deleting a project

## Add another data set to the current project

File | Add project

Select *File | Add project* from the main menu if you want to add all data from another project to the currently open project. Use this option for merging the data of two or more excavations which were first analysed separately.

On choosing this menu option *Stratify* asks you if you want to backup the current project before adding the data from another project. It is recommended to create a backup copy of the original data set before starting the adding procedure.

Then *Stratify* prompts for the name of the project which contains the data to be added to the open project. After selecting the desired project file, the data is added to the open project.

You may also add data from the same excavation. In this case, *Stratify* checks, if a unit is defined in both projects. If so, a list of unit names present in both projects is displayed. On confirming this dialogue box with the *OK* button, the unit field definitions of the current project are superseded by the unit definitions of the project added. The relationships of both projects are retained.

If the *Project composition* was set to *Single excavation* in the *Configure Fields* dialogue box and data from another excavation is added, then the *Project composition* is automatically changed to *Two or more excavations*.

## Import stratigraphic data

File | Import

*Stratify* is able to import ANSI or ASCII/OEM lists created by *Arched* or the *Harris program* (Bonn Seriation Package - BASP). In addition, data bases in Paradox or dBase format can be imported. Another option is the import of separator delimited ANSI or OEM files.

To import your data, select *File | Import* from the main menu. If another project is still open, close it before importing new project data. Enter the name of the import file and other options in the import control form.

### Parameters of the import control form:

#### Import File

Enter the name of the file to be imported in this edit box. Using the *Search* button to the right of the *Import File* edit box, you open a standard dialogue box for choosing an existing file. *Stratify* will recognize the file format from the file extension. For this reason *Arched* or *Harris* program list files are supposed to have a *lst* file extension, Paradox files should have a *db*-extension, the dBase file extension is *dbf*, and separator delimited files are expected to come with a *csv* file extension. After selecting a file, the file name will be displayed in the *Import File* edit box. If you prefer to type in the file name in the edit box, please enter the full path of the file, otherwise *Stratify* will look for the file in the current directory.

#### Target Project File

The target project file controls the project configuration of the imported data set. It is obligatory to enter a project file name for each project. Using the *Search* button to the right of the *Target Project File* edit box, you open a standard dialogue box for creating a project file. If you prefer to type in the name in the edit box, please enter the full path of the file, otherwise *Stratify* will create the file in the current directory.

#### Excavation

You must enter the *excavation name* in this edit box. When importing an *ArchEd* or *Harris* list file, it is assumed that all imported contexts belong to one excavation, and the *excavation name* entered is assigned to all newly imported contexts.

With the other import formats it is optional to import the *excavation name* for each unit. If the *excavation name* is not entered in a field or in part of a field in the input data set, the *excavation name* entered in the edit box is assigned to all newly imported contexts.

In any case, this entry will become the default *excavation name* for the target project.

The default *excavation name* can be changed later by selecting *Configure | Change excavation* from the main menu. If the contexts in the import file belong to different excavations which are not specified in this file, you may edit the *excavation names* after the import (and after configuring the *Project composition* accordingly).

#### OK / Cancel buttons

When importing an **ArchEd** or **Harris list file**, *Stratify* asks you if you want to convert ASCII to ANSI. This is only necessary, if the list file was created by the Bonn *Harris* program.

If a **Paradox** or **dBase** file is to be imported, a dialogue window allows you to set the field concordance, i.e. to select for each field in the input file the corresponding field in the *Stratify* project.

On selecting a **separator delimited ANSI or OEM format file**, a dialogue window with csv import options is brought up.

After successfully importing the data, the unit and relationship tables for this data set displayed in the corresponding lists in the main *Stratify* window. In addition, menu entries for entering, checking, and displaying stratigraphic data will appear, and the corresponding toolbar buttons will become active.

With the *Cancel* button, all entries are discarded and no project is created.

## Import/Export, CSV options

File | Import; or File | Export; separator delimited ANSI or OEM files

When exporting a separator delimited ANSI or OEM file from your data base program or from *Stratify*, make sure to note the export options so that you can choose the appropriate import options in *Stratify* (or the target data base system).

### Tips and tricks

It is recommended to export the field names in the first row of the export file, this will prevent mistakes in setting the concordance between input and *Stratify* fields.

With text fields, make sure that the field delimiter is not used as a character in any of the field entries.

With number fields, the decimal separator and the thousands separator should not be used as a field delimiter, except when using a field delimiter for all fields.

### Import

After choosing the CSV options and confirming with *OK*, a dialogue window allows you to set the field concordance, i.e. to select for each field in the input file the corresponding field in the *Stratify* project.

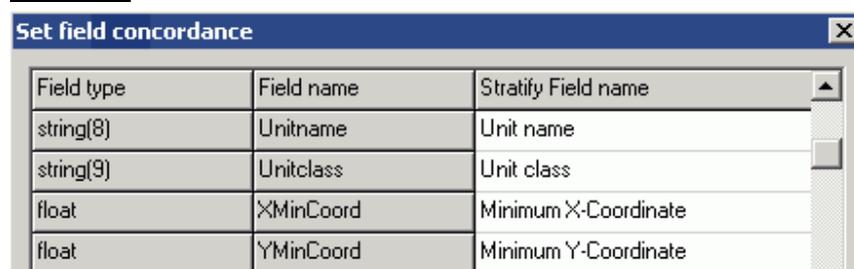
## Import, set the field concordance

File | Import; Paradox, dBase file, or separator delimited ANSI/OEM file

If a Paradox, dBase, or separator delimited ANSI/OEM file is to be imported, a dialogue window allows you to set the field concordance, i.e. to select for each field in the input file the corresponding field in the *Stratify* project.

In the dialogue window a list with one row for each field in the input file is displayed (see example below). The list consists of three columns, the first one shows the field type, the second the field name of the fields in the input file. These two columns have a gray background to indicate that they cannot be changed by the user. In the third column the name of the corresponding *Stratify* field can be selected.

Example:



With a separator delimited ANSI/OEM file, *Stratify* will first test the whole file to determine for each field the field type and maximum length. In case no field names are present in the first row of the file, numbered fields will appear in the *Field name* column: FIELD1, FIELD2 etc.

If you right-click in the *Stratify Field name* column, a list of *Stratify* field names will be displayed. The list depends on the field type: For string fields (also called alphanumeric or character fields) the list will consist of the *Stratify* string fields, for float fields (also called number fields), all *Stratify* float fields will be listed. Choose the appropriate *Stratify* field name from the list.

Integer fields (number fields without decimal separator) can be converted to float fields.

If the length of the input field exceeds the length of the *Stratify* field, you are asked to confirm field truncation.

Several string fields may be combined to one new string field, but target fields of all other field types must not be selected twice. When combining string fields, the text entries will appear in the sequence of the fields in the input file, and the entries will be separated by semicolons. There are no warnings, if the result of the combination exceeds the target field length, and the field entry is truncated.

You may choose to import only some of the fields in the source data base.

If a field name in the input file is identical with the internal field name in the *Stratify* unit file, then the *Stratify* field name will be automatically suggested. So when you plan to import data into *Stratify* regularly, it is a good idea to export a sample project to the dBase format. Then use this example to rename your data fields by an automatic procedure (adding the data to an empty table with the appropriate field names) before starting the import procedure.

### Unit identifiers (excavation name and unit name)

It is mandatory that the input file has a unit name field, but the unit name may be combined with the excavation name (select *Excavation+unit name* from the field list, if the two are combined). Of course, two or more unit name fields are not allowed, and similarly, at most one excavation

name field may be chosen. When combining the excavation name with the unit name, the two parts of the unit identifier must be separated by a separator that consists of one or two characters.

For example, the unit names ABA:121, ABC:121 belong to two different excavations, ABA and ABC, the separator between the excavation name and the unit name is a colon. After confirming the dialogue with *OK*, you are asked to enter the character(s) that separate(s) the excavation name from the unit name. Up to two separator characters are allowed.

**Warning:** Unit or excavation names exceeding the maximum field lengths defined in *Stratify* are truncated, which may lead to a merge of units which is not intended when importing the data.

Unit names or excavation names that do not conform with the *Stratify* restrictions cannot be imported.

If you need excavation names and if you want to import relationship lists along with the unit fields, then it is necessary to use combined excavation and unit names rather than two separate fields for excavation and unit names.

### **Unit class field**

If no unit class field is identified, it is assumed that all units are contexts. Of course, choosing two or more unit class fields will result in an error message. Three unit classes are supported by *Stratify*: contexts, groups, and work areas, and these are the only entries allowed in this field. When the unit class field is blank the default unit class "context" is chosen.

### **Relationship lists**

Relationships can be imported if they are stored in fields containing lists of units. For each kind of relationship supported by *Stratify*, a relationship list field may be present. After right-clicking the *Stratify field name* cell, the relationship fields will appear at the end of the field list. When working with relationship lists, you are asked to enter the special character(s) that separate(s) the unit names in the list. A typical separator is a comma, often followed by a blank character. With these separators, a relationship list may look like: ABA:121, ABC:121, ABC:121a. Up to two separator characters are supported by *Stratify*.

Note that relationship restrictions are enforced on import in a similar way as when entering new relationships. In addition, *Stratify* enters opposite and transitive relationships automatically.

If the data structure of the file to be imported has fields like *LaterThan1*, *LaterThan2*, ...*LaterThan<n>* and each of these fields contains at most one unit name, then choose the *Stratify* field *Later than relationships* to each of these fields. In this case, enter arbitrary separator character(s) that is (are) not used in unit names. Of course, all other relationship lists may be split into several fields as shown here for the later-than-relationship.

## Harris program list file

The *Harris* program list file is an ASCII or ANSI file with extension .lst. The first three lines are ignored by *Stratify*, the first unit name is expected in line 4. *Stratify* ensures that only legal unit names are imported (*Arched* is able to deal with longer names and special characters that are not supported).

The unit name may be followed by a label, but the label must not start before position 9 in the unit definition line. In the example below, unit 1 has the label "post-, medieval, Saxon, Roman", this label will be imported into the *description* field. The label is not obligatory (see unit 11 in example below). Note that *Arched* is able to create labels with linefeed characters that cannot be imported directly by *Stratify*. Please use the *AnsiTester* program to convert these linefeed characters before importing the .lst file.

The unit definition line is followed by four lines which list the relationships of the unit. All four lines must be present, even if the appropriate relationship list does not contain any entries. The unit names in the relationship lists are separated by commas. Any number of blanks before the relationship keywords are allowed.

Illegal relationships are not imported: For example, if the list file contains the relationship 5 is equal to 5, then this relationship is not entered. Similarly, a relationship contradicting another relationship entered previously and relationships to undefined units are ignored.

Several 5 line blocks for one unit may be present, so it is fairly easy to convert a list of related unit pairs to the list file format.

Example:

```
Stratigraphic Dataset burleigh

Name
1      post-, medieval, Saxon, Roman
      above:
      contemporary with:
      equal to:
      below: 2
10     Saxon, Roman
      above: 11
      contemporary with:
      equal to: 10a
      below: 9
11
      above: 15
      contemporary with:
      equal to:
      below: 10, 21, 22
```

## Export stratigraphic data

File | Export

*Stratify* supports three data export formats: Extended Harris List, dBase, and CSV. With all formats, the data is converted to one table or one file respectively.

In addition you may export the Harris diagram after the layout to different graphic formats.

## Export, Extended Harris List

File | Export; Extended Harris List format

You may export the *Stratify* data in an ANSI list format which is the extended version of the *Harris* program list format used in the programs *Harris* and *ArchEd*. Only those fields that are filled are listed in the export file, so that the number of lines per unit varies.

The date and number formats depend on the settings of the operating system, the examples below were created with German settings for decimal separators and dates.

With two or more excavations, each unit is identified by the combination of excavation name and unit name, both are separated by a double colon (a single colon is used to separate field name and field contents).

### Example 1 (part of an export file):

```
Stratigraphic Dataset testgl

Name
1
    below: 14, 2, 3, 4
    above: 201
    part of: G1
    Unit class: context
    Location: C 100/125
    Unit type: layer, natural
    Phase: Phase 1

122
    below: 401
    above: 121
    part of: G3, W1
    Unit class: context
    Minimum X-Coordinate: 2534124,22
    Minimum Y-Coordinate: 5627554,55
    Minimum Z-Coordinate: 53,21
    Maximum X-Coordinate: 2534125,04
    Maximum Y-Coordinate: 5627555,35
    Maximum Z-Coordinate: 53,47
    Location: B 110-115/210
    Unit type: pit fill
    Colour: dark greyish brown
    Description: sand (40%) silt (60%); occasional lenses of organic
material
    Inclusions: frequent medium and small fragments of bone;
occasional fragments of leather
    Visibility of boundaries: uneven
    Excavation method: mattock
    Conditions: weather: dry
    Formation process: refuse
    Drawings: P 138
```

## Stratify 1.5

---

Photos: 2003-345-12; 2003-346-17  
Samples: 23  
Interpretation: A dumped deposit (probable refuse). Fairly large quantities of bone and leather suggest it is a dump of refuse material  
First year: 1250  
Last year: 1300  
Mean year: 1275  
Source of dating: pottery  
Phase: Phase 2  
Excavation date: 26.06.2003  
Excavator: John Smith

14

below: 8, 8a  
above: 1  
equal to: 4  
part of: G1  
Unit class: context  
Location: C 100/130  
Unit type: ditch  
Phase: Phase 1

G1

Unit class: group  
Phase: Phase 1

G3

part of: G4  
Unit class: group  
Phase: Phase 2

W1

Unit class: work area  
Description: all pit fills

### Example 2 (part of an export file):

Stratigraphic Dataset testadd2

Name  
test 08::W01  
Unit class: work area

test 10::01  
below: test 10::02, test 10::03, test 10::04, test 10::05  
part of: test 10::G01  
Unit class: context  
Unit type: ditch  
Colour: black

test 10::02

---

## Stratify 1.5

---

below: test 10::07  
above: test 10::01  
part of: test 10::G01  
Unit class: context  
Unit type: ditch

## Enter a new context, group, or work area

Units | New

If you want to enter a new context, group, or work area, select *Units | New* from the main menu or the corresponding toolbar button. Then the unit entry form will appear on the screen. The unit entry form presents a synthesis of those context recording sheets that have come to the author's notice. As most fields in this form can be used to describe groups and work areas as well, it was decided not to generate separate forms for groups or work areas.

### Fields in the unit entry form:

It is mandatory that the fields *Excavation* and *Unit name* are filled before saving the new unit. The field *Unit class* determines whether a context, group, or work area is created. The appearance of the context box in the Harris diagram can be controlled by the colour button to the right of the *Unit name* field and with the drop down field *Border style*. As an alternative, it is possible to use thematic box styles for Harris diagram display.

The other fields in the unit entry form are not mandatory. You can even make some or all of them invisible if you do not want to enter any data in these fields.

### Entering relationships for the new unit

Activate the *Relations* sheet in order to enter the relationships. The relationships belong to one of three categories:

- **Earlier than:** The current context is earlier than the contexts in the list, i.e. these contexts appear above the current context in the Harris diagram.
- **Other relations:** List of contexts that are contemporary with or equal to the current context; list of work areas or groups to which the unit belongs ("part of" relationships)
- **Later than:** The current context is later than the contexts in the list, i.e. these contexts appear below the current context in the Harris diagram.

You enter a new relationship by pressing the *Add* button to the right of the appropriate relationship list. It is obligatory to enter *excavation* and *unit name* before adding a relationship. With the *Add* buttons the relationship entry form is shown, the *Relation Category* field is set to the "earlier than" or "later than" symbol or left blank depending on the position of the *Add* button.

### Checks before saving a new unit

- *Stratify* checks that both the *excavation* and the *unit name* are entered. These two fields together must form a unique pair in the unit table.
- Additionally, the program tests all triples Min/Max/Center (for example the Z coordinates). If the maximum value is less than the minimum or the center is not within the interval defined by the minimum and maximum values, an appropriate error message will be issued.
- When entering a group or work area, any "later than", "earlier than", "contemporary with" and "equal to" relationships are rejected when saving the unit. A warning message appears whenever a relationship is rejected.

### Next Older / Next / OK / Cancel buttons

Press the *Next Older* button if you want to save the newly entered context and if the next context is older than (below) this new context. Then the unit entry form for the next context is shown and the "later than" relationship between the two contexts will be entered automatically. With the *Next* button, the current unit is saved and an empty unit entry form is shown. The *OK* button saves the current unit data and closes the unit entry form. With the *Cancel* button or

<Esc>, any entries in the active unit entry form are discarded, and the form is closed.

See also:

Unit editing functions

*Term list* button

**Other ways to create a new unit:**

- Copy an existing unit
- Split an existing unit
- Create several units with consecutive numbers
- Select units that form a new group or work area

Define units while entering a new relationship:

- Single relationships
- Chain-like relationships

## Excavation name

Several adjacent excavations may be analysed in one *Stratify* project. Both the excavation name and the unit name are combined to provide a unique identifier for each unit in the project. It is obligatory to enter a non-blank excavation name when creating a new project. An excavation name may consist of up to twelve alphanumeric characters with the exception of colons. Colons are used to separate excavation names and unit names in lists and messages. Each excavation must be given a unique name (or site code, see below).

If several excavations are present in one project, then it is often necessary that the context boxes in the final diagram display the excavation name as well as the unit name. As the excavation name consists of up to twelve characters it is recommended to use abbreviations rather than the full names in order to create a concise Harris diagram display. The term file allows the definition of an abbreviation for each excavation name.

*Stratify* uses the expression "excavation" rather than "site", for the archaeological site may be larger than the excavation or during an excavation two or more sites are recorded.

Groups and work areas must have an entry in the *excavation* field, though they may span several excavations.

See also:

- Set default excavation name

- Two or more excavations

- Adding another data set to the current project

## Unit name

Each unit must have a unique short identifier (alphanumeric, up to 8 characters). The maximum length of the names will determine the size of the context boxes in the Harris diagram layout, so that for a compact diagram short names with up to 4 or 5 characters are recommended. Entries are case-sensitive, i.e. 243a and 243A are considered to be two different names. The following characters must not be part of a unit name: comma, equal sign, blank, colon.

If the unit names are consecutive numbers, *Stratify* can generate the names automatically (*Units | Consecutive Numbers*). The user may choose variable length names (example: 1, 2, ..., 100) or fixed length names (example: 001, 002, ..., 100). Also, names consisting of a prefix and consecutive numbers may be created automatically (example: B001, B002, ..., B100).

### Examples for unit names:

Sand-11, 276a, 210/211, A27, Q2Y, BOTTOM, TOP#1, <Middle>

F0001, F0002,..., F0647, Str001, Str002,..., Str123, Skel1, Skel2, Skel3,..

When combining the results of two excavations, however, several unit names may occur twice. Therefore, *Stratify* allows you to store the excavation name as well as the unit name, which are combined to provide a unique unit identifier in the project.

Roskams (2001, pp. 113-114) discusses the advantages and disadvantages of various numbering systems.

## Unit entry: other fields

The example term file (SampleTerms on the sample directory) shows typical entries for most of the text fields. In a term file each term may be explained and defined. This is especially important when qualitative terms like "good", "poor", or "clear" are used.

### Unit type

The unit type is an initial interpretation of the context. Typical entries for contexts are:

- Deposits: natural stratum, pit fill, grave fill, occupation debris
- Interfaces: pit, posthole, stake hole, ditch, trench, grave, well
- Non-deposits: wall, timber, skeleton, coffin

Work areas and groups have different unit types. Typical entries are:

- Work areas: section, top plan
- Groups: house, surface

### Colour

"The colour of each stratigraphic unit has to be described using a defined language which is both diverse enough to be sensitive to individual characteristics, yet sufficiently constrained to enable useful comparative analysis later on" (Roskams 2001, p. 175). The problems in describing colour may be overcome in the near future with the availability of electronic colour recording devices.

### Description

In this field, all characteristic attributes of the context may be recorded which do not fit in any other field. These attributes include particle size (silt, clay, sand proportions) and compaction or consistency of deposits (loose, friable, firm, compact, rigid) (see Roskams 2001, pp. 177-180). This field may also contain some information about the changes in thickness of the deposit or describe undulations of the surface.

### Inclusions

In the field *Inclusions* cultural as well as natural materials should be recorded that occupy less than 10% by volume of the deposit. What is considered an inclusion does not depend on size, but only on proportion. Not only the material of the inclusion but also the proportion and size should be recorded (see Roskams 2001, pp. 180-181). Typical entries are: frequent medium and small fragments of bone; occasional medium and small fragments of leather (see Spence 1993, p. 39). Inclusions play an important role when searching for correlations (i.e. "equal to" relationships) between contexts (see Roskams 2000, p. 87).

### Visibility

Use this field to describe how clearly the context boundaries could be defined. Typical entries in this field are: clear, compacted, laminate, poor, truncation, uneven (see Adams 2000, p. 98).

### Excavation method

In this field you may enter the excavation tool. Typical entries are: trowel, shovel, JCB. This information is useful if you want to assess the quality of the context record.

### Conditions

The *conditions* field should give some information about the reliability and the quality of the observations recorded. So rather than employing terms like "good" or "poor", you should note when there are difficult ground conditions (too dry, too wet, too cold), if there was too little time to do justice to the quality or complexity of the context and so on (see Adams 2000, p. 99).

### Formation Process

In this field you should indicate the duration of the context formation process and any evidence of disturbances. Typical entries are: single episode, accumulated, water logging, animal activity, floral activity, wind-derived, refuse (see Adams 2000, pp. 98-99).

### Interpretation

Your personal interpretation of the unit can be entered in this field. Please discuss how you came to these conclusions, this information is often very valuable during post-excavation analysis.

A typical entry is: A dumped deposit (probably refuse). Large quantity of pottery and bone plus other material, and well sorted nature suggest it is a dump of refuse material. (see Spence 1993, p. 39)

### Location

The field *location* may store the area, section, or grid square of the excavation where the unit is located. If a hierarchy of work areas was defined for the excavation (i.e. area A and area B, area A is subdivided into grid squares A00, A01, A02..., A10,...) then it may be useful to define work areas in the unit table instead.

### Coordinates

The coordinates are useful for projection layout and for checking that the heights of the contexts are consistent with the "later than" or "earlier than" relationships. *Stratify* does not support a full 3D recording of the context, but you may record the smallest box which contains the context by specifying the minimum (Min.) and maximum (Max.) value of each coordinate. Normally, the X-coordinate increases when you move to the East, the Y-coordinate is incremented when moving to the North, the Z-coordinate corresponds to the height of the point considered. For projection layout and plausibility checks, only the center coordinates are considered. You may calculate the center coordinates by computing the midpoint of the interval defined by *Min. coordinate* and *max. coordinate* (i.e.  $0.5 * (\text{mincoord} + \text{maxcoord})$ ). But this point is not necessarily the true center of the context, it may even lie outside (especially with interfaces). Therefore it is possible to choose any center point within the limits of the Min. and Max. values.

Coordinates may be entered in metres, inches, or any other unit of measurement. Please ensure that the unit of measurement selected is used throughout the whole recording process. For recording you may use either a local grid or earth projection coordinates like UTM, Lambert, or Gauss Krüger. If you want to combine the data of several excavations, it is recommended to use one coordinate system for all excavations involved, preferably a projection of the earth.

As typing in numbers is not only tedious but also error-prone, it is advisable to import the coordinates from an EDM or GIS (not yet implemented).

### Drawings / Photos

In these fields you may list the numbers of the drawings or photographs showing the current unit. If *Stratify* detects a cycle or warns that a context is below an earlier context, you may find

out the error or reexamine the relationships by checking the drawings or photographs available for the contexts. In this situation it is useful if you can look up the drawing and photo numbers in the data base or even better, look at the digital photos or drawings directly.

You may use any format for the drawing, photo and sample numbers, and there are no rules for the character used to separate multiple entries (typically a comma or semicolon). With some care, it is difficult to search multiple entries in any field. For example, if you want to list all units that are depicted on a specific photograph, you can use the *Units | Search/Replace* menu option. This function gives reliable results only if no photo name is a substring of another photo name (i.e. the photos are named 0001, 0011, 0110 rather than 1, 11, 110).

If all the excavation photos are stored as picture files in one path, you may create a link to the photos so that these images are displayed after pressing the *Photos* button. Similarly, a link to the drawings will enable the *Drawings* button to show the drawing image files.

### **Samples**

Enter the numbers of the samples taken from this unit. Samples may help to date a deposit or to correlate two contexts. A full documentation of a context should include the sample numbers. As described above for the list of drawings or photos, the choice of the separating character is up to you, but multiple entries cannot be searched properly. For this reason, it is not possible to check if a sample number was used twice.

### **Period / Phase**

*Stratify* provides two fields for entering dating information. One of the fields may be used to record preliminary dating information, the other may store the post-excavation interpretation which takes the finds analysis into account. The limits of phases or periods may be indicated by horizontal lines across the full width of the Harris diagram (see check and display phases or periods).

### **Year (Min. / Max. / Center)**

The *min. year* field stores the approximate beginning year of the unit, the *max. year* field the end of the unit. Often it is easier to work with a single date value, for example when colouring the background of the context boxes based on chronology (see thematic box styles). Therefore, it is useful to enter the center year of the units as well. You may calculate the center year by computing the midpoint of the interval defined by *min. year* and *max. year* (i.e.  $0.5 * (\text{minyear} + \text{maxyear})$ ). But it is recommended to account somewhat for the skewness of the underlying distribution: For example, if most artifacts date from the second half of the period, the center should be moved somewhat towards the second half.

If you want to work with BC dates, then the years have to be entered as negative numbers.

When you save the data record, *Stratify* will check that the *min. year* value will be below the *max. year*. In addition, the *center year* must be within the interval defined by *min. year* and *max. year*. If these conditions are not fulfilled, the program will issue an error message and will not save the data record.

### **Source of Dating**

The *source of dating* helps to assess the reliability of the entries in the period or phase fields.

### **Excavation date**

*Stratify* expects you to enter the excavation date in the standard short date format preset in your operating system. With the <F6> function key you may enter the current date. An alternative is

to right-click on the field in order to open a short menu, then select *Today* from the menu.

### **Excavator**

Enter the name of the archaeologist responsible for documenting the context. As it is tedious to enter the same name over and over again, the following short-cuts may be of use:

- Copy the name from the previous entry by pressing the <F5> function key in the *excavator* field.
- Define the excavator's name in the term table and choose an appropriate abbreviation, for example the initials. After typing in the initials and moving the cursor to another field, the abbreviation will be replaced by the full name automatically.
- If the contexts are labeled by consecutive numbers, you may create a model context first with all the data which remain constant for a certain range of context numbers (including the excavator) and create the contexts using this model unit.

### **Find Category**

The find category may be recorded to give an indication of how reliably the finds date the context. Typical entries are: No finds retrieved, primary refuse, secondary refuse, residual material (see Adams 2000, p. 99).

## Border style

Context and group boxes may be drawn with different border styles. Border styles refer to either line styles or shapes. The following line styles are available:



Solid is the default border style.

Currently, the following shapes are supported:



It is not recommended to use shapes for group boxes, except for "rounded rect".

With context boxes the equal signs between two shapes may be too short, because the length of the equal signs is calculated for the standard rectangle shape only.

## Edit an existing context, group, or work area

Units | Edit

To edit an existing context, group, or work area double-click the appropriate row in the unit list. Alternatively, you may click on the row and select *Units | Edit* from the main menu or press the corresponding toolbar button. Then the unit entry form appears showing the data entered for the currently selected unit. You may change and add data as described for unit entry.

### Arrow buttons

At the bottom of the form four arrow buttons are displayed. Using these buttons you can move to the first, the previous, the next and the last unit in this unit table. This allows you to easily correct consecutive units. The arrows become inactive, if the unit name or the excavation is changed, because then the unit moves to another position in the unit table.

### OK / Cancel buttons

The *OK* button first checks the unit data (as with unit entry), then saves the current unit data changes and closes the unit entry form. With the *Cancel* button or <Esc>, any changes in the active unit entry form are discarded, and the form is closed.

See also:

- Unit editing functions
- Delete a unit
- Split an existing unit
- Create a new relationship
- Delete a relationship

## Unit editing functions

There are buttons for the clipboard functions *copy*, *cut*, and *paste* in the lower left area of the form. Alternatively, these functions can be called by right-clicking a data field. The menu which is displayed after right-clicking a field also offers possibilities for selecting the content of a field and for deleting the field entry as well as an *undo* function.

### Copy the previous entry

In any data field you may copy the previous entry in this field by pressing <F5> or selecting *Copy Previous* from the menu which appears after right-clicking the field. Whenever the unit entry form data is saved, the list of previous entries is updated. This applies for both new and updated units.

### Term lookup

If a term file is present, you may look up and select a term in a text field: Click in the field you want to fill with a term. Then choose the *Term list* button, press <F4> or select *Term lookup* from the menu which appears after right-clicking the field. The list of terms available for the current field is then displayed. Choose the term by double-clicking the appropriate row of the list or by using the menu option *Select*. The term will be copied automatically to the active field in the unit entry form. Any previous entries will be replaced. Alternatively, you may close the term list without choosing a term by selecting *Exit* from the term list menu.

If the *phase* or *period* field is filled this way and year dates are present in the term file, these dates are also copied if the current unit entry form contains no date values.

If you want to define a term as you go along, select *New* from the term list menu. In this situation, the *target field* is fixed. Furthermore, you may change the term data visible in the term list by selecting the *Change* menu item.

When entering an abbreviation defined in the term file, *Stratify* will replace the abbreviation with the full term on leaving the field.

If you want to ensure that only a restricted set of terms is used in a specific field, you should set the *Terms only* option in the field configuration dialogue.

## Delete one or several units

### Units | Delete

If you want to erase a unit, first select the appropriate row in the unit list by clicking in the row (or click on the unit name in the group hierarchy display). Then select *Units | Delete* from the main menu (or the corresponding toolbar button) and confirm the deletion. When a unit is erased, all relationships referring to this unit are deleted at the same time.

You may delete multiple units by selecting several rows in the unit list: Hold the <Ctrl> key down while clicking on the second unit and any other unit you want to erase.

*Stratify* asks you to confirm the deletion of units to avoid that a lot of information is lost by mistake.

## Copy a unit

### Units | Copy

If you want to copy a unit, first click on the appropriate unit in the unit list or the group hierarchy. Then select *Units | Copy* from the main menu. The unit entry form appears with the data of the unit selected. Modify the data according to your wishes and save the new unit with the *OK* button. You must change the *unit name* before saving the new unit because the unit name has to be unique.

With the *copy* function, only the unit data is copied, but no relationships. If you want to copy the relationships as well, use the *split* function.

## Create units with consecutive numbers

### Units | Consecutive numbers

You may want to create a large number of units in one step rather than typing in a list of consecutive numbers and other repetitive data. If some of the data fields are the same for all units to be generated, create a new model unit first using the *Units | New* menu item. Fill all the data fields which do not vary within the set of units to be created and save the model unit. Typical examples for such data fields are *Location*, *Excavation Method*, *Conditions*, and *Excavator*.

After creating the model unit, or if you do not want to duplicate data from a model unit, select *Units | Consecutive numbers* from the main menu. It is possible to use this option several times, for example, if two excavation teams were involved, one starting their numbering at 1, the other starting at 1001, you may want to define contexts with numbers in the range 1..647 and in the range 1001..1430. Later on, you may wish to create groups G001 to G107 or work areas W0001 to W0063.

In order to create units with consecutive numbers enter the first and the last unit number and other options in the control form that appears after selecting *Units | Consecutive numbers* from the main menu.

## Parameters for the creation of units with consecutive numbers

### Excavation

All units to be created must belong to one excavation. The default excavation name is entered automatically. You may overwrite the excavation name if you choose to work with two or more excavations. It is obligatory to fill this edit box.

If a term file is present, you may look up and select an excavation defined in this file: Right-click the excavation edit box, and the list of excavation terms available is then displayed. Choose the term by double-clicking the appropriate row of the list or by using the menu option *Select*. Alternatively, you may close the term list without choosing a term by selecting *Exit* from the term list menu.

When entering an abbreviation defined in the term file, *Stratify* will replace the abbreviation with the full excavation term on leaving the edit box.

### First / Last unit number

If you want to create unit names F1001 to F1430, set the first unit number to 1001 and the last unit number to 1430. In order to generate the names 0001 to 0647, enter 1 in the *First unit number* edit box and 647 in the *Last unit number* edit box. It is obligatory to enter a value in both edit boxes because these entries provide the basis for the automatic creation of units with consecutive numbers. The first unit number must be smaller than the last number.

### Prefix

You may choose a prefix with up to four characters for the unit names. Then the unit name consists of the prefix and the unit number. For example, if you choose the prefix is F, units F1, F2 and so on are created (if the first unit number is 1 and variable format names are selected). The prefix and the number of digits together must not exceed the maximum unit name length of 8.

### Unit class

You may use the consecutive numbers method in order to create contexts, groups, or work areas.

### Number of digits

*Stratify* may generate fixed format or variable format names:

#### Example:

fixed format:        0001, 0002, ..., 0010, ....., 0100, ...,0647  
                          F001, F002, .., F647

variable format:    1, 2, ..., 10, ....., 100, ..., 647  
                          F1, F2, .., F647

The default are variable format names, i.e. the *Number of digits* is set to 0. A disadvantage of variable format names is that they are not displayed according to increasing numbers in the unit list, but they are ordered alphabetically. For example, if F1 to F200 are created, they will appear in the unit list in the following sequence: F1, F10, F100, F101,..., F109, F11, F110,...

If you want to create fixed format names, choose the number of digits accordingly. When confirming the settings with the *OK* button, the number of digits is checked: this number must be equal to or exceed the number of digits required for the last unit number. So if the last unit number is 647, *Stratify* will accept the following entries for the *Number of digits*: 0, 3, 4, 5, 6, 7, 8. The *Number of digits* must not exceed 8 because this is the maximum length of a unit name.

Note that the prefix length is taken into account in the unit name length calculation, i.e. if the prefix "Pit" is used and the last unit number is 647, then legal values for the number of digits are: 0, 3, 4, 5.

### Name of model unit

A model unit may be used to duplicate some of the data fields that are the same for all units to be generated. If you want to use a model unit, make sure that the model unit is created before starting the consecutive numbers dialogue. You get an error message if you enter the name of a unit which has not yet been entered. The model unit must belong to the same excavation as the units to be created. Additionally, the unit class of model unit and new units have to be identical, for example only a group may be a model for new groups.

### Create chain-like relationships

When creating contexts, you may automatically add chain-like relationships. Then the first context will be later than the second, the second later than the third, and so on. It is not possible to create chain-like relationships for groups or work areas.

When pressing the *OK* button, *Stratify* checks that all the entries in the form are valid. For each unit to be created it is checked first if the unit name is already present in the unit table. If so, the existing unit is retained unchanged, and a warning message at the end of the unit creation process informs about the number of units not superseded.

See also:

    Create chain-like relationships

## Search and replace

### Units | Search/Replace

You may wish to replace certain field entries by a new value. For example, if there is a spelling mistake in the excavator's name and this name was copied for many units, this menu option is useful. Another example is the possibility to search and replace within the *phase* field, so that all "Phase 4" could be renamed "Phase 5" if one suddenly realises that there is an extra phase to slot in before it (suggestion by Andrew Wilson, Institute of Archaeology, Oxford).

With this menu option, a list of all the fields in the unit table (with the exception of *excavation*, *unit name*, and *unit class*) will be shown. Choose the field for which you want to replace a field entry and confirm by clicking on the *OK*-button. You may set replace field entries in text, number, and date fields. *Stratify* displays a dialogue box that prompts you for a search string and the optional replace string. On starting the find or replace operation, it is checked that the entries in the search and replace boxes are of the appropriate field type (i.e. text, number, or date) and that they do not exceed the maximum field length. With text fields, you can choose the *Match Case* option to ensure that the case of the searched string and the string found agree.

See also:

- Set default field entries

## Set default values for field entries

### Units | Set default

You may wish to replace blank field entries by a default value. For example, if the excavator of all the units is James Bond, you can enter all the unit data first and leave the field *excavator* empty. But later, you may fill the field *excavator* for all units using the *Units | Set default* menu option. This technique is also useful if there are some contexts with different excavators. Then you may enter the name of the excavator for these exceptional contexts only and fill in the name of the main excavator later for all other units.

In addition, this feature may help you to define phases or periods. As phase or period layout requires that all contexts belong to a phase or period, it may be helpful to first assign all contexts to a "blank" phase and then start at the bottom to create "phase 1", "phase 2" and so on (suggestion by Andrew Wilson, Institute of Archaeology, Oxford).

You may set the default value for text, number, and date fields. On selecting *Set default* from the *Units* menu, a list of all the fields in the unit table (with the exception of *excavation*, *unit name*, and *unit class*) will be shown. Choose the field for which you want to set the default value and confirm by clicking the *OK*-button. After that, *Stratify* prompts for the default value. When the default value is appropriate, all the blank entries are replaced by the default value (after your confirmation).

It is checked that the default value is of the appropriate field type (i.e. text, number, or date) and that it does not exceed the maximum field length. When the option *Terms only* was selected for a text field, only terms defined in the term table are accepted.

Note that this feature does change all blank field entries, irrespective of any filters.

See also:

- Use of a model unit when creating units with consecutive numbers
- Search and replace

## Blank field

### Units | Blank field

You may wish to replace entries in a specific field by a blank value. This function is useful, if you want to create a new system of phases and to delete all entries in the phase field. It may also be necessary to delete the results of monotone regression in the *Mean year* field in order to start a different run of monotone regression, and for this purpose this function can be used.

You may blank the values of text, number, and date fields. On selecting *Blank field* from the *Units* menu, a list of all the fields in the unit table (with the exception of *excavation*, *unit name*, and *unit class*) will be shown. Choose the field which you want to set blank and confirm by clicking the *OK*-button.

Note that this function changes all field entries of the field selected, irrespective of any filters.

See also:

- Set default field entries
- Search and replace

## Split a unit

### Units | Split

With contexts, the splitting operation is the same as copying, except that the relationships are copied as well. With groups or work areas, you are asked to redistribute the group or work area members which belong to the source unit.

To start the splitting operation, click on the appropriate unit in the unit list or the group hierarchy. Afterwards, select *Units | Split* from the main menu. The unit entry form appears with the data of the unit selected. Modify the data according to your wishes and save the new unit with the *OK* button. You must change the *unit name* before saving the new unit because the *unit name* has to be unique.

### Splitting a context

When splitting a context with equal relationships, an equal relationship will be established between the new context and the source context. Similarly, a contemporary relationship is created if the source context has contemporary relationships. As two contexts may only have one relationship, i.e. they are not allowed to be both contemporary and equal, it is not possible to split a context that has contemporary as well as equal relationships.

### Splitting a group or work area

When splitting a group or a work area, you are asked to reassign the "part of" relationships, i.e. to decide for each member of the source group or work area if it belongs to the source unit or the newly created unit. First, *Stratify* will display a form with two lists side by side. The first list shows those units which are part of the source unit, while the second list contains the contexts that are part of the new unit. Each unit may be only in one of the lists. Initially, all units are shown in the first list. If you want to move a unit to the second list, select the unit and click on the > button. The < button undoes this move. With the >> button, all units are moved from the first to the second list, the << button moves all units from the right-hand list to the left-hand list. Distribute the units using these buttons until the member lists for both the source unit and the new unit are correct, then confirm the dialogue with *OK*. With the *Cancel* button all members are still part of the source unit, but the new unit is not deleted.

You may undo a splitting operation by merging.

See also:

Copy a unit

Merge two or more units

## Merging two or more units

### Units | Merge

Two or more contexts can be merged so that one new context results which has all the relationships of the source contexts. Similarly, you may merge groups or work areas: The resulting group (or work area) will contain all the units which were part of the source groups (or work areas).

Choose the units to be merged by selecting several rows in the unit list: Hold the <Ctrl> key down while clicking on the second unit and any other unit you want to merge. Then select *Units / Merge* from the main menu. *Stratify* will move all relationships to the first unit selected, the other units will be deleted. The program will then issue a message indicating the name of the unit which is the result of merging.

*Stratify* is not able to merge units belonging to different unit classes.

You can undo the merging operation by splitting the unit created by merging. However, to ensure that the relationships are the same as before merging, some manual work is necessary. Furthermore, unit data information may be lost by merging. Therefore, you are asked to confirm the merging operation before starting it.

If you happen to merge two contexts 4 and 5, with 4 earlier than 3 and 5 later than 3, only one of these relationships will be retained, since a context cannot be both earlier than and later than another context. *Stratify* chooses the relationship retained at random.

Merging is only available in the *Show unit list* mode because the group hierarchy display does not allow the selection of multiple units.

## Create groups or work areas by combining units

### Units | Combine

The standard procedure to define a group or work area is as follows: You create a new group or work area by selecting *Units | New* from the main menu. For each member of the new group or work area you enter the "part of" relationship in the unit entry form or by selecting *Relations | Add* from the main menu.

However, if the member units of the new group or work area have already been defined, the following procedure may be a lot faster, especially where a group or work area has many members: Select the rows in the unit list corresponding to the members of the new unit or work area: Hold the <Ctrl> key down while clicking on the second unit and any other member unit. Afterwards, select *Units | Combine* from the main menu. The unit entry form for the new group or work area is opened. The default unit class entry is "group", but may be changed to "work area". When saving the new unit successfully using the *OK* button, all the selected member units are automatically part of the new unit.

### Checks:

- You must select at least two groups or contexts before starting the combination procedure.
- A context or group may belong to one group only. So if some of the contexts or units selected for membership in the new group are already part of another group, these relationships are not replaced. Instead, *Stratify* will show a list of those units, which were not included in the new group.
- A work area must not belong to a group or another work area. Therefore an error message is issued if you try to start the combination procedure after selecting one or several work areas.
- *Combine* can only be performed for units of the same unit class, i.e. either contexts or groups.

## Count all or selected units

### Units | Count

On opening an existing project file *Stratify* displays the number of units in the unit table in the status line at the bottom of the main form. But you may be interested in the number of units after you did some changes in the project. By selecting *Units | Count* from the main menu, you are informed about the current number of units in the unit table.

If you want to know how many contexts are in the unit table, first set the appropriate filter condition. On selecting *Units | Count* from the main menu, *Stratify* shows the total number of contexts. With other filter conditions, you may for example count how many postholes are defined in the project, how many contexts belong to a certain group, how many contexts are in the z-coordinate range 65m to 65.5m and so on.

See also:

Filtering unit data

## Find a unit in the list

### Units | Find unit

The unit list is ordered alphabetically by excavation name. The names of units belonging to one excavation are in alphabetical order. So you may find a unit by browsing through the unit list until that unit becomes visible.

An alternative and often faster method is to use the *Find* button  in the toolbar or the *Units | Find unit* menu item. *Stratify* prompts for the unit name and positions the cursor on that unit if it is found in the list.

If the project consists of two or more excavations (see menu item *Configure | Configure fields*, group box *Project composition*) you may enter the excavation name and the unit name, separated by a colon (no blanks), for example "MyDig:Unit06". If the unit name is unique or if you want to find the first occurrence of a unit name, then it suffices to enter the unit name only. *Stratify* is able to find units if only the first few characters are entered. So if "Unit06" is not found, then *Stratify* searches for any unit name starting with "Unit06", for example "Unit061". In case a matching unit name is found, *Stratify* positions the cursor on the appropriate row in the list, otherwise it will issue a beep.

The *Find* button works in a similar way when the group hierarchy is displayed instead of the unit list (see menu item *Configure | Show group hierarchy*).

## Print a list of units

File | Print

You may print a list of units or the group hierarchy. Two standard report formats are available: short and long report. With the short report, one line per unit is printed, showing the entries in the *excavation*, *unit name*, *unit type*, *period*, and *description* fields. The long report creates one sheet of paper for each unit, listing all fields in the unit table as well as the relationships.

If the group hierarchy is displayed, a group hierarchy report is available as well. This report prints the group hierarchy without any additional niceties.

In the print configuration dialogue, you may enter the title of the report.

The layout of the short and long reports is designed for A4 paper size and portrait paper orientation. It may be necessary to set up your printer accordingly via the *Printer setup* button.

Using the *Preview* button, you may preview both the short and the long report before printing , but there is no preview available for the group hierarchy report.

When printing the data set, any filtering condition remains active, i.e. only those units currently displayed in the unit list will be printed.

Printing of the Harris diagram is only possible after the layout was created using *Diagram / Layout and check*.

see also:

HTML report

## HTML reports

File | HTML report

You may configure your own HTML report. HTML reports can be printed by any web browser or you may open the HTML file with your word processor, modify and print it. Two report variants are supported: Table and form. Select the variant by choosing the appropriate option of the report selection radio group.

In the HTML report configuration dialogue *Stratify* will show a table listing all the fields in the unit table. In the **Table report** column an X indicates that the corresponding field is shown in the table report, whereas an X in the **Form report** column means that the corresponding field is shown in the form report. To change the selection status of a field, double-click the appropriate cell in the table. Alternatively, you may type in the character "x" or delete an X by pressing the backspace key. The **Smart field selection** button automatically selects all non-blank fields for the report variant chosen, with the exception of those fields where all entries are identical. The difference between the smart field selection for tables and form reports is that relations are included by default in the form report field list.

Both report variants consist of a header section and a table. The header section starts with the title naming the report variant and the project name. When creating a HTML report, any filtering condition remains active, i.e. only those units currently displayed in the unit list will be printed. If a filtering condition is active, a short text describing this condition will be included in the header section. With *smart field selection*, a list of fields with identical field entries for all units is part of the header section. If you deactivate the unit name selection for the report, *Stratify* will ask you for confirmation. Normally, the unique unit identifier should be part of every report.

On selecting to include **relations** in the HTML report, all relationships of one unit will be listed in one cell of the table. The sort of relationship will be indicated by the appropriate relationship symbol. For each relationship, a new line is created.

### The form report

The main part of the form report is a table consisting of two columns: The first column contains the field name, the second column the field value. The field lists of two consecutive units are separated by an empty row. With a form report, you may choose to **include blank fields in the form** so that the number of rows created for each unit is the same. When deactivating this option, a row is included for non-blank fields only, so that the length of the field list, i.e. the number of rows, varies depending on the unit.

If the fields *excavation* and *unit name* are chosen for form report, the two identifiers will be combined in the form report in the field *unit name*, separated by a colon.

### The table report

The table report consists of a table whose number of columns depends on the number of fields selected in the HTML report configuration dialogue. For a table report, only a few fields should be selected, but *Stratify* does not prevent you from choosing all fields for a table report.

The **bold unit names** option is active for both table and form report. After creating the report, *Stratify* allows you to open the report with your standard web browser.

see also:

Print a list of units

## Relationships

*Stratify* supports “earlier than”, “later than”, “contemporary” and “equal” relationships as defined in the concepts section. These relationships are for contexts only, not for groups or work areas. Each relationship category is designated by a symbol.

Symbol	Explanation
>	later than
<	earlier than
=	equal to
-	contemporary with
p	part of

### "Part of"

In addition to the time relationships, a “part of” relationship is introduced. Each stratigraphic unit may be part of one and only one group, which may be part of another group, and so on. In addition, a context may belong to one or several work areas.

### Opposite and transitive relationships

If the user enters the relationship that context 1 is later than 2, *Stratify* automatically establishes the opposite relationship that 2 is earlier than 1. Similarly, if 1 and 2 are already set contemporary and the user sets 3 contemporary with 2, then *Stratify* knows that 1 and 3 are contemporary (because the contemporary relation is transitive). The equal relation, is also transitive, and *Stratify* therefore inserts additional equal relationships where necessary. But there is no opposite relationship to a "part of" relationship in the relationship table. If you want to see a list of members of a group or work area, use *Filter | Part of current unit*.

### Relationship comment

*Stratify* allows you to comment each relationship so that the reliability of the relationship or the physical relationship may be documented. This comment field may also be used to give reasons for contemporary relationships. You may define terms to be used in the comment field as well as opposite terms, which are entered automatically in the comment field of the opposite relationship.

## Create a new relationship

Relations | Add

If you want to enter a new relationship, first select a row in the unit list corresponding to one of the units involved in the relationship. Then select *Relations | Add* from the main menu or the corresponding toolbar button. The relationship entry form will appear on the screen.

### Checks before opening the relationship entry form

- At least one unit must be defined before entering the first relationship.
- A work area must not have any relationships except that contexts or groups may be part of a work area. Therefore, the selected unit must not belong to the class work area.
- A group may be part of not more than one group, and other relationships are not admitted for groups. So if you select a group that has a "part of" relationship already, the relationship entry form will not appear, but an appropriate message will be displayed.
- As "part of" relationships are the only legal relationships for groups, *Stratify* will fill in the appropriate symbol in the *Relationship Category* field if you choose to enter a relationship for a group.

### The relationship entry form

In the relationship entry form the excavation and the unit name of the first unit of the relationship will be filled in automatically, i.e. the data of the unit selected in the unit list is entered. It is not possible to change these two entries. But it is mandatory to enter the excavation and the unit name of the second unit of the relationship. *Stratify* enters the excavation name automatically by copying the excavation from the first unit. You may overwrite the excavation name if you choose to work with two or more excavations. When working with a term file, you can look up the terms defined for the *excavation* field by pressing the <F4> function key or selecting *Term lookup* from the menu that appears after right-clicking the field. If the second unit of the relationship has not been defined before, this can be done when saving the relationship using the *OK* or *Next* button. The class of this newly defined unit depends on the *Relationship Category*. When entering a "part of" relationship, the new unit will be a group, in all other cases a context is created.

The *Relationship Category* is designated by a symbol. If you type in a character that is not defined in the symbol list, the list of symbols and their explanations will be displayed, allowing you to select a symbol from this list by simply clicking on the appropriate row of the symbol list and confirming this choice with the *OK* button (alternative: double-click on the row). If the relationship entry form was opened by pressing one of the *Add* buttons in the unit entry form, then the *Relationship Category* is filled with the appropriate symbol when the *Add* button next to the "Earlier than" or "Later than" relationship list is chosen, with the *Add* button next to the "Other relations" list, only "equal to", "contemporary with", or "part of" relationships can be entered.

In the *relationship comment* field you may look up terms as well.

### Checks before saving a new relationship

- *Stratify* checks that both the *excavation* and the *unit name* of the second unit are entered.
- An entry in the field *Relation Category* is obligatory, too.
- The first and the second unit must not be identical.
- *Stratify* tests whether a relationship between the two units does already exist. If so, the new

relationship is not stored. If you want to change the relationship between two units, you must delete the relationship and enter another relationship.

- When entering "contemporary with" or "equal to" relationships it is checked whether the transitive relationships induced by this new relationship are valid.
- *Stratify* checks that the second unit of a "part of" relationship is a group or work area, rejecting all other entries. Furthermore, only units of class "context" may be the first or second unit of a "later than", "earlier than", "contemporary with" or "equal to" relationship. Relationships for work areas are not supported.
- A context or group may belong to not more than one group, and "part of" relationships to a second group will be rejected, therefore.
- If the second unit name has not been defined before, you may choose to define the unit. The unit class is assigned automatically: On entering a "part of" relationship a group is created, a unit of class context is created in all other cases.

When saving the new relationship, *Stratify* enters opposite and transitive relationships automatically.

### ***Next / OK / Cancel* buttons**

With the *Next* button, the current relationship is saved and a new relationship entry form is shown (with the first unit already entered as before). The *OK* button saves the current data and closes the relationship entry form. With the *Cancel* button all entries are discarded in the active relationship entry form and the form is closed.

See also:

Create chain-like relationships

Delete a relationship

Change the relationship comment

## Create chain-like relationships

### Relations | Chain

Select this menu item if you want to enter a chain of "later than" relationships, i.e. if the first context listed is later than the second, the second later than the third, and so on. If the contexts listed have not already been defined, *Stratify* offers you the option to create them.

For entering only a single "later than" relationship, select *Relations | Add* from the main menu.

In order to create chain-like relationships, select *Relations | Chain* or the corresponding toolbar button. The chain entry relationship form will be displayed.

### Chain entry relationship form

#### Excavation

All contexts in the chain must belong to one excavation. *Stratify* enters the default excavation name automatically. You may overwrite the excavation name if you choose to work with two or more excavations. It is obligatory to fill this edit box.

If a term file is present, you may look up and select an excavation defined in this file: Right-click the excavation edit box, and the list of excavation terms available is then displayed. Choose the term by double-clicking the appropriate row of the list or by using the menu option *Select*.

Alternatively, you may close the term list without choosing a term by selecting *Exit* from the term list menu.

When entering an abbreviation defined in the term file, *Stratify* will replace the abbreviation with the full excavation term on leaving the edit box.

#### List of contexts

Enter the contexts in the chain from the top (latest context) to the bottom (earliest context). Type in the name of the topmost context in the first row. Then use the <Tab> key or click with the mouse in order to move to the next row. When moving to another row, *Stratify* will check if the unit name has been defined in the unit table. The result of this check will be displayed in the grey cell at the beginning of the row: Either the unit is undefined, or the unit class is shown.

Initially, the list contains only four empty rows. If you enter <Tab> in the fourth row, another row will be added, i.e. you may add to the list as many rows as you need. Alternatively, you may use the <Ins> key.

When pressing the *OK* button, *Stratify* checks that all the entries in the form are valid:

- Empty rows in the list of contexts are ignored.
- Only contexts and undefined entries may be part of the context list.
- If the list contains undefined entries, *Stratify* asks you to confirm the creation of these units. But if the unit names are undefined because of typing errors, you should refuse this confirmation and correct these errors.
- Before creating a new relationship *Stratify* checks whether another relationship exists between the two consecutive contexts in the chain. If so, a warning message is issued and the chain relationship is not entered in the relationship table.

See also:

Create units with consecutive numbers

## Delete one or several relationships

Relations | Remove

If you want to erase a relationship, first select the appropriate row in the relationship list by clicking in the row. Then select *Relations | Remove* from the main menu (or the corresponding toolbar button) and confirm the deletion. If a "later than" relationship is erased, the opposite "earlier than" relationship is deleted at the same time (and vice versa).

You may delete multiple relationships by selecting several rows in the relationship list. Hold the <Ctrl> key down while clicking on the second relationship and any other relationship you want to erase.

### Erasing "contemporary with" or "equal to" relationships

When erasing a "contemporary with" relationship, some decisions must be taken should the two contexts have other contemporary relationships.

#### Example:

Suppose you established the relations: Contexts 1, 2, 3 and 4 are contemporary. You want to erase the relationship between 1 and 2. Thus, 3, 4 cannot be contemporary with both 1 and 2 any longer. Therefore, you are asked to decide whether 3 is contemporary with 1 or 2. The same decision is required for context 4.

*Stratify* will display two lists side by side. The first list shows those contexts which are contemporary with the first context, while the second list contains the contexts which are contemporary with the second context. Each context may be in one of the lists only after splitting the contemporary relation of the first and the second context. Initially, all contexts are shown in the first list. If you want to move a context to the second list, select the context and click on the > button. The < button undoes this move. With the >> button, all contexts are moved from the first to the second list, the << button moves all contexts from the right-hand list to the left-hand list. Distribute the contexts using these buttons until the two contemporary lists are correct, then confirm the dialogue with *OK*.

"Equal to" relationships are dealt with in a similar way.

When choosing several relationships for deletion, make sure that you select no "contemporary with" or "equal to" relationships. Exception: If the contemporary/equal group consists of two members only, i.e. there is no other context contemporary or equal to the two contexts forming the relationship. In order to delete contemporary or equal relationships involving three or more contexts, delete the relationships one by one.

Alternatively, you may delete a relationship in the unit entry form. But in this form you must not delete contemporary or equal relationships because this deletion process is more complex, as described above.

See also:

Delete a unit

## Change the relationship comment

Relations | Edit

If you want to change the *relationship comment*, double-click on the appropriate row in the relationship list. An alternative is to select *Relations | Edit* from the main menu after clicking on the relationship in the list. Then *Stratify* will display the relationship entry form. All data fields in this form are set to read-only, except for the *relationship comment*. If a term file is available, you may select a term from the list of terms. To activate the term list for relationship comments, press the <F4> function key or select *Term lookup* from the menu that appears upon right-clicking the field.

Confirm the change by pressing the *OK* button, or use the *Next* button to move to the next relationship in the list. If you do not want to confirm the changes in the form currently displayed, press the *Cancel* button or <Esc>.

## Test if two contexts are related

Relations | Test context pair

You may want to test, if there is a stratigraphic relation between stratum 1 and stratum 2. There are three possible answers to this question:

- stratum 1 is earlier than stratum 2
- stratum 1 is later than stratum 2
- There is no stratigraphic relationship between the two contexts.

In order to start the test, click on the first context (stratum 1) in the unit list. Then move to the second context and click on the appropriate list row while pressing the <Ctrl> key. Thus both units are marked. Select *Relations | Test context pair* from the menu.

The check takes not only equal but also contemporary relationships into account. If there is no stratigraphic relationship between both contexts, you will get a short message. Otherwise, the stratigraphic relationships between the two contexts will be listed, beginning with the later context and ending with the earlier context of the selected context pair. In the list, the second and all following lines will start with the relationship symbol indicating the relationship between the contexts listed in the current and the previous row. There may exist several ways from the later context down to the earlier one. *Stratify* will list the first way found, which is not necessarily the shortest connection.

When the group hierarchy is displayed, this menu item is inactive (greyed out) because it is not possible to select two contexts in the hierarchy.

See also:

- Concepts: Paths between two contexts
- What are stratigraphic relationships?

## Creating and maintaining a term file

### Configure | Terms

The term table allows you to store for each text field in the unit entry form a list of terms and their descriptions. Thus, the term table helps to avoid misspellings and may assist first-time users in choosing a term. A term table may in part replace the traditional recording manual used in some institutions, as it does not only store the terms, but also their definitions. The term file also plays a role when creating a thematic Harris diagram and for the display of Harris diagrams showing multiple excavations.

The use of a term file is optional. You may create a new term file or load an existing one when creating a new project. For an existing project, you may create or load a term file by selecting *Configure | Terms | Create or load term file* from the main menu. The reference to the term file will be stored in the project file so that it is reloaded when opening an existing project. It is a good idea to keep one basic term file and to copy this term file for each individual project, allowing you to define specific terms for the project. For example, you may want to create terms concerning the *location* or the *excavator* which are valid for one project only.

You may remove the reference to a term file by selecting *Configure | Terms | Remove link to term file*. Only the link to the term file will be removed, the term file will not be erased. This option is useful if the wrong term file was linked to a project. By removing the link and loading another term file, this problem can be fixed.

If a term file is present, *Configure | Terms | Show term list* or clicking on the corresponding toolbar button will display the term list window with a table showing all terms. The menu of this window offers you following options: close this window (exit), enter new terms, change existing terms, or delete terms. The term list is ordered alphabetically by target field. Where several terms are available for one target field, these are listed in alphabetical order.

If you want to proceed with the main *Stratify* window, you must close the term list window using the *Exit* menu item or the standard Windows functions for closing windows.

### See also:

- Entering new terms
- Changing existing terms
- Deleting existing terms
- Copying a term file
- Stratify* data base structure

## Entering new terms

Configure | Terms | Show term list | New

In the term list window, select the menu item *New* to create a new term. The term entry form will appear on the screen. First, you should select the **Target field**. A set of terms may be entered for any text field in the unit entry form (except for *Unit name* and *Unit class*), therefore all these text fields are in the *Target field* list. In addition, terms may be available for the *relationship comment*. When entering a new term while editing a unit, the *target field* is set to the current field in the unit entry form and cannot be changed by the user.

Then type in the new term in the **Term** field. The maximum length of this field corresponds to the maximum length of the target field in the unit entry form. An entry in this field is required before you can save the current term record. The **colour button** to the right of the *Term* field may be used to select the default thematic colour for this term. After choosing a colour, the *Term* field background colour will change accordingly.

An **Abbreviation** of up to four characters may speed up data entry. If you type in the abbreviation in the unit entry form and leave the field, *Stratify* will replace the abbreviation by its corresponding term, i.e. no data lookup is necessary in this case.

The definition and **Description** of a term improve the integrity and objectivity of the data set. For example, when entering the conditions of context recording, terms like "good", "fairly good", or "difficult" may only be interpreted or used in the same way by another archaeologist if they are explained properly.

You may select the default *Border style* for thematic box style assignments by choosing from the drop down list of styles.

The fields **Relation category** and **Opposite term** are only applicable for relationship comments. If physical relationships like "cuts" are to be stored in the relationship comments, the opposite relation (i.e. "is cut by") may be stored in the opposite term field. The *relation category* can be entered directly by typing in the symbol or by choosing a category from a lookup list. You may display the lookup list by right-clicking the *Relation category* field or by entering any non-symbol character in this field. The *Opposite term* may be the same as the original term. This is useful if you want to record the visibility of the layer separation in the *relationship comment* field. If the opposite term has not been defined yet, this will be done when saving the current term record.

The **year** fields are only relevant for period and phase terms. There are corresponding year fields in the unit data entry form. The year values may speed up unit data entry: If year values are available for a period or phase and this period/phase is selected from the term table, *Stratify* will check if the year fields in the unit entry form are still empty. If so, the year values are copied from the term list.

### **Next / OK / Cancel buttons**

If you press the *Cancel* button, all entries in the active term entry form are discarded and the form is closed. When pressing the *OK* or the *Next* button, *Stratify* will check the data entries first before saving the new data record:

- It is obligatory to fill the *Term* field.
- If the *Term* has already been defined for the *Target field* selected, the new term cannot be saved and an appropriate error message will appear.
- The *Abbreviation* must be unique for each target field.
- Any year entries will also be checked ensuring that the minimum value is less than the center value and the center value is less than the maximum entered.

- When entering a term for the *relationship comment* field: If an entry in the edit box *Opposite term* is present, the *Relation category* must be entered as well.

If the "save" operation was successful after the *OK* button was pressed, the term entry form will be closed and the list of terms will become the active window again. With the *Next* button, after saving a term, a new empty term entry form will be displayed, so that you can define another term.

See also:

Term editing functions

## Changing existing terms

Configure | Terms | Show term list | Change

In the term list window, click on the term you want to edit and select the menu item *Change* in order to modify an existing term data set. Alternatively, you may double-click the term in the list. Then the term entry form will appear showing the appropriate field entries. The fields are described in the "Entering new terms" section. When saving the changed term the same checks as for new terms are performed.

Note that changes in the term data base do not lead to automatic changes in the unit and relationship tables. For example, if you replace the term "post hole" by "posthole" in the term list, all the "post hole" entries in the unit table will remain unchanged. Similarly, alterations in the *opposite term* or the year intervals and centers corresponding to period or phase entries will not induce any automatic modification of entries in the relationship or unit data base. Moreover, a term file can be in use for several projects, i.e. it is possible that a term is not used in the current project but may be present in another one.

### Arrow speed buttons / *OK* / *Cancel*

If you press the *Cancel* button, all changes of the current term data set are discarded. To save the changes, press the *OK* button. You may directly move to the next, previous, first or last entry in the term table using the arrow buttons at the lower right-hand corner of the term entry form. This feature is only available if the term itself was not changed but only the other fields, because after a term change the data set automatically moves to a new position in the data base (which is ordered alphabetically by target field in the first place and by term in the second place). Before moving to another term entry, *Stratify* will check that the term data set is valid.

See also:

Term editing functions

## Term editing functions

There are buttons for the clipboard functions copy, cut, and paste in the lower left area of the form. Alternatively, these functions can be called by right-clicking a data field. The menu which is displayed after right-clicking a field also offers functions for selecting the contents of a field, for deleting the field entry, and an undo function.

## Deleting existing terms

Configure | Terms | Show term list | Delete

In the term list window, click on the term you want to delete and select the menu item *Delete* to delete a term from the term table. *Stratify* will check if this term was used in the data base. If so, *Stratify* will ask you to confirm the deletion, but even if deletion is approved, the unit and relation table entries will not be changed. A term that has not been used will be deleted without any further questions.

Note that a term file can be in use for several projects. Therefore it is possible that a term is not used in the current project but may be present in another one.

## Copying a term file

File | Save term file copy as

It is recommended to backup the term file you are working with at regular intervals. *Stratify* allows you to create a copy of the term file. After selecting *File | Save term file copy as* from the main menu, the standard dialogue box for creating a file is displayed, so that you may choose or create the directory of the new term file, and you can enter a file name. After copying, the original term table is still open and referenced by the current project.

It is a good idea to keep one basic term file and to copy this term file for each individual project, allowing you to define specific terms for the project. For example, you may want to create terms concerning the *location* or the *excavator* which are valid for one project only.

See also:

Backup or copy the project data

## Navigate through the relationships

### Diagram | Navigate

If you want to see a graphical display of a context and its immediate stratigraphic relationships, click on the appropriate entry in the unit table and then select *Diagram | Navigate* from the main menu (or the corresponding toolbar button).

The *Navigate* menu item displays the current context and its immediate stratigraphic relationships in a separate window.

Normally, the navigate view consists of three rows:

- I. The first row lists the contexts that are immediately later than the current context. A short vertical line at the top of a first row context box indicates that there is at least one context that is later than this context.
- II. The second row lists the current context as well as contemporary and equal contexts. Contemporary contexts are displayed on the left of the current context, equal contexts are shown on the right hand side. Boxes of equal contexts are connected with the equal sign.
- III. The third row lists all contexts that are immediately earlier than the current context. A short vertical line at the bottom of a third row context box indicates that there is at least one context that is earlier than this context.

Context boxes in the first or third row indicate contemporary or equal relations by a short single (contemporary) or double (equal) horizontal line.

Group and work area memberships are not shown in this display.

### Changing the focus

If you want to change the focus to another context, click on the appropriate context box in the navigate window. The selected context box will appear at the center of the navigate window.

### Editing context data in the navigate window

Double-click on a context box to open the unit entry form. In this entry form you may change the unit data as well as modify the relationships of the unit. After confirming the changes, the navigate window will update the display. Alternatively, select the *Edit* menu item from the navigate window menu to edit the current context, i.e. the context at the center of the display.

### Preferences

There are some options available to configure the context box display. These options may be selected using the *Preferences* menu item.

If you select a bigger *font*, you will create the impression of zooming into the display.

The navigate window will show the colours and borders of the context boxes as entered in the unit entry form. Another way to assign colours and border styles to context boxes is via *Units | Thematic Style* in the main menu of *Stratify*. If you want to show the thematic box styles rather than the individually assigned box styles, then select the *Thematic unit style* option from the *Preferences* menu.

Where units of several excavations are stored in one project, it may be useful to indicate the excavation for each unit. With the option *Excavation:name*, the full excavation name is shown in the context box, followed by a colon and the unit name. The option *Excavation abbreviation:name* allows for a more concise display of the context boxes. The abbreviation of the excavation may be entered in the term file. If the *abbreviation* field was left empty, the full excavation name is taken as a substitute.

If you want to proceed with the main *Stratify* window, you must close the navigate window using the *Exit* menu item or the standard Windows functions for closing windows.

Group and work area memberships are currently not displayed in the navigate window. With huge data sets (2000 units or more) it may take some time until the navigate window appears. Moreover, the display may react with delay when you set other preferences or navigate through the relationships.

## Estimate center year

Units | Estimate center year

Using this menu option, you may calculate new *center year* values for the contexts so that the dates are consistent with the stratigraphic relationships. This is done by monotone regression which assumes that the stratigraphic relations are correct, but that absolute dates which do not agree with the stratigraphic sequence have to be adjusted. The aim of the algorithm is to change the dates as little as possible but to ensure that no inconsistencies between the dates and the stratigraphic relationships exist. For details on monotone regression see the publication by Hansohm.

The algorithm will be carried out, if at least 5 or 5 per cent of the contexts are dated, i.e. both the *min.* and the *max year* fields are filled or the *center year* field is not blank. Stress calculation and monotone regression will proceed only if the data set does not include any cycles.

### Weight calculation selection

In most cases, only date intervals (*min.* and *max. year* values) will be present for some of the contexts. The date assigned by *Stratify* to each of these dated contexts is the center of the date interval. It is assumed that the reliability of the center year date calculated this way depends on the size of the date interval. For example, with radiocarbon dates, the size of the date interval is twice the standard deviation. A small standard deviation means that the probability that the true date is close to the center of the date interval is high. For monotone regression, the dates are weighted based on the date interval length. Two weight calculation methods are supported by *Stratify*: Either the inverse of the length of the date interval increased by 1 or the square root of this value.

Example: The minimum value of the date interval is 1200, the maximum value is 1299. Then the interval length is 99, the weight is either  $1/(99+1)=0.01$  or the square root of this value (0.1).

When only a *center year* value is given, the weight is 1 for both weight selection options. The method of weight calculation is recorded in the protocol file, if the detailed or summary report option was selected.

### Date combination selection

If contexts are set equal or contemporary, they are said to form a tie group. The dates of the contexts belonging to a tie group must be identical. Two ways of calculating the date of the contexts within a tie group are available:

- The tie group date is the weighted average of the interval centers, the weight of the tie group is the sum of the weights of the members.
- The method well-known for radiocarbon combination of dates is chosen.

The first variant fits in better with the concept of monotone regression whereas the second variant has a solid statistical basis for radiocarbon dates. In general, the weight of the date combination calculated by the first variant will be higher than that of the second variant.

The method of date combination is recorded in the protocol file, if the detailed or summary report option was selected. In addition, the summary report shows the total number of tie groups. The detailed report lists all tie groups, the tie group members, the number of dated contexts within each tie group, the center year assignment for this tie group as well as the date interval calculated on the basis of the date intervals of the members of the tie group. In addition, the detailed report will include warnings, if the date intervals of two contexts set equal or contemporary do not overlap or even worse, if the distance between the two dates exceeds twice the date interval sizes (this is called a gross error).

### **Calculate stress only**

A stress value of 0 indicates that the earlier-than relationships are consistent with the center year estimates. The larger the stress value, the larger the contradictions between the earlier-than relationships and the center year estimates. Each earlier-than relationship where the center year value of the earlier context exceeds the center year value of the later context contributes to the stress value. Therefore the stress value is a sum total of individual stress value contributions. The stress value contribution of a relationship depends not only on the difference in years between the two contexts involved but also on the weights of the two contexts. The lower the weights and the smaller the year differences the lower the contribution of a problematic relationship. When undated contexts are present, indirect relationships are considered to check all possible relationships between dated contexts.

Stress calculation requires that at least 5 contexts and 5 % of the contexts in the project are dated.

The total stress value as well as the sum total of year differences for problematic relationships is shown in the summary report. The detailed report lists each problematic relationship and the contribution of this relationship to the total stress value. It is recommended to double-check all relationships which make an exceptionally large contribution to the total stress value because gross errors may distort the results of the monotone regression.

When *Calculate stress only* is activated, the options *Calculate monotone regression*, *Estimate dates for contexts without dates*, and *Generate ... phases* are disabled.

### **Calculate monotone regression**

Monotone regression starts with the estimation of the tie group dates and weights, then the stress value. If the stress value is calculated. If the total stress value is 0, the number of absolute dates which are inconsistent with the stratigraphic sequence is 0. The core monotone regression algorithm is carried out only if center year dates have to be adjusted. The adjustment is done in such a way that the new dates are as close as possible to the initial center year values (in a least squares sense) but ensuring that the new dates are consistent with the stratigraphic sequence (i.e. the stress of the new date values is 0). Monotone regression is implemented as an iterative algorithm which decreases the stress value successively, the larger the number of iterations, the closer the iteration result is to the true solution. For this reason, a spiral was chosen as a symbol for the algorithm, as the spiral curve is progressively approaching the central point. The iterations stop if the stress value is below 0.01 and the sum of integer year differences is 0.

The results of monotone regression are stored in the *center year* field. The summary report shows the number of iterations and the stress value of the result, whereas the detailed report lists for each iteration the total stress value and the sum of integer year differences of the adjusted center year dates. After monotone regression is finished it is tested whether the new center year dates are within the min./max. year limits. The summary report indicates the number of contexts or tie groups respectively where the new center year dates are not within the initial year intervals. The detailed report lists all the contexts or tie groups with problematic new center year values and the min. or max. limit which is violated.

If before monotone regression is started the *center year* field entries are all blank, it is possible to undo the monotone regression by setting these entries to blank again.

### **Saving old center year values**

If *center year* values are present before monotone calculation is started, these values will be overwritten. Several options are available to save these values before they are overwritten, but

note that the number value can only be saved to a text field, and an undo function is not supported. For this reason, it is recommended to backup the project before starting monotone regression if for some contexts the *center year* fields are filled. When choosing to save the *center year* values to the *phase* or the *period* field, entries in the *phase* or *period* field will be overwritten without asking for confirmation. On saving the old *center year* values to the *description* field, the information concerning the old *center year* value will be added to the *description* field if it fits into the field, otherwise the description text will be cut short before adding the information without asking for confirmation.

### **Estimate dates for contexts without dates**

Monotone regression will calculate new dates for contexts with date intervals or center year values. Date estimation for undated contexts is optional and requires the total stress value to be 0. This means that in most cases it will be necessary to run monotone regression before starting date estimation for undated contexts. Even the monotone regression option is not active, date combination of equal and contemporary contexts will be calculated and the data set will be checked for cycles.

Undated contexts which belong to a dated tie group are assigned the combined date of this group. All other undated contexts belong to one out of three classes:

- 1 Contexts without any dated predecessor. These contexts are assigned the minimum date of all dates in the dataset.
- 2 Contexts without any dated successor. The dates of these contexts are set to the maximum date of all dates in the dataset.
- 3 Contexts with dated predecessors and dated successors. For these contexts the minimum date of the dated successors and the maximum date of the dated predecessors is determined. The undated contexts are assigned the average of these two dates.

Only if the undated contexts are in a chain of relationships, i.e. only one dated predecessor and one dated successor exist and all the contexts along the chain connecting the dated predecessor and the dated successor have exactly one earlier-than and one later-than relationship, then the dates are distributed regularly along the chain.

The summary report and the detailed report show the number of contexts (or tie groups) for which a center year value was estimated. The detailed report also displays the first and the last year of all the dated contexts.

### **Generate phases or periods**

The time line may be cut into several phases or periods, and based on the *center year* values, the contexts can be assigned to these phases or periods. The user selects whether the results of this procedure will be stored in the *period* or the *phase* field and the number of periods or phases desired. Any entries in the selected field will be overwritten without asking for confirmation.

The phase or period ranges control dialogue bears some similarity to the dialogue shown to select thematic styles for a number or date field.

If neither stress calculation nor monotone regression are activated, phase or period generation will work nevertheless. Temporary dates will be assigned to all dated contexts based on the year interval means, and date combinations of equal and contemporary contexts will be calculated. The phases or period assignments established with the help of these dates may include cycles. Therefore it is recommended to automatically assign phases or periods only if the total stress value is 0.

The detailed report lists all phases and periods and their corresponding start and end years, whereas the summary report shows the number of periods or phases created.

## Report selection

Depending on the report selection option, a detailed report, a summary report or no report is shown at the end of the date estimation processes. The differences between the report modes are given above. If no report was selected but the stress value was to be calculated, a simple message box will inform you about the total stress value computed.

The report is shown in the report window. If you want to proceed with the main *Stratify* window, you must close the report window using the *File | Exit* menu item or the standard Windows functions for closing windows.

see also:

- Check the date entries (*center year* field)

- Check and display phases or periods

## Phase or period ranges control dialogue

Units | Estimate center year, Generate phases/periods check box

In this dialogue, you can define date ranges for each phase or period. Whenever the *center year* entry of a context is within a date range of a phase or period, the appropriate phase or period name will be entered automatically in the *phase* or *period* field on confirming this dialogue by the *OK* button.

First, the minimum and maximum entries in the *center year* field are calculated. *Stratify* suggests to divide this range into intervals of equal size and shows a table where the number of rows corresponds to the user-selected number of phases or periods. The default phase or period names are P-1, P-2, P-3, and so on, but these names may be changed.

You may change the date intervals for each period or phase according to your requirements by editing the cells of the  $\geq$  *Min* and  $<$  *Max* columns. Each interval corresponds to a row in the table displayed in the dialogue window. With the **Add Range** button you can insert a new row in the table, immediately below the current row. This new row is a copy the previous row so that usually only two values must be adjusted. The **Delete Range** button will delete the current row.

Using the **Calculate** button, the number of contexts in each range is counted, and the results will be displayed in the *Count* column of the table. If there are any units that are not within any range at all, a message box will inform you of their number at the end of the counting procedure. When editing a range, the *Count* column will be emptied automatically because it may have become incorrect.

Ranges must not overlap, i.e. the maximum value given in a row must not be greater than the minimum value entered in the next row. Gaps between ranges are tolerated.

On confirming the dialogue by the *OK* button, the *period* or *phase* fields will be filled for all contexts whose *center year* dates are within the date ranges defined in the table.

see also:

- Estimate center year

- Select thematic styles for a number or date field

## Layout and check dialogue

Diagram | Layout and check

If you want to create a Harris diagram for your project data, select *Diagram | Layout and check* from the main menu or the corresponding toolbar button. *Stratify* allows you to perform many plausibility checks, some of which are in close connection to the layout procedure. Therefore the layout options and some options for plausibility checks are combined in one dialogue.

With the layout and check dialogue, you may

- perform coordinate checks
- use coordinates to determine the horizontal context sequence (projection layout)
- check the date entries (*center year* field)
- check for connected components
- check for cycles
- delete redundant relationships
- check that periods or phases do not overlap
- decide to show groups and check strict group chronology
- enter a random number generator seed
- select the report format
- choose to show the Harris diagram layout or the layout and check report only
- determine the number of colours (colour depth) in the Harris diagram

After confirming the dialogue with the *OK* button, *Stratify* starts checking the data according to the options selected. If a fatal error is found, for example a cycle, then no layout will be generated but the layout and check report is shown. When the Harris diagram layout option was selected and the layout could be created successfully, the Harris diagram window appears.

See also:

Harris diagram layout

## Check coordinates

Diagram | Layout and check, Coordinates group box

*Stratify* allows you to perform several coordinate checks. None of these checks are obligatory for creating a diagram layout but they may help to identify problems and errors.

### **Check that all center coordinates for contexts are present**

With this option, *Stratify* checks if a center X, Y, and Z coordinate is present for each context in the project. This check is useful before starting a projection layout. If a context with at least one missing center coordinate is found it will be listed in the detailed check report, the summary report will show the total number of contexts with this problem.

### **Check that later contexts are below earlier ones by at most .. coordinate units**

With natural strata, later layers are above earlier ones. Of course, the layers may be tilted compared to a plane with constant height, but if all layers cover the whole area considered, the center height (or Z) coordinates should reflect the chronological order. Of course, archaeological stratigraphy is more complex, standing structures and interfaces cannot be compared to natural layers. But still, in most cases, later contexts are above earlier ones. With this option, all "later than" relationships are checked: For example, if context 1 is later than context 2 and the center Z coordinate of context 1 is below the center coordinate of context 2 by a user-defined threshold, then this relationship might be problematic and will be listed in the detailed check report, whereas the summary report will only show the total number of problematic relationships. This check can only be performed if a threshold value is entered. A sensible threshold depends not only on the coordinate unit chosen but also on the site: In an excavation with many standing structures a higher threshold should be chosen than in a site where the layers were mostly accumulated by natural forces.

### **Check that contemporary contexts differ in height by at most .. coordinate units**

In general, the Z coordinates of contemporary contexts should not vary very much. Of course, there are exceptions to this rule, but this check may help to identify problematic contemporary relationships. *Stratify* processes the "contemporary with" relationships in the same way as described above for the "later than" relationships.

### **Check that equal contexts differ in height by at most .. coordinate units**

In general, the Z coordinates of equal contexts should vary even less than that of contemporary contexts. Of course, even with equal contexts, there are exceptions to this rule, but this check may help to identify problematic equal relationships. *Stratify* processes the "equal to" relationships in the same way as described above for the "later than" relationships.

See also:

Check report

Projection layout

## Show projection of context coordinates

Diagram | Layout and check, Use coordinates to determine horizontal context sequence  
*Stratify* supports a layout technique which takes the spatial positions of the contexts into account (see concepts). In addition, you may use this option to view different projections of context center coordinates.

With this option, *Stratify* will firstly check that coordinates were entered for at least five contexts. On detecting that only four or less contexts have coordinate entries, no layout will be created but an appropriate warning message will be issued.

After this coordinate check, the projection configuration dialogue will be shown:

### The projection configuration dialogue

In the upper part of the dialogue box the suggested projection of the contexts' center coordinates is displayed. In the lower left corner, a black line in a small top plan of the context center coordinates indicates the position of the projection plane (section).

### Thematic display

If you want to show thematic box colours in the projection image rather than the individually assigned box colours, then select the *Thematic display* option. Beforehand, choose the thematic colours using *Units | Thematic Style* in the main menu of *Stratify*. Note that border styles are ignored in the projection image, all boxes are displayed with solid borders.

### Section angle

The *section angle* is in the range of 0 to 180 degrees. You may change the *section angle* by entering another number or by pressing the arrow buttons to the right of the edit box. Then you get the impression that the context centers rotate.

### Major / Minor ticks

In the projection display, the x- and the z-axis are drawn. If you want to change major or minor tick mark spacing for the z-axis, use the *major tick / minor tick* edit boxes.

Tick marks come in two general varieties, major and minor. Major tick marks are longer than the minor tick marks. Normally, they are spaced so that they occur at whole-number intervals on the axis. Minor tick marks are shorter and should subdivide the region between the major tick marks. There are no plausibility checks for these two edit boxes.

Note that tick mark alterations become effective when the section angle is changed.

After confirming the current projection configuration by pressing the *OK* button, the layout will be created. The positions of contexts without coordinates and contexts in a chain (contexts with exactly one "later than" and one "earlier than" relationship) will be determined by the standard layout method.

You may combine projection layout with checking and displaying phases or periods, but groups are not supported with this layout option.

After creating the layout, the Harris diagram window is displayed.

## Chronology / year checks

Diagram | Layout and check, Years group box

*Stratify* allows you to perform several checks by comparing the *center year* entries in the unit table with the relationships. None of these checks are obligatory for creating a diagram layout but they may help to identify problems and errors.

### **Check that later/earlier relationships and center years match**

With this option, all "later than" relationships are checked: For example, if context 1 is later than context 2, then the date (i.e. *center year*) of context 1 should be later than that of context 2 accordingly. All relationships not fulfilling this condition will be listed in the detailed check report, whereas the summary report will only show the total number of problematic relationships.

### **Check that dates of contemporary contexts differ by at most .. years**

With this option, all "contemporary with" relationships are checked. In general, contemporary contexts should have identical dates (i.e. *center year* entries). This check may help to identify problematic "contemporary with" relationships.

For example, consider two contemporary contexts 1 and 2, with *center year* entries 1634 and 1640. *Stratify* will calculate the year difference (six years in this example) and compare it with a user-defined threshold. If the threshold is set to 5 or less, the relationship is considered problematic and will be listed in the detailed check report. The summary report will only show the total number of problematic relationships.

This check can only be performed if an integer threshold value is entered. The threshold may be set to 0.

### **Check that dates of equal contexts differ by at most .. years**

In general, the *center year* entries of equal contexts should vary even less than that of contemporary contexts. *Stratify* processes the "equal to" relationships in the same way as described above for the "contemporary with" relationships.

See also:

Check report

Estimate center year

## Check for connected components

Diagram | Layout and check, Check for connected components

It is recommended not to create a Harris diagram showing two or more separate components, i.e. Harris diagrams where the contexts are not connected by stratigraphic relationships. *Stratify* counts the number of components and the number of single disconnected contexts (alternatively, you may find disconnected contexts using the unrelated contexts filter, without "part of" relationships).

If *Stratify* detects two or more separate components, you are given the option to create a *Stratify* project for each of these components. The project file names are chosen automatically: If the current project name is MyDig, then the project file names will be MyDig\_1, MyDig\_2 etc.. Note that "part of" relationships are ignored while checking if all the contexts are connected by stratigraphic relationships. But when the component projects are created, any group or work area with a member belonging to this component will be copied to the component project unit file. Therefore, a group or work area may be present in several component projects. A group or work area without any member will not be copied to any of the component project unit files. Moreover, the disconnected single contexts will not be stored in any of the component projects. So adding up the number of units in the component projects will not necessarily result in the total number of units in the source project.

After creation of these component projects, *Stratify* will show the check report but will not proceed with the layout.

If you choose not to store each connected component separately, *Stratify* proceeds with checking and layout. Separate components will appear side by side in the final diagram.

See also:

Relationships

## Check for cycles

Diagram | Layout and check, Check for cycles

*Stratify* looks for cycles, i.e. for contexts that are indirectly earlier or later than themselves. If cycles are found, the program lists for each cycle the contexts that form it. A context may be involved in more than one cycle. All relevant cycles are listed in the check and layout report.

### Example 1:

Consider the relationships context 1 later than 4, 4 later than 5, and 5 later than 1. Then context 1 is indirectly later than itself.

### Example 2:

Consider the relationships 1 later than 4, 4 later than 5, 5 later than 7 and 8, 7 later than 3, 3 later than 1, 8 later than 6, 6 later than 2, 2 later than 4. Then the contexts 4 and 5 are involved in two cycles, which *Stratify* lists in the report as follows:

Cycle no. 1:

- 1 (relationships: 1 earlier, 1 later)
- > 4 (relationships: 1 earlier, 2 later)
- > 5 (relationships: 2 earlier, 1 later)
- > 7 (relationships: 1 earlier, 1 later)
- > 3 (relationships: 1 earlier, 1 later)
- > 1 (relationships: 1 earlier, 1 later)

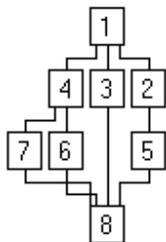
Cycle no. 2:

- 4 (relationships: 1 earlier, 2 later)
- > 5 (relationships: 2 earlier, 1 later)
- > 8 (relationships: 1 earlier, 1 later)
- > 6 (relationships: 1 earlier, 1 later)
- > 2 (relationships: 1 earlier, 1 later)
- > 4 (relationships: 1 earlier, 2 later)

The report lists one context per line. The relationship symbol at the beginning of each line (except for the first one) indicates the relationship to the context in the line before. With the detailed report option, the number of relationships is given for each context in parantheses after the context name. It is recommended to first check contexts with more than one "earlier than" or "later than" relationship because for these contexts the probability of an erroneous relationship entry is higher.

The cycle detection method is also used to identify bad or conflicting contemporary or equal relationships.

### Example 3:



Consider the Harris diagram on the left hand side. When adding the relationship 1 contemporary with 5, a conflict results with the fact, that 1 is indirectly later than 5. In this case, *Stratify* will create the following cycle list:

- 1 (relationships: 3 earlier, 1 contemporary)
- > 2 (relationships: 1 earlier, 1 later)
- > 5 (relationships: 1 earlier, 1 later, 1 contemporary)
- 1 (relationships: 3 earlier, 1 contemporary)

This Harris diagram may also be used to illustrate conflicting contemporary relationships: If contexts 4 and 5 are set contemporary as well as contexts 2 and 6, it is not possible to lay out the diagram. The resulting cycle list for this example is:

- 2 (relationships: 1 earlier, 1 later, 1 contemporary)
- > 5 (relationships: 1 earlier, 1 later, 1 contemporary)
- 4 (relationships: 2 earlier, 1 later, 1 contemporary)
- > 6 (relationships: 1 earlier, 1 later, 1 contemporary)
- 2 (relationships: 1 earlier, 1 later, 1 contemporary)

Similarly, conflicting equal relationships and equal relationships conflicting with contemporary relationships are detected.

Sometimes, the cycle list will show a "-/=" symbol. In this case, the context listed in the line above is contemporary with a context that is equal to another context whose name is displayed after the "-/=" symbol (or the context in the line above is equal to a context that is contemporary with another context... or there is even a more complicated sequence of equal and contemporary relationships connecting the contexts in the two successive lines). Whenever a "-/=" symbol appears, the list of all direct and indirect contemporary and equal units for the unit listed will be shown in parantheses.

A computer program cannot decide which relationship in a cycle is erroneous. It is your job to locate and correct the error in your data set. Therefore, *Stratify* returns to the main menu, after listing the cycles. User check via Test context pair or other check procedures may help to identify the errors.

Note that cycles may also be detected in the phase or period relationships as well as in the group relationships. In both cases, the relationships are deduced from the context relationships, for example, if a context which is part of group 1 is later than a context belonging to group 2, then group 1 is later than group 2.

It is necessary to perform this check, if you want

- to create the Harris diagram layout
- to delete redundant relationships
- to show groups in the Harris diagram layout.

See also:

Relationships

## Delete redundant relationships

Diagram | Layout and check, Delete redundant relationships

Redundant relationships are "earlier than" or "later than" relationships that can be established indirectly as well (for an example, see concepts section).

All redundant relationships are ignored when drawing a Harris diagram. Therefore, the default option is to delete redundant relationships. If you choose to retain these relationships, they are marked in the relationship table with an R in the *RelationStatus* field. With the *detailed report* option, all redundant relationships are listed in the check and layout report, the short summary shows only the total number of redundant relationships.

The detection of redundant relationships requires that the relationship network does not have any cycles. For this reason, the *Check for cycles* option is automatically checked if the *Delete redundant relationships* option is chosen.

In graph theory, appropriate technical terms are "reduced digraph" or "transitive reduction". Transitive reduction is often applied because "transitive edges can clutter a graph drawing and cause confusion" (Di Battista / Eades / Tamassia / Tollis 1999, p. 5).

## Random number generator seed

Diagram | Layout and check, Random number generator seed group box

The layout algorithm used by *Stratify* iteratively improves the initial horizontal sequence of units in the diagram. Therefore, the layout result depends on the initial sequence of the units on each horizontal level. You may create different initial horizontal sequences by choosing different random number generator seeds. A random generator seed may be any positive or negative integer of up to 9 digits.

### **Shuffle button**

With the *Shuffle* button you may initialise the random number generator seed to a new value. This takes less time than typing in a new nine-digit number. The shuffling process depends on the system time, which means that whenever you press the *Shuffle* button, a different value will be displayed.

## Check and layout report

Diagram | Layout and check, Report selection group box

When starting check and layout, you may choose between a *detailed report* and a *short summary only*. If you select the *Check only* option, then the report will be displayed after the check procedures are finished. With the *Harris diagram* option, the report will only be displayed if fatal errors are found so that the diagram cannot be created. To view the report after successfully laying out the Harris diagram, select *Report* from the Harris diagram window menu. Note that the report will not be shown when displaying a Harris diagram created previously.

The report is shown in the report window. The menu of the report window allows you

- to save the report results as a file (rich text format or ANSI text format)
- to print the report (after setting up the printer if needed)
- to copy the selected text to the clipboard (If no text is selected, the whole text is copied to the clipboard)
- to find a text string in the report
- to change the font for the whole text of the report

If you want to proceed with the main *Stratify* window or the Harris diagram window respectively, you must close the report window using the *File | Exit* menu item or the standard Windows functions for closing windows.

The following list shows the check options and the difference between the two report modes for each check option:

### Coordinate checks

Detailed report:

- lists all contexts with missing center coordinates
- lists all relationships where the later context is below an earlier one, and the depth difference exceeds a user-defined threshold
- lists all "contemporary with" relationships where the depth difference exceeds a user-defined threshold
- lists all "equal to" relationships where the depth difference exceeds a user-defined threshold

Short summary:

- total number of contexts with missing center coordinates
- total number of relationships where the later context is below an earlier one, and the depth difference exceeds a user-defined threshold
- total number of "contemporary with" relationships where the depth difference exceeds a user-defined threshold
- total number of "equal to" relationships where the depth difference exceeds a user-defined threshold

### Year checks

Detailed report:

- lists all "later than" relationships where the *center year* entry of the earlier context is greater than the *center year* entry of the later context
- lists all "contemporary with" relationships where the *center year* difference exceeds a user-

defined threshold

- lists all "equal to" relationships where the *center year* difference exceeds a user-defined threshold

Short summary:

- total number of all "later than" relationships where the *center year* entry of the earlier context is greater than the *center year* entry of the later context.
- total number of all "contemporary with" relationships where the *center year* difference exceeds a user-defined threshold
- total number of all "equal to" relationships where the *center year* difference exceeds a user-defined threshold

### **Check for connected components**

Detailed report:

- lists each connected component with the corresponding number of contexts
- lists each disconnected single context

Short summary:

- total number of connected components
- number of unconnected single contexts

### **Check for cycles**

In both report modes, all relevant cycles are listed, i.e. all the contexts that form these cycles. The report lists one context per line. The relationship symbol at the beginning of each line (except for the first one) indicates the relationship to the context in the line before. With the detailed report option, the number of relationships is given for each context in parantheses after the context name.

### **Delete redundant relationships**

Detailed report:

- lists each redundant relationship found

Short summary:

- shows total number of redundant relationships.

### **Check that periods / phases do not overlap**

In both report modes, on detecting the first erroneous "equal to" or "contemporary with" relationship, the check is stopped and the relationship is shown. An "equal to" or "contemporary with" relationship is erroneous when the two contexts involved do not belong to one period / phase. If no erroneous "equal to" or "contemporary with" relationship is found, *Stratify* checks that each context has a period / phase entry. On detecting the first context with missing period / phase entry, the check is stopped and the context is shown. If this check was passed successfully, *Stratify* tries to sort the phases / periods chronologically. The first contradictory phase / period relationship or cycle detected is shown and the check is stopped. If no problems are found, no message will appear in the report file but you will see in the Harris diagram that the phases / periods are marked by dotted horizontal lines.

### **Show groups**

Detailed report:

- lists each "equal to" relationships with conflicting group assignments

Short summary:

- shows total number of "equal to" relationships with conflicting group assignments

In both report modes, lists the first empty group encountered or a message that no empty group was found. If a cycle in the group chronology is found, an appropriate message will name the group within which the cycle occurred.

### **Check strict group chronology**

In both report modes, on detecting the first contradicting relationship between two groups, the check is stopped and the problematic relationship is shown.

## Number of colours

Diagram | Layout and check, Number of colours group box

Harris diagram window: Options | Number of colours

The size of the diagram and the number of colours (colour depth) determine the size of the Harris diagram in the computer memory. The larger the Harris diagram storage requirements, the more the layout will slow down. With a large data set, it is recommended to start the layout with a small number of colours and to increase the number later in the Harris diagram window if necessary. Therefore, the default number of colours for data sets consisting of more than 1000 units is set to "2 black/white" when starting the layout. For smaller projects, 65536 colours will be selected by default if non-white unit box background colours were entered at all.

For the same reason, the *Diagram | Display Harris diagram* menu command will show a monochrome (black and white) layout for large projects, regardless of the number of colours selected when creating the diagram.

The following example shows how the storage requirements increase with the number of colours. A simulated data set consists of 3000 contexts. The diagram with the standard font has a width of 11269 pixels and a length of 8517 pixels.

With black and white colours only, the diagram size is nearly 12 MB. With 16 colours, nearly 47 MB of memory space are required. On selecting 256 colours, 93 MB are needed to store the diagram. After selecting 65536 colours, more than 187 MB are used by the diagram. My computer with 128 MB memory took half an hour to create and store this diagram. With 16 million colours the storage requirements increase to 281 MB.

In the colour selection dialogue, one out of 16 million colours may be chosen. The greater the number of colours, the more faithfully the Harris diagram will represent the colours assigned to the context boxes.

With 256 colours only, *Stratify* substitutes each colour by another one out of the 256 colour palette, trying to come as close as possible to the original colour. Normally, you will not be able to detect any difference between a 16 million colour (so-called true colour) and a 65536 colour Harris diagram. Often the 256 colour display comes reasonably close to the colours originally selected. If you want to work with a 16 colour diagram, you should make some experiments with a small diagram first to find out which colours are suitable. After identifying suitable colours, you may store these colours in the custom colours palette in the colour dialogue.

Note that with a 16 colour diagram only 8 colours can be used to fill a context or group box background, the other colours are too dark, so that the black unit name is hardly visible.

**Warning** (see: <http://www.efg2.com/Lab/Graphics/VeryLargeBitmap.htm>)

There are significant limitations in creating a very large bitmap in Windows 95/98. Surprisingly, having a lot of CPU memory and video card memory doesn't necessarily mean a larger bitmap can be created. Resource limitations (mostly available memory) appear to be the only restriction for Windows NT/2000/XP.

## Harris diagram layout

If you want to create a new Harris diagram layout for your project data, select *Diagram | Layout and Check* from the main menu or the corresponding toolbar button. You can configure the Harris diagram layout using the options in the layout and check dialogue box.

### Examples:

- Example layout
- Example with phases
- Example with groups
- Example with groups and phases

## Equal relationships

Whenever two or more contexts are set equal, the layout procedure contracts all the "earlier than", "later than", and "contemporary with" relationships of the equal contexts at one context box: The impression is created that "earlier than" and "later than" relationships are present for only one of the equal contexts (that is the context with the largest number of relationships). This special context is leftmost in the horizontal sequence of the equal contexts, the boxes of equal contexts are connected by "=" symbols. The relationship contraction facilitates the layout but the relationship table remains unchanged.

Examples are contexts 14 and 4, 8 and 8a in the example layouts.

## Vertical positions of the contexts and groups

The vertical sequence of the contexts is created while looking for cycles in the relationship network. In general, more than one vertical order of the units is valid (see: *Why additional information?*). *Stratify* positions the units as high as possible (i.e. as late as possible) in the diagram. When phases or periods are shown in the layout, the number of vertical context levels usually increases, and the whole diagram becomes longer.

## Horizontal positions of the contexts and groups

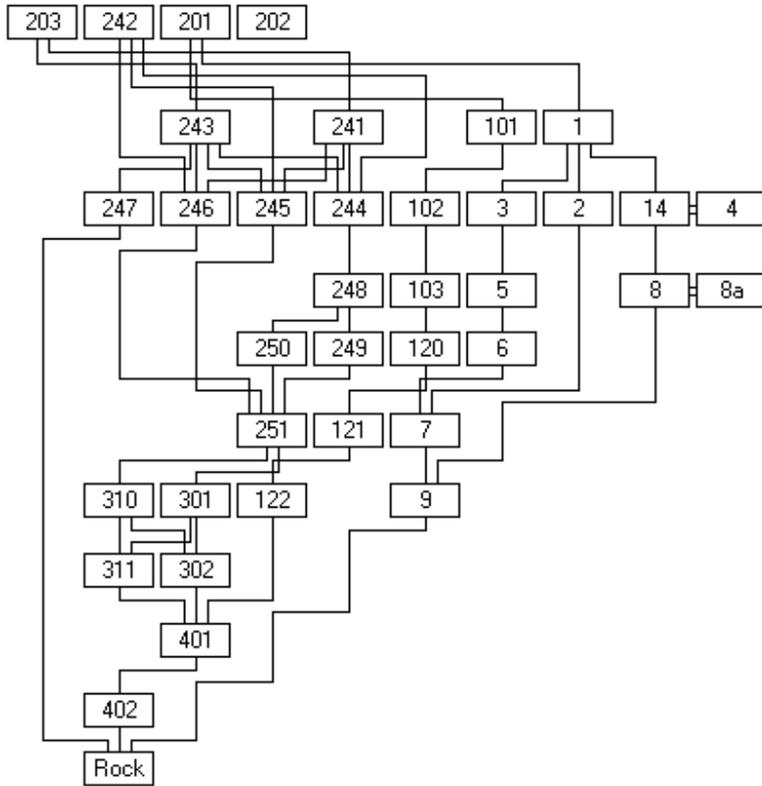
The horizontal positions of the contexts or groups are calculated in three steps, following mostly an algorithm published by Sander in 1996: First the horizontal sequence of the context boxes is calculated trying to minimise the crossings between the orthogonal lines that represent the "earlier than" or "later than" relationships respectively. Then initial horizontal positions of the contexts are found and are balanced in the next step.

## Layout of the "earlier than" and "later than" relationships

The "earlier than" and "later than" relationships are depicted as orthogonal lines that connect the appropriate context boxes. The layout algorithm refines the procedure suggested by Sander in his 1996 paper, ensuring that any two horizontal relationship line segments do not share a point and that any two vertical line segments never touch. The only exception occurs when the number of relationships for a unit box is very large (depending on the font size used). Sometimes, the relationship line will have many bends (steps) due to the imperfections of the balancing algorithm implemented.

The Harris diagram layout is shown in the Harris diagram window.

## Layout example



In this fairly small example, it is difficult to detect any structures.

See also:

- Example with groups
- Example with groups and phases
- Example with phases but without groups

## Check and display phases or periods

Diagram | Layout and check, Check that periods / phases do not overlap

If you want to layout the Harris diagram so that phases are indicated by horizontal lines across the full width of the final Harris diagram (see example 1, example 2), mark the *Check that phases do not overlap* option in the *Layout and check* form. This option will be checked automatically, if phase entries are provided for all units.

*Stratify* checks that each context in the unit table has an entry in the *phase* field. In addition, equal contexts as well as contemporary contexts must belong to the same phase. With group layout, all the members of a group must belong to one phase, so that each group belongs to one phase only. The *phase* field of a group is filled automatically if blank.

### Sorting the phases

*Stratify* sorts the phases: For example, if a context of phase 1 is later than a context of phase 2, then phase 1 is later than phase 2. When contradictions or cycles are found, i.e. phase 1 is both later than and earlier than phase 2, *Stratify* will show the phase relation count list which may help you to identify the error(s). On leaving this window, the check report with the appropriate error message is displayed, and *Stratify* will not proceed with the layout. If no errors are found, *Stratify* tries to establish a chronological sequence of the phases. In some cases, several possible chronological sequences result from the "later than" and "earlier than" relationships between the phases. For example, phase 1 is earlier than both phases 2a and 2b, phases 2a and 2b are both earlier than phase 3, but there is no chronological relationship between phases 2a and 2b. Then it is up to you to decide which of the phases is earlier than the other. In case of several possible chronological sequences, *Stratify* shows a form suggesting a sequence, which you can modify. If you want to change the position of a phase in the sequence, click on this phase entry in the list and use the up and down arrows to the right of the list to move the phase name upwards or downwards. Note, that it is possible to create a sequence of phases which is not consistent with the context relationships. Confirm the chronological sequence selected by pressing the *OK* button.

You may either use the *phase* or the *period* field for phase display, so you may proceed as described above but replace the word "phase" by the word "period".

See also:

Combining group and phase layout

## Phase relation count list

Diagram | Layout and check, Check that periods / phases do not overlap

The phase relation count list will be shown if a cycle of phase or period assignments is detected during phase or period layout. The aim of this list is to assist you in identifying erroneous relationships and / or phase or period attributes of units. For brevity, the function is described for phases only but works for periods in the same way.

### Yellow background

The window consists of two lists: In the list displayed in the upper part of the window, all phase relationships and the counts of the later than and earlier than relationships for contexts supporting the phase relationship is shown. Look out for entries with a yellow background. A line with yellow background indicates that both later than and earlier than relationships have been recorded for the pair of phases considered in this line of the list. Click on a phase name, if you want to see all the context relationships contributing to both count values in this line. The context relationship list is displayed in the lower part of the window. Click on a count value to focus on the context relationships contributing to this count value only. This way you may identify context relationships leading to errors in the chronological sequence.

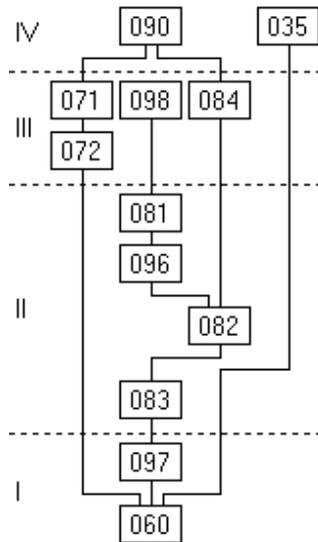
### Green background

Sometimes, no direct contradiction between induced phase relationships are noted, but a cycle of phase relationships exists nevertheless. In this case, all the phases which might be involved in the cycle are displayed in the phase relation count list with a green background. Normally, you will know the true chronological sequence of the phases and therefore it should be fairly easy to identify the erroneous context relationships by locating the contradictions in the phase relationships and clicking on these lines to see the corresponding context relationships in the lower part of the window.

See also:

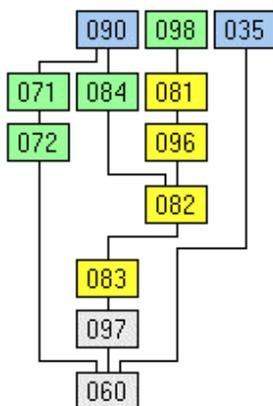
- Check that periods / phases do not overlap
- Cycles

## Phase, example layout

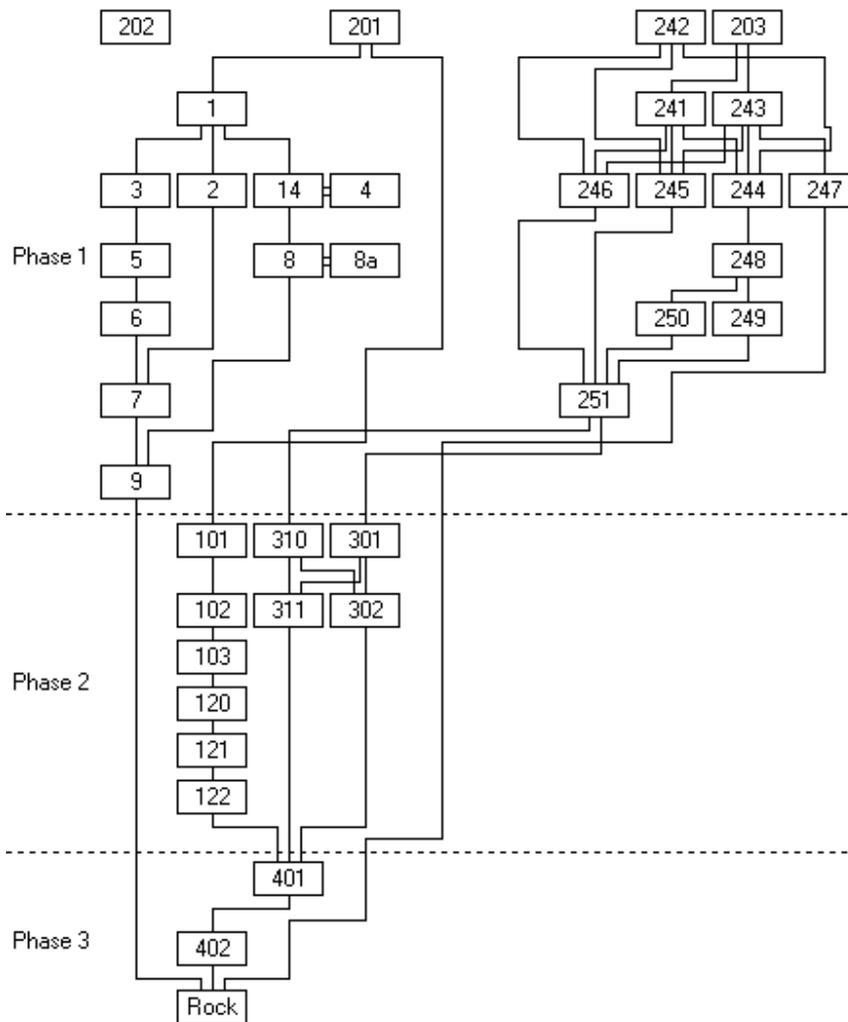


The above example shows a small Harris diagram with four phases. In the first phase (phase I) there are two contexts, 060 and 097. Note that the position of context 035 in phase IV is not determined by stratigraphic relationships but by additional information. This layout was created by *Stratify*, based on a small Harris diagram published in Jones, M., 2000, *The Stratigraphic Examination of Standing Buildings: problems and solutions*. In: S. Roskams (ed.), *Interpreting Stratigraphy. Site evaluation, recording procedures and stratigraphic analysis*. BAR Int. Ser. 910 (Oxford 2000), p. 122.

The following layout shows the above data with the phases indicated by thematic colours:



### Phase layout example



See also:

- Example without phases or groups
- Example with groups
- Example with groups and phases

## Show groups

Diagram | Layout and check, Show groups

If you want to display groups as rectangular boxes in the Harris diagram, check the *Show groups* option in the layout and check dialogue box (see example layout).

Some additional checks are needed for group layout, the results can be found in the layout and check report:

- An "equal to" relationship is consistent with group layout, when the two contexts involved belong to one group or are both part of no group. If inconsistent relationships are detected, *Stratify* cannot proceed with group layout.
- After this check, *Stratify* tries to create a group hierarchy display and performs the checks required for this.
- If group hierarchy display was successful, *Stratify* checks that each group has at least one member. If an empty group is detected, the appropriate error message will appear in the report and no group layout will be created.

The next step is to deduce the relationships between the groups from the relationships between members of these groups. With the option *Check strict group chronology* you decide how to deal with contradictory relationships. If a cycle is detected in the group chronology, an error message is added to the report and no group layout is created. Some of the deduced relationships between the groups may be redundant, these redundant relationships are deleted.

A low level group comprises only contexts. A higher level group consists of at least one group and may also include contexts. With the help of the deduced relationships, a hierarchical layout is created. That means that the relationships of contexts within a low level group remain unchanged, but those to members of other groups are only reflected in the group relationships. The hierarchical Harris diagram created by *Stratify* shows only relationships between groups at the same level. A more general concept are so-called compound graphs (Sugiyama/Misue 1991; Sander 1996) but algorithms for compound graph layout are more difficult to implement and the contract/expand functions are often not very intuitive with compound graphs.

Most of the checks required for group layout are carried out while the group layout is created. Therefore, with the *Show groups* option, *Stratify* always tries to create a Harris diagram layout, and the *Check only* option is disabled. The group layout requires that the relationship network does not have any cycles. For this reason, the *Check for cycles* option is automatically checked if the *Show groups* option is chosen.

One of the aims of group layout is to be able to contract groups so that a more abstract and compact diagram results which can be published more easily.

See also:

Combining group and phase layout

## Check strict group chronology

Diagram | Layout and check, Check strict group chronology

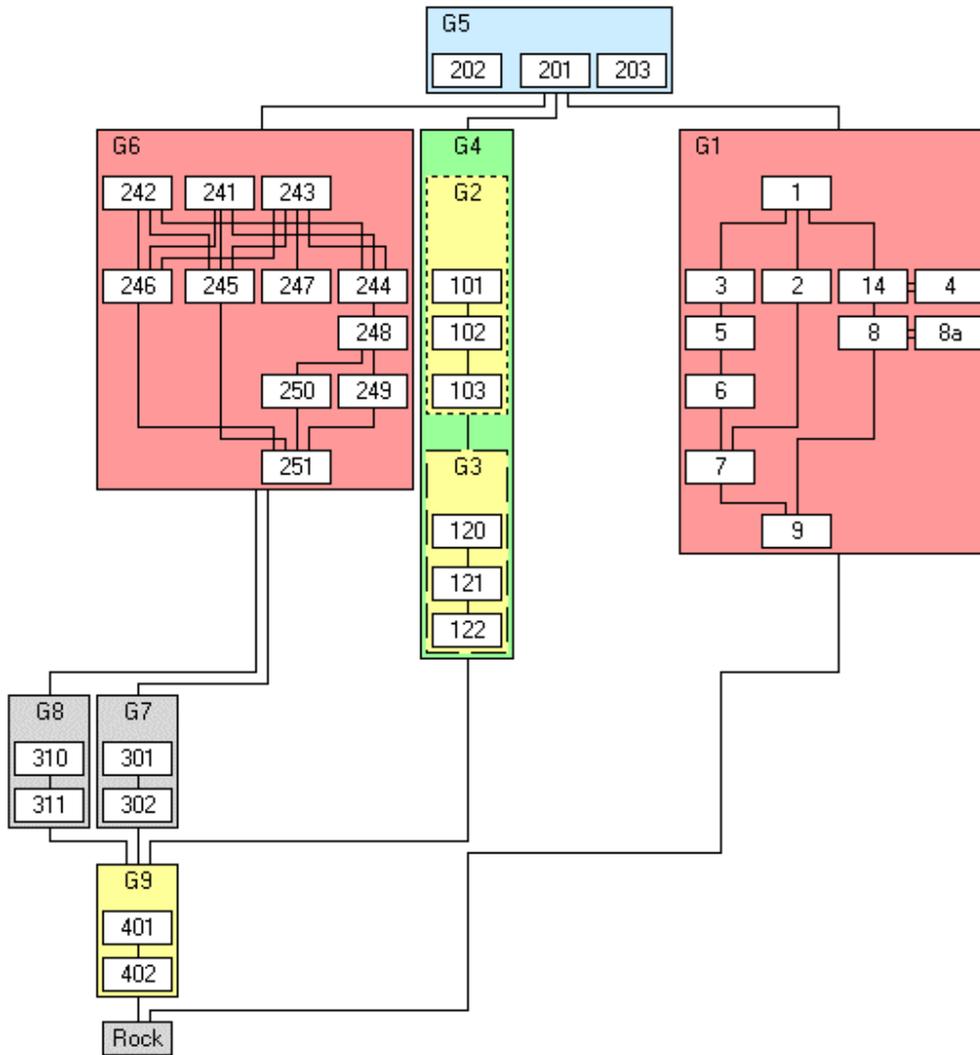
For group layout, *Stratify* deduces the relationships between the groups from the relationships between members of these groups: For example, if a context which is part of group 1 is later than a context belonging to group 2, then group 1 is later than group 2. When contradictions are found, i.e. group 1 is later than and earlier than group 2, there are two possibilities:

- 1) With *strict group chronology*, *Stratify* will show the check report with the appropriate error message but will not proceed with the layout.
- 2) If the *strict group chronology* option is not checked, the two groups will be set contemporary. Some archaeologists think that contradicting relationships between members of two groups can only be due to some error. If you agree, then you should check this option before starting a group layout.

This option is only eligible with group layout, so if you check this option, the *Show groups* option will be marked automatically.

## Group layout example

The layout example shows groups G1, G2, G3..G9 and their relationships. Different colours and border styles were assigned to the groups. Group G4 contains two subgroups, G2 and G3.



See also:

- Example without groups
- Example with groups and phases
- Example with phases but without groups
- Example with contracted groups

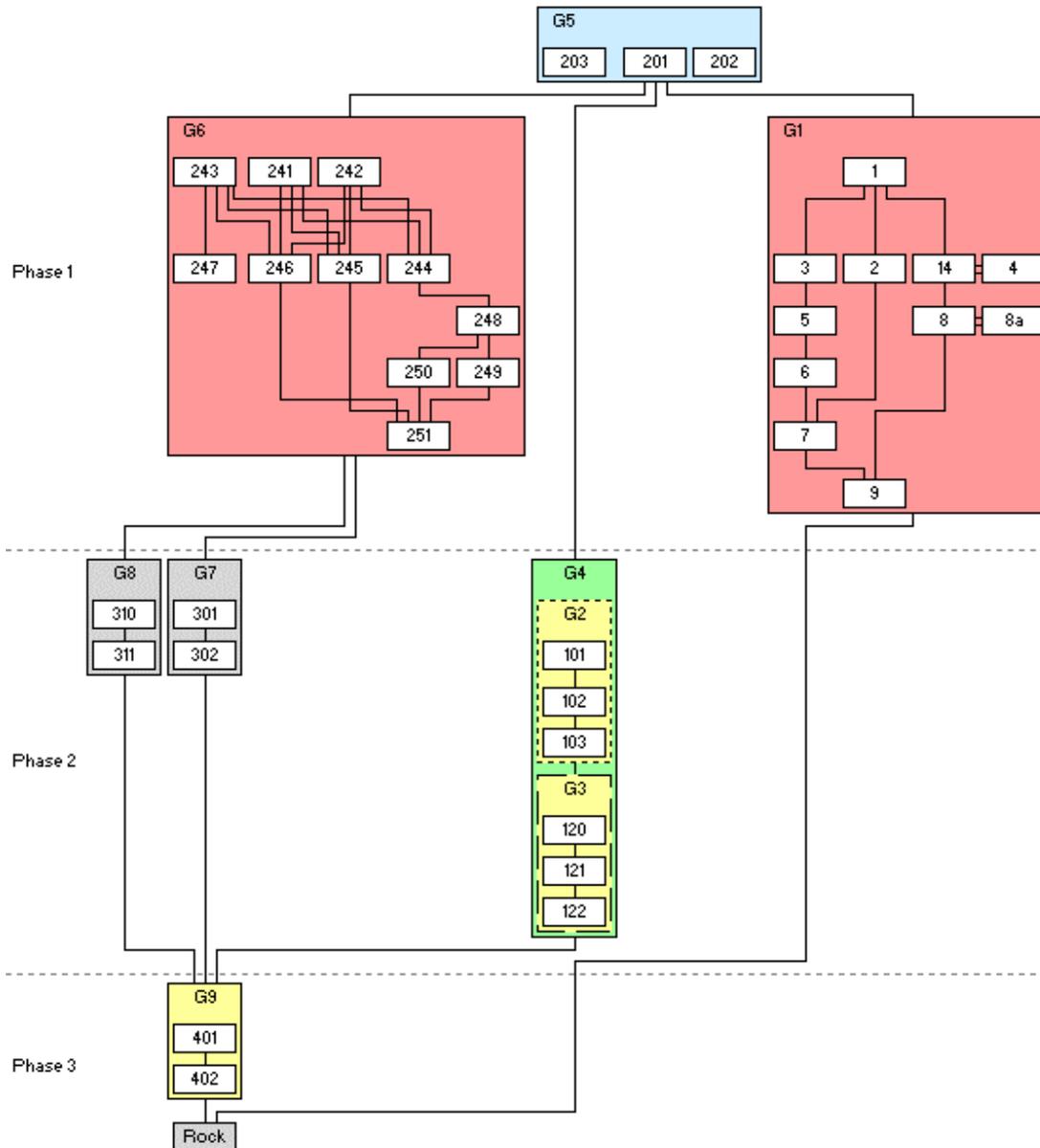
## Combining group and phase layout

Diagram | Layout and check, Check that periods / phases do not overlap; Show groups

If you want to combine group and phase layout (see example), check both the *Check that phases do not overlap* and *Show groups* options in the layout and check dialogue box. *Stratify* performs all the checks required for both options. In addition, it tries to create a group hierarchy display including phases. For the combined display it is necessary that each group belongs to one phase only, the phases become the top level groups in the group hierarchy.

You may either use the *phase* or the *period* field for phase display, so you may proceed as described above but replace the word "phase" by the word "period".

## Groups and phases layout example



See also:

- Example without groups or phases
- Example with groups but no phases
- Example with phases but without groups

## The Harris diagram window - after the layout

After successfully creating a Harris diagram, the Harris diagram window appears.

The menu of this window allows you

- to save or export the Harris diagram:
  -  by saving the Harris diagram picture as a bitmap (BMP) file (*File | Save as*)
  - by exporting the Harris diagram to JPEG format (*File | Export | JPEG*)
  - by exporting the Harris diagram to WMF file format (*File | Export | Windows meta file*)
  - by exporting the Harris diagram to DXF format (*File | Export | AutoCAD*)
  - by exporting the Harris diagram to SVG format (*File | Export | SVG*)
  - by exporting the Harris diagram to HPGL format (*File | Export | HPGL*)
  - by exporting the Harris diagram to *MapInfo* file format (*File | Export | MapInfo format*)
  - by creating an ANSI list of all units and their box coordinates (*File | Export | Layout positions*)
-  to print the diagram (*File | Print*)
- to display information about the size of the diagram (*File | Diagram info*)
- to close the window (*File | Exit*)
-  to focus on a unit in the diagram (*Find*)
-  to choose the unit information mode (*View | Show unit information*) to see the data of a selected unit.
-  to zoom in and out of the diagram image (*View | Zoom in* or *View | Zoom out*) within reasonable limits. With monochrome display, zooming out will preserve the information of the long connecting lines.
-  to restore the zoom factor to the actual size (*View | Zoom actual size*)
-  to show and print the check and layout report (*Report*)
- with group layout: to contract groups marked by right-clicking (*Groups* menu items)
- to configure the context box display, i.e. the box label font, switch to thematic display etc. (*Preferences | Box contents*)  
In addition, you may change the colour or border style of a group or context box by right-clicking the unit name.
- to change the number of colours also called colour depth (*Preferences | Number of colours*).

If you want to proceed with the main *Stratify* window, you must close the Harris diagram window using the *File | Exit* menu item or the standard Windows functions for closing windows.

See also:

Harris diagram layout

## DXF export

Harris diagram window: File | Export | AutoCAD

If you want to export the Harris diagram to *DXF* format, choose *File | Export | AutoCAD* from the Harris diagram main menu. Two text alignment options are available: centred and left. Centred alignment will make it easier to change the font in AutoCAD, whereas according to my experiments, only DXF with left text alignment is imported properly both by *Corel Draw* and *MapInfo*.

*Stratify* will prompt for the export file name. The relationships and the context resp. group boxes are exported to two different layers, called "Units" and "Relationships". If the context boxes are filled with different colours these are stored in the layer "BoxFill". If present, period or phase dividing lines and the appropriate period or phase names are written to the layer "Periods".

With black and white display (two colours), *Stratify* creates a black and white DXF file. Otherwise, colour files are created. If thematic display is active, thematic colours and border styles are exported.

## DXF format

DXF is the standard file format for *AutoCAD* drawings, and still one of the most popular formats for exchanging vector data. Unfortunately, this format changes slightly between different *AutoCAD* versions. The DXF output created by *Stratify* has been tested successfully with the "free DWG Viewer powered by brava!" of the Informative Graphics Corp.

([www.bravaviewer.com](http://www.bravaviewer.com)). In addition, *Corel Draw* (version 8.232) and *MapInfo* are able to import DXF files generated by *Stratify*. The DXF export has also been tested by two colleagues who own different versions of AutoCAD.

The *Stratify* DXF output adheres to the format descriptions published by Autodesk in the "AutoCAD 2002 DXF Reference Guide". For an introduction to DXF, the Web site <http://local.wasp.uwa.edu.au/~pbourke/dataformats/dxf/dxf10.html> was helpful.

## Known problems

The DXF version created by *Stratify* does not support full colour resolution RGB colours (24 bits) but a subset of less than 256 colours. *Stratify* uses a table of the so-called AutoCAD Color Index (ACI) and its corresponding RGB value and tries to find the colour closest to the RGB colour according to a formula suggested by Riemersma ([www.compuphase.com/cmtric.htm](http://www.compuphase.com/cmtric.htm)). According to my experience, the results are fairly good, except for pale colours, i.e. colours with high brightness value.

With my experiments using the free DWG viewer, the colours white and black are interchanged if the background colour is changed. So with white context boxes, the box fill suddenly appeared black after changing the background colour. Therefore, white boxes as well as black boxes are exported with no fill at all.

Unfortunately I did not find any DXF entity for creating filled polygons, so the filled polygons in the BoxFill layer are made of rectangles and triangles. With rounded rectangles the rounded areas are not filled, because it is necessary to approximate the shape by rectangles and triangles in this case, this can be done but is a lot of work.

## Trademarks

*DXF* and *AutoCAD* are registered trademarks of Autodesk Inc. ([www.autodesk.com](http://www.autodesk.com)). *Corel Draw* and *MapInfo* are registered trademarks of the Corel Corporation ([www.corel.com](http://www.corel.com)) and Pitney Bowes (<http://www.mapinfo.com/>).

## HPGL export

Harris diagram window: File | Export | HPGL

HPGL is the Hewlett-Packard Graphics Language, designed for Hewlett Packard pen plotters. This graphics format can be imported by several vector graphic programs, for example Corel Draw ([www.corel.com](http://www.corel.com)).

On selecting HPGL export, the HPGL export control form is opened, and you can enter the export parameters:

### HPGL output file(s)

It is obligatory to enter an HPGL output file name. Using the *Search* button to the right of the HPGL output file(s) edit box, you open a standard dialogue box for creating an HPGL file. If you prefer to type in the name in the edit box, please enter the full path of the file, otherwise *Stratify* will create the file(s) in the current directory. Often, several sheets of paper are needed. The data of each sheet is stored in a separate file, the file name of each sheet is derived from the file name entered by adding an underscore character and the sheet number. For example, if you enter the file name test.plt, *Stratify* will create files test\_1.plt, test\_2.plt and so on.

### Title

The title will be plotted on the upper left corner of the diagram.

### Paper format and orientation

Choose the paper format and orientation which creates as few sheets as possible so that the pasting effort is reduced. Paper formats were taken from an HP Draftpro plotter handbook. With A, B, A4 and A3 format, the origin of the plotter's coordinate system is in the lower left corner of the sheet whereas it is in the center with bigger formats.

### HPGL output on several sheets of paper

Depending on the size of the diagram, paper format, and orientation, one or more sheets of paper are needed to plot the diagram. Before creating the sheet files, *Stratify* will inform you about the number of swaths and the number of sheets per swath so that you can calculate (multiply the two numbers) the total number of sheets.

Paste the sheets together to obtain the diagram. The plots on the sheets will overlap by 2.5mm. The data of each sheet is stored in a separate file, and these files must be printed one by one. The sheet number 1 will start at the upper left corner of the diagram, the second sheet is below the first one and so on, until the first swath (strip) is completed. The next number designates the top most sheet on the next strip, then this strip is completed and so on.

If thematic display is active, thematic border styles are exported.

### Known Restrictions and problems

The font size of HPGL output is fixed, so choosing another font in the Harris diagram window does not change the result of HPGL export.

Colour output is currently not supported. Some special characters are not converted properly. The import was tested with Corel Draw 8, which does not convert line styles properly and has difficulties with rounded rectangles, if landscape orientation is selected.

## **JPEG export**

Harris diagram window: File | Export | JPEG

JPEG is a standard bit map format for publishing on the Web and creates smaller files than the BMP format. You are asked to set the quality of the JPEG image. The higher the quality value (up to a maximum of 100), the better the image quality, but the larger the file size. The lower the quality value (to a minimum of 1), the smaller the resulting file size, but at the expense of picture quality.

For legend output, the quality value is set to 100 automatically.

If the Harris diagram is set to monochrome (black and white) display, a grayscale JPEG file is created, with colour display, the JPEG image will support 16,7 Millions colours (24 bits per pixel).

JPEG is short for Joint Photographic Experts Group.

## MapInfo export

Harris diagram window: File | Export | MapInfo Format

If you want to export the Harris diagram to *MapInfo*, choose *File | Export | MapInfo Format* from the Harris diagram main menu. *Stratify* will prompt for the export file name. The relationships and the context boxes are exported to two different MIF files, because the relationship data base has a different data structure than the unit data base. The unit MIF file name consists of the export file name with a *\_unit* suffix, the relationships are stored in a MIF file with a *\_rel* suffix. After successfully exporting the graphic data, *Stratify* will issue a message informing about the two file names.

*MapInfo* is a geographic information system which mainly deals with vector data. The *MapInfo interchange format* (MIF) is an ASCII file format which can be used to define vector and text data. This MIF format created by *Stratify* is fairly general and it should be possible to import files created by the export option to any *MapInfo* version. If present, phase or period separating lines are also stored in the relationship MIF file. Group boxes are stored in the unit MIF file.

With black and white display (two colours), *Stratify* creates a black and white MIF file.

Otherwise, full colour resolution files are created. If thematic display is active, thematic colours and border styles are exported.

The data base data is stored in the MID file, which should be present in the MIF file directory when importing a MIF file in *MapInfo*.

### Importing the MIF files

In *MapInfo* use the import function to import both the relationship and the unit file. Then create a new map window displaying the two MapInfo layers. The context box labels can be shown by using the MapInfo labeling functions.

### Known problems

The labels of the phase or period lines are not exported.

With group layout, the sequence of drawing the units in the unit layer cannot be fixed in the MIF file so that a group box may be hidden under another group box. It may be necessary to copy some of the group boxes to separate *MapInfo* layers in order to ensure the proper sequence of displaying the boxes.

In addition, the labeling of the groups is expected in the upper left corner of the group box whereas the context box labels should appear in the center of the boxes.

*MapInfo* is a registered trademark of Pitney Bowes ([www.mapinfo.com](http://www.mapinfo.com)).

## SVG export

Harris diagram window: File | Export | SVG

If you want to export the Harris diagram to *MapInfo*, choose *File | Export | MapInfo Format* from the Harris diagram main menu. *Stratify* will prompt for the export file name.

SVG is the scalable vector graphics format as defined by the World Wide Web Consortium (W3C). It allows to publish vector data in the Internet. The SVG output created by *Stratify* was tested with the Adobe SVG Viewer 3.0 Plugin for *Netscape*. Many graphic programs are able to import SVG files.

With black and white display (two colours), *Stratify* exports a black and white svg file. Otherwise, full colour resolution files are created. If thematic display is active, thematic colours and border styles are exported. The SVG format created by *Stratify* uses a sans serif font, and adjusts this font according to the font attributes that were chosen for the diagram. These attributes include font size, font styles like bold, italic, or underline and colour.

## Printing the diagram

Harris diagram window: File | Print

Use the *Print* button  in the Harris diagram window toolbar or the *File | Print* menu item to print the Harris diagram. Depending on the size of the diagram, paper format, selected font, scaling factor, and orientation, one or more sheets of paper are required to print the diagram. Use the *Printer setup* menu option to choose the printer, paper format, and orientation before starting the print job. With the *Print scale factor* menu option, you can control the magnification of the printed diagram.

### Print scale factor

With the standard font (MS Sans Serif 8pt) and 300dpi resolution, a scaling factor of 2 or 3 is recommended. On increasing the font size, decrease the scaling factor. With 600dpi a scaling factor of 4 or 5 will be adequate in most cases. The print scale factor must be an integer value in the range 1..32. Experiment with printing a small Harris diagram to find the appropriate scaling factor for your favourite font, resolution, and printer.

### One sheet of paper

If only one sheet of paper is required for the printout, *Stratify* will print this sheet immediately without any prompts or headlines.

### Printing several sheets of paper

Before starting the printout of several sheets, *Stratify* will inform you about the total number of sheets required allowing you to cancel the job if you think that another printer setup might create a smaller number of sheets.

When several sheets are printed, each sheet starts with a header indicating the project name and the page number. Paste the sheets together to obtain the diagram. The sheet with page number 1 will show the upper left corner of the diagram, the second sheet is below the first one and so on, until the first swath (strip) is completed. The next page number designates the top most sheet on the next strip, then this strip is completed and so on.

### Known Restrictions and problems

The resolution of the Harris diagram bitmap is fairly low. Of course, you can print the diagram with 1200dpi and scaling factor 8, but the result is most probably no better than printing the diagram with 300dpi and scaling factor 2. Exporting the Harris diagram to a vector file format and printing this format with an appropriate program will normally create higher quality printouts. Some printers are not able to deal with the print data generated by *Stratify*. If printing fails, use the freeware PDFcreator to create PDF-files and print these files.

## Find a unit in the diagram

Harris diagram window:  Find

If you want to focus on a context or group in the Harris diagram window, use the *Find* button  in the toolbar or the *Find* menu item. *Stratify* prompts for the unit name and positions the horizontal and vertical scroll bars of the window so that the unit becomes the center of the window.

If the project consists of two or more excavations (see main menu item *Configure | Configure fields*, group box *Project composition*) you may enter the excavation name and the unit name, separated by a colon (no blanks), for example "MyDig:Unit06". If the unit name is unique or if you want to find the first occurrence of a unit name, then it suffices to enter the unit name only.

In case a matching unit name is found, *Stratify* positions the horizontal and vertical scroll-bars of the Harris diagram window so that the unit becomes the center of the window. When the context box is located at one of the borders of the Harris diagram then the context box will be displayed in the window but not necessarily in the center. When looking for a group, the size of the group box may exceed the size of the layout window. In that case, *Stratify* will show the name of the group box in the upper left corner of the layout window.

## Unit information mode

Harris diagram window: View | Show unit information

You may toggle the unit information mode by choosing *View | Show unit information* or the corresponding button .

If this mode is active and the zoom factor is set to actual size, on clicking on a context box a window with the unit data will be shown. The unit data is presented in a table consisting of two columns: The first column contains the field name, the second column the field value. All relationships of the unit selected will be listed in one cell of the table. The sort of relationship will be indicated by the appropriate relationship symbol. For each relationship, a new line is created. This table is read-only, the only way to manipulate the unit data is by leaving the Harris diagram window and returning to the main *Stratify* window.

## Harris diagram preferences

Harris diagram window: Preferences

There are some options available to configure the context box display. These options may be selected using the *Preferences* menu item.

By the *Font* option or the *Select font* button , you may choose another font for the characters displayed within the context boxes. If you select a bigger font, you will create the impression of zooming somewhat into the diagram.

Initially, the Harris diagram window will show the border styles of the context boxes as entered in the unit entry form. The box background colours will also reflect the entries in the unit table, if the number of colours (colour depth) is greater than 2.

Another way to assign colours and border styles to context boxes is by selecting *Units | Thematic Style* in the main menu of *Stratify*. If you want to show the thematic box styles rather than the individually assigned box styles, then select the *Thematic unit style* option from the *Preferences* menu or press the corresponding button .

Where units of several excavations are stored in one project, it may be useful to indicate the excavation for each unit. With the option *Excavation:name*, the full excavation name is shown in the context box, followed by a colon and the unit name. The option *Excavation abbreviation:name* allows for a more concise display of the context boxes. The abbreviation of the excavation may be entered in the term file. If the *abbreviation* field was left empty, the full excavation name is taken as a substitute.

## Contract groups

Harris diagram window: Groups

### Why contraction

In the group layout, you may decide to hide the details of a group, i.e. to contract the group to a so-called black box (Paulisch 1993, p. 77), then the members of this group and their relationships are ignored during layout, and the group box is of the same size as a context box showing the group name only.

This feature assists the publication of large Harris diagrams, that is only the main groups may be presented in a first diagram, the details of the groups can be shown in other diagrams.

### How to contract

First select the groups to be contracted. To select a group, choose *Mark for contraction* from the menu which appears after right-clicking the group name. The group box is marked by a red rectangle with yellow line(s) in the upper left corner. With black and white display, a black and white pattern appears instead.

After marking all groups you want to contract, select *Contract marked groups* from the *Groups* menu. The contracted group display will appear after a short while.

If you want to contract a group which contains other groups, please mark only the top level group. To contract all top level groups, i.e. show the most abstract diagram of the data set, choose *Groups | Select all top level groups* to mark all groups which are not part of other groups.

If you want to undo a selection, choose the menu entry *Unmark for contraction* after right-clicking the appropriate group name. To undo all selections, choose *Groups | Unselect all*. To undo the contraction procedure, choose *Groups | Restore all details*.

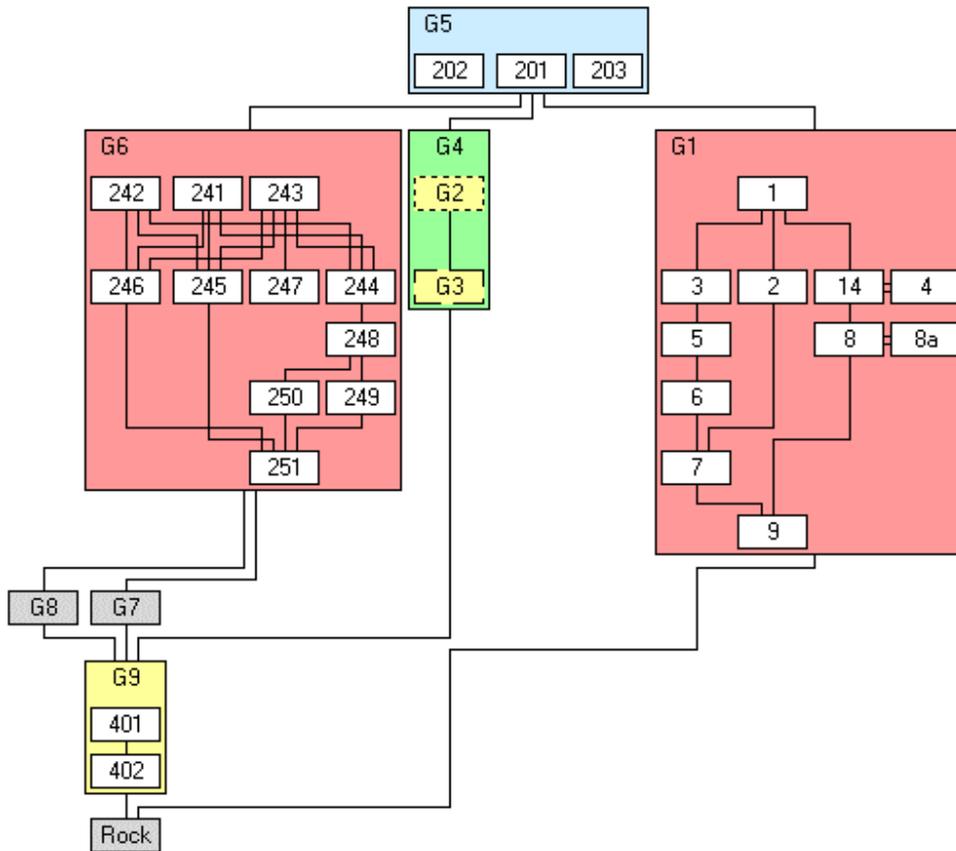
In the contracted diagram, it is not possible to select a group for contraction. To change the set of groups that are contracted, restore the full diagram first (*Groups | Restore all details*), mark the new set of groups in this diagram and contract these groups by choosing *Contract marked groups* from the *Groups* menu.

The creation date of the layout shown when selecting *Diagram | Display Harris diagram* from the main menu will not be affected by contracting groups. With the *Display Harris diagram* option, always the full diagram is shown.

See also:

Example with contracted groups

### Contracted group layout example



In this example, the groups G2, G3, G7, and G8 of the group layout example are contracted.

See also:

Example with groups and phases

## Display Harris diagram

Diagram | Display Harris diagram

If you have created a Harris diagram previously using *Diagram | Layout and Check*, you may display it once again by selecting *Diagram | Display Harris diagram* from the main menu or the corresponding toolbar button. Creating a large diagram may take some time, so this is a fast method to display a layout once created. Please note, that this procedure shows the layout as stored in the layout tables, any changes in the unit or relationship tables, which took place after the layout, will not influence the layout tables. Therefore, a message box will inform you on the creation date of the layout tables and indicate whether groups or periods/phases were taken into account when generating the layout. If you confirm that you want to see the layout, the Harris diagram window appears. The Harris diagram will be set to a monochrome (black and white) display for large projects (more than 1000 units), regardless of the number of colours selected when creating the diagram. With group layout, this option will show the groups with full details, any contractions created previously are ignored.

See also:

Data base structure

## Colour or border style change

Harris diagram window

You may change the colour or border style of a group or context box by right-clicking the unit name and choosing the appropriate item from the menu that appears.

Please note that colour and border style selection are only enabled if *Thematic unit style* is not active and the full diagram is displayed (no group contraction). With black and white display (2 colours), colour changes do not become visible. With 16 or 256 colours, the colours appearing on the screen will differ from those selected from the colour palette (see: number of colours).

The colour and border style settings will be permanent, i.e. the unit table entries will be modified accordingly.

The creation date of the layout shown when selecting *Diagram | Display Harris diagram* from the main menu will not be affected by changing the colour or border styles.

When changing the style of a context box, only the context box will be redrawn, with group boxes the whole diagram is drawn again.

## **Thematic box styles - overview**

The user may choose a colour and a border style for each unit. It is recommended to use this feature only in rare cases, for instance in order to highlight layers with dates obtained from dendrochronology. Alternatively, a thematic display of the Harris diagram may be generated, similar to a thematic map in a geographical information system. Any database field can be selected for thematic display. One field may control the border style of the boxes, another may determine the box background colour. If a term table is used, colours and border styles can be assigned to all terms and these settings are the default for the thematic display.

This feature can be used as an exploration tool, i.e. to test hypotheses about groupings or phases in the stratigraphic data set, and also as a means to add more information to the presentation of the stratigraphic analysis results.

see also:

Thematic box styles - details

## Thematic box styles - details

### Units | Thematic style

You may assign colours and border styles to context boxes similar to a thematic map in a geographical information system. Any unit field can be selected for thematic display (except for *unit name* and *unit class*). One field may control the border style of the boxes, another may determine the box background colour. For example, the box background colour can be dependent on the period, whereas the border styles are determined by the entries in the field *visibility*. These thematic style assignments are an alternative to the style assignments given in the unit entry form. You may switch between both display modes.

After selecting *Units | Thematic style* from the main menu, *Stratify* will list all the fields in the unit table (with the exception of *unit name* and *unit class*). Choose the field for thematic style assignment and confirm using the *OK*-button. The next dialogue depends on whether a text or a number field was selected.

In both cases, you may choose to determine both border style and colour via a single field, or you may set only one of the style elements. In the latter case you may select the *Thematic style* menu option again in order to determine the other style element.

### Thematic styles for a text field

If a text field was chosen, *Stratify* will list all the entries in the field, each in a context box. Additionally, the entry " blank " is included at the top of the list if there is at least one unit in the project with no entry in this field. When a term table is used, colours and border styles can be assigned to all terms, and these settings are the default for the thematic display.

Right-click the box in order to change its style. If you chose to set only one style element in the configuration frame at the bottom of the form, then the style selection dialogue will appear directly. If the option "set both border style and colours" was selected, you may choose via a short menu whether to change the colour or the border style.

### Thematic styles for a number or date field

The minimum and maximum entries in the selected field are calculated. *Stratify* suggests to divide this range into four intervals of equal size and shows a table with four rows (and an additional row for missing entries, if appropriate). You may change these intervals according to your requirements by editing the cells in the  $\geq$  *Min* and  $<$  *Max* columns. Each interval corresponds to a line in the table displayed in the dialogue window. In addition, the first line will be used to control the display of units with no entry in the selected field if such units exist. With the **Add Range** button you can insert a new line in the table, immediately below the current line. This new line will copy the previous line so that usually only two values must be adjusted. The **Delete Range** button will delete the current line.

The colours are represented by numbers in this table. The background of the cell shows the colour currently selected for this range. To change the colour, right-click the table cell in the column *Colour*. Then you may choose the colour from a palette. Similarly, the border style can be selected by right-clicking a border style cell. Note that the right mouse button will not open any dialogue if you chose to set the thematic style of the other style element only. Using the **Calculate** button, you count the number of units in each range, and the results will be displayed in the *Count* column of the table. If there are any units that are not within any range at all, a message box will inform you of their number at the end of the counting procedure. When editing a range, the *Count* column will be emptied automatically because it may have become incorrect. Prior to counting or assigning thematic styles, *Stratify* will test the table values: All entries in the

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Min or Max columns must be of the same type as the field selected for thematic style assignment (except for a possible *blank* entry in the first row). Ranges must not overlap, i.e. the maximum value given in a line must not be greater than the minimum value entered in the next line. Gaps between ranges are tolerated.

Select the *Legend* option in the **Display Selection** box to preview the thematic boxes in the Harris diagram. With the *Legend* option you cannot change the ranges or the style assignments, switch back to the *Table with ranges* option to modify ranges or style assignments.

### **Save Legend**

Use the *Save Legend* button to store the legend as displayed in the dialogue window. You may later combine one or two legends with the appropriate thematic Harris diagram in your graphic or picture processing software. All formats supported for storing or exporting the Harris diagram are available for the legend file as well, and the same restrictions apply.

After confirming the thematic style setting dialogue using the *OK* button, the thematic style of each unit will be stored in the unit table. Please note that the thematic style of a context is not changed if the field value used for thematic display is modified.

If you have created a Harris diagram previously, the thematic styles are transferred to the layout tables as well. So with the *Display Harris diagram* menu option the new thematic styles can be shown without calculating a new layout. The creation date of the layout shown when selecting *Diagram | Display Harris diagram* from the main menu will not be affected by changing the thematic styles.

This feature can be used as an exploration tool, i.e. to test hypotheses about groupings or phases in the stratigraphic data set, and also as a means to add more information to the presentation of the stratigraphic analysis results.

## Filtering unit data

### Filter

After filtering, only those units fulfilling certain conditions are displayed in the unit list. You may use filtering operations to check your data set. Filtering is a simple way of querying your project data bases. If you need more complex queries, you should export the unit and relationship tables to a relational data base system.

### See also:

General information on filtering

Filter units of a specific excavation

Filter units of a specific unit class

Filter units with a specific field condition (including empty fields, non-empty fields, numbers in a range)

Filter unrelated units (i.e. contexts without any relationships; groups or work areas without any members)

Filter top / bottom contexts

Filter contexts that are not part of any group

Filter all units that are part of a specific group or work area

Filter contexts that are later than (earlier than) a specific context

Filter: Show relationships of selected unit(s) only

## General information on filtering

After filtering, only those units fulfilling certain conditions are displayed in the unit list. You may use filtering operations to check your data set: For example, you may list

- all contexts where the field *unit type* is still blank, or
- all contexts without any stratigraphic relationships.

In addition, filtering is useful if you want to print out only part of your data set.

Any filter condition can be removed by selecting *Filter | None* from the menu.

Certain operations need an unfiltered data set and will therefore remove all filter conditions. These operations include *Diagram | Layout and Check* and *Configure | Show group hierarchy*. When the group hierarchy is displayed, the *Filter* menu item is not visible .

If you print out the data set, the filtering condition remains active, i.e. only those units currently displayed in the unit list will be printed out.

After filtering, you may count the number of units that are displayed in the list by selecting *Units | Count*.

While a filter condition is active, the vertical scrollbar of the unit list does not take the reduced amount of units into account, and will therefore often behave unpredictably.

The relationship list is not affected by filtering and all relationships entered will be shown.

While editing units and moving through the data set, any filtering conditions are ignored.

After filtering, the status bar at the bottom of the application window displays the filter condition.

### Combining filter conditions

You may choose to combine two or more filter conditions. Once you enter a new filter condition, which may be combined with the active one, you are prompted to select one of three options:

1. New filter
2. All conditions must be fulfilled (AND)
3. One of the filter conditions must be fulfilled (OR).

#### Example 1:

You want to create a list of all post holes and pits. Select *Filter | Other unit field | Unit type* then select the term "post hole". The unit list will show only those contexts with unit type "post hole". Then start the same sequence of menu commands but select the term "pit". Next, *Stratify* allows you to choose the combination method for these two filters: Select the third condition ("One of the filter conditions must be fulfilled") to insure that both "post holes" and "pits" are included in the list.

#### Example 2:

You want to generate a list of all medieval pits. Select *Filter | Other unit field | Unit type*, and select the term "pit". The unit list will show only those contexts with unit type "pit". Then select *Filter | Other unit field | period* and select the term "medieval". Next, *Stratify* allows you to choose the combination method for these two filters: Select the second condition ("All conditions must be fulfilled") to insure that only medieval pits will be included in the list.

## List all units belonging to a specific excavation

Filter | Excavation

The unit list is ordered by excavation name so that all the units of an excavation appear in a block. But if you want to print the units of one excavation only, this option may be useful.

This menu item is only active if *Project composition* was set to *Two or more excavations*. Even if this option was chosen, it is possible that all units belong to one excavation. In this case, *Stratify* will issue a warning message.

See also: General information on filtering

## List all units of a specific unit class

Filter | Unit class

You may want to print a list of contexts, groups, or work areas only. In order to restrict the unit list to contexts only, select *Filter | Unit class* from the menu and then select *context* from the list of unit classes.

See also:

General information on filtering

Unit Classes: Contexts, groups, and work areas

## List all units with a specific field condition

Filter | Other unit field

Select *Filter | Other unit field* if you want to show only those units

- with a specific entry in a text field (exceptions: *excavation*, *unit name*, and *unit class*),
- with the coordinates, the *center year*, or the *excavation date* within a specific range, or
- with an empty field value (or with a non-empty entry).

## List all units with a specific field value

Filter | Other unit field

If you want to show only those units with a specific entry in a text field, select *Filter | Other unit field* from the main menu. Then *Stratify* will list all the fields in the unit table (with the exception of *excavation*, *unit name*, and *unit class*). Choose the field and confirm by clicking on the *OK*-button. If a text field was chosen, *Stratify* will list all the entries in the field. Additionally, the entries "blank" and "not blank" are included in the list if there is at least one unit in the data set with no entry in this field. Choose the entry and confirm the dialogue in order to restrict the list to those units with the selected field value only.

If there are no entries in a field, *Stratify* will issue a warning message instead of showing the list of entries in the field.

You can use this menu item for example to print a list of all pits in the data set. Moreover, this filtering operation is useful for error checking. It helps to discover empty fields and keystroke errors as it creates a list of all entries in the field.

See also:

- General information on filtering
- List all units belonging to a specific unit class
- List all units belonging to a specific excavation
- List all units with an empty field value (or with a non-empty entry)
- List all units with a number or date within a specific range

## List all units with an empty field value (or with a non-empty entry)

Filter | Other unit field

If you select *Filter | Other unit field* from the main menu *Stratify* will list all the fields in the unit table (with the exception of *excavation*, *unit name*, and *unit class*). Choose the field and confirm by clicking on the *OK*-button. If a text field was chosen, *Stratify* will list all the entries in the field. Additionally, the entries " blank " and " not blank " are included at the top of the list if there is at least one unit in the data set with no entry in this field. Choose " blank " to show all units with an empty field value or " not blank " to show all units with a non-empty entry in the selected field, and confirm the dialogue.

If a number or date field was chosen, one out of three options may be selected. The second and the third option refer to blank and non-blank entries, respectively.

If there are no entries in a field, *Stratify* will issue a warning message instead of showing the dialogs described above.

See also:

- General information on filtering
- List all units with a specific field value.
- List all units with a number or date within a specific range

## List all units with a number or date within a specific range

Filter | Other unit field

If you want to show only those units with the coordinates, the *center year* or the *excavation date* within a specific range, select *Filter | Other unit field* from the main menu. Then *Stratify* will list all the fields in the unit table (with the exception of *excavation*, *unit name*, and *unit class*).

Choose a number or date field and confirm using the *OK*-button. If a number or date field was chosen, *Stratify* will offer three options:

- I. Range - to show all units where the entry in the selected field is within a specific range
- II. blank - to show all units with no entry in the selected field
- III. not blank - to show all units with any non-blank entry in the selected field.

With the first option, the minimum and maximum entries in the selected field are shown. You may edit these range values so that the range you want to see is displayed. Press the *OK* button to invoke the filter.

If there are no entries in the selected number or date field, *Stratify* will issue a warning message instead of displaying the dialogue with the three options.

If you enter a range, the range values must be entered in the format of the country settings of your operating system. The minimum and maximum values given as default are examples for this format. If a date field was chosen, dates must be entered, if an integer field was selected, integer numbers (no decimal separators) are required. The first number (or date) of the range must be less than or equal to the second number (or date) in the range. Both limits of the range are included in the selection, i.e. field entries which coincide with one of the range values are shown in the filtering result.

Alternatively, you may want to display all the units with a specific number or date value. Then type in the number or date value in one of the range fields and leave the other field blank.

The second and third option are shown even if no blank field entries are present. On selecting one of these options, *Stratify* will check the field values and issue a warning message if there is no blank entry.

You can use this menu item for example to print a list of all units excavated within a particular period of time. Moreover, this filtering operation is useful for error checking. It helps to discover empty fields and outliers as it calculates minimum and maximum values for a field.

See also:

- General information on filtering
- List all units with a specific field value

## List all unrelated units

Filter | Unrelated

Select *Filter | Unrelated*, if you want to

- check if you forgot to enter any relations for some contexts, or
- detect either empty groups or work areas.

## List all unrelated contexts

Filter | Unrelated | context

If you forgot to enter any relationships for some contexts, these contexts will be listed with this option. You are asked to decide whether you want to take not only stratigraphic, but also "part of" relationships into account: Depending on your decision, a context which is part of a work area but has no other stratigraphic relationships will or will not appear in the result list of this filtering operation.

See also:

General information on filtering

Relationships

Check for connected components

## List all contexts which are not part of any group

Filter | Contexts without group

This menu item will list all contexts which are not members of any group. If you work with groups, you may want to ensure that every context is part of a group.

See also:

General information on filtering

Unit Classes: Contexts, groups, and work areas

## **List all contexts at the top**

Filter | Top contexts

This menu item will show only those contexts which do not have any "earlier than"-relationship, i.e. there is no context that is stratigraphically earlier than the context listed.

## **List all contexts at the bottom**

Filter | Bottom contexts

This option will show only those contexts which do not have any "later than"-relationship, i.e. there is no context that is stratigraphically later than the context listed.

See also:

General information on filtering

## List all contexts earlier than a specific context

Filter | Show earlier contexts

This menu item answers the question: Which contexts are stratigraphically earlier than a given context?

Click on the context whose stratigraphic relationships are of interest. Then select *Filter | Show earlier contexts* from the main menu.

The result depends on whether or not equal and contemporary relations are taken into account. Therefore, this decision is required first. The unit list then displays only those contexts that are earlier than the current context. Even if contemporary and equal relations are taken into account contexts, which may be reached only via the direct contemporary or equal relationships of the start context, will not appear in the resulting list.

In the filtered unit list, the contexts are in alphabetical order. It is not possible to sort this list by the depth of the contexts in the diagram. At this stage there still may be cycles in the data set, so that depths cannot be assigned.

## List all contexts later than current context

Filter | Show later contexts

This menu item creates a list of all contexts later than a given context. The operation is analogous to *Filter | Show earlier contexts*.

See also:

- General information on filtering

- Concepts: Paths between two contexts

## List all members of a specific group or work area

Filter | Part of current unit

Click on a group or work area entry in the unit list. Then select *Filter | Part of current unit* from the main menu to display those groups or contexts, that are part of the group or work area selected. This option does not take indirect "part of" relationships into account: If group g20 consists of groups g1 and g2, both of which comprise several contexts, then this option will list only the members g1 and g2 for group g20 but not the contexts contained in g1 and g2.

An alternative to get an overview of the group structure is to select group hierarchy display via *Configure | Show group hierarchy*.

See also:

- General information on filtering
- Unit Classes: Contexts, groups, and work areas

## List all groups or work areas without members

Filter | Unrelated | group / work area

Groups and work areas help to define structures within the data set. But groups and work areas only make sense if they consist of contexts or groups. This option detects either empty groups or work areas.

See also:

- General information on filtering
- Unit Classes: Contexts, groups, and work areas

## Show relationships for currently selected unit(s) only

Filter | Relations of selected unit(s)

This option allows to hide all stratigraphic relationships except the ones relevant for the currently selected unit(s) in the *Units* list view. At least one unit must be selected to activate this filter.

After activating this filter, whenever you click on a unit in the unit list, the corresponding relationships will be shown in the relationship list whereas all other relationships are hidden.

See also:

- General information on filtering

## Set default excavation name

Configure | Change excavation

Whenever a dialogue requires the entry of an excavation name, the default excavation name is entered automatically. You may change the default excavation name by selecting *Configure | Change Excavation* from the main menu. This option is inactive if *Project composition* was set to *Single excavation*.

After selecting *Configure | Change Excavation* from the main menu, *Stratify* creates a list of all excavation names that are eligible, i.e. excavation names used in the project, supplemented by additional terms defined in the term file (if present). When the list consists of two or more excavation names, this list is displayed and you may choose an entry. To enter a new name, which is not in the list, choose **\*\* New Excavation \*\*** at the bottom of the list.

Upon opening an existing *Stratify* project, the default excavation name is read from the project file.

## Two or more excavations

Configure | Configure fields

File | Add project

Several adjacent excavations may be analysed in one *Stratify* project. As a first step, you may choose to deal with the excavations separately. Later, the excavations may be combined in one project using the menu option *File | Add project*. Alternatively, all the data may be held in one single project from the start.

If several excavations are to be stored in one project, the *Project composition* must be set to *Two or more excavations* in the *Configure Fields* dialogue box.

See also:

- Excavation name

- Set default excavation

## Select fields for display in list view and form view

Configure | Configure fields

Using this menu option, you may select which fields are displayed in the unit list and in the unit entry form. In addition, you may choose if one or more excavations are to be stored in the project.

In the unit field configuration dialogue *Stratify* will show a table listing all the fields in the unit table (with the exception of *excavation*, *unit name*, and *unit class*). In the **List view** column an X indicates that the corresponding field is shown in the unit list, whereas an X in the **Form view** column means that the corresponding field is shown in the unit entry form. To change a field configuration, double-click the appropriate cell in the table. Alternatively, you may type in the character "x" or delete an X by pressing the backspace key.

If you want to ensure that only a restricted set of terms is used in a specific field, you should use a term file and mark the appropriate cell in the **Terms only** column in the same way as described above. This applies for text fields only, other fields are marked by a "-", and this entry cannot be changed. If no term file is used by the current project, all fields are marked by a "-" in the *Terms only* column. After entering a new field value in the unit entry form, *Stratify* checks if the *Terms only* option is set for this field. If this option is set and a term is typed in which is not defined in the term file, the cursor will remain in this field even if you try to leave the field until a valid term is entered.

### Project composition

If several excavations are to be stored in one project, the *Project composition* must be set to *Two or more excavations*. In this dialogue box, the project composition frame is only visible if the project consists of just one excavation.

In the *Single excavation* mode, the *Excavation* column in the unit list and the *Excavation1* and *Excavation2* columns in the relationship list are not displayed, because they all refer to one excavation. It is recommended to choose the *Single excavation* mode whenever applicable so that only the relevant data is shown. This option also controls whether excavation name and unit name or unit name only are shown in reports, error messages, and the group hierarchy display: With *Two or more excavations*, the excavation name and unit name are shown, separated by a colon.

These settings will be stored in the project file and restored on reopening the current project. So each project may employ its own field configuration.

See also:

*Stratify* user interface

## Set the path and prefix of photos and drawings

Configure | Configure link to images

You may store the digital photos and drawings of an excavation in such a way that *Stratify* is able to show the photos and drawings belonging to a unit.

If you want to use this feature, all the excavation photos must be stored in one path, with short names or names beginning with identical characters (prefixes). The same rules apply for drawings, but they may be stored in a different path with another prefix.

### Example:

The names of the photos are:

c:\MyDig\MyPhotos\Pic001.jpg, c:\MyDig\MyPhotos\Pic002.jpg and so on.

The names of the scanned drawings are:

c:\MyDig\MyDrawings\Draw001.jpg, c:\MyDig\MyDrawings\Draw002.jpg and so on.

If a unit is depicted on photo Pic011.jpg and Pic012.jpg, enter

011, 012

in the *photos* field.

Similarly, if a unit is shown on drawings Draw021.jpg, Draw022.jpg, and Draw023.jpg, enter

021, 022, 023

in the *drawings* field.

Use *Configure | Configure link to images*, to tell *Stratify* where and how the photos and drawings are stored:

Set the photo path to: c:\MyDig\MyPhotos\

Set the photo prefix to: Pic

Set the drawing path to: c:\MyDig\MyDrawings\

Set the drawing prefix to: Draw

Set the separator to: ,

Currently, *Stratify* can deal with the following picture formats: JPEG (\*.jpg; \*.jpeg), Bit map (\*.bmp), Enhanced Metafiles (\*.emf) and Metafiles (\*.wmf).

To set the photo or drawing path, click on the *Search* button and select the first image in the appropriate path. The photo or drawing path will be entered on confirming the dialog. In addition, *Stratify* suggests that the file name prefix ends with the last character that is not a digit (Example: file name 2005-08-29-0001.jpg - suggested prefix is: 2005-08-29-).

It is optional to enter a photo or drawing prefix.

The separator must be identical in the list of drawings as well as in the list of photos. Blanks after the separator are ignored. The default separator is a semicolon.

See also:

Entering drawing and photo numbers

## ***Photos/Drawings* button**

On pressing the *Photos* button, *Stratify* will show the list of photos for the current unit and will display the first photo in the list. Prerequisite for this feature is that the photo path, the separator and optionally the photo prefix have been entered for the currently open project by choosing *Configure link to images* from the *Configure* menu. If the referenced image file is found, this image will be displayed on the right hand side of the form, otherwise a short message informs about the fact that no picture file was found. After clicking on another photo image name in the list, the appropriate photo will be displayed (if present).

The *Fit image to window* option ensures that the full image is shown, but reduced in size, if necessary. After disabling this option, the image is shown in full resolution. In this case, horizontal and vertical scrollbars allow to move to the part of interest.

The *Show* button has the same effect as double-clicking the image file currently displayed in the Windows Explorer. So you can link your favourite picture processing programme to *Stratify*, enabling you to modify or display the image file in a familiar way.

Similarly, pressing the *Drawings* button will open a form showing the list of drawings for the current unit.

See also:

    Entering drawing and photo numbers

## Show group hierarchy / Show unit list

Configure | Show group hierarchy / Show unit list

On creating a new project or opening an existing project *Stratify* shows the unit list on the left hand side of the main window. You may replace the unit list by a group hierarchy display (see example), after entering at least one group.

When you select *Configure | Show group hierarchy*, the hierarchy configuration box is displayed:

### **Ignore phases and periods**

If you want to display a hierarchy of groups without taking phases or periods into consideration, choose this option.

### **Include periods**

With the *include periods* option, all the members of a group must belong to one *period*, so that each group belongs to one *period* only. The *period* field of a group is filled automatically if blank. In addition, *Stratify* checks that each context in the unit table has an entry in the *period* field. In the hierarchy, the periods will be displayed as top level groups but designated by a different symbol than groups (see below).

### **Include phases**

You may use the *phase* field instead of the *period* field for hierarchy display, so the above applies for phases as an alternative (see example).

### **Include contexts**

On selecting *include periods* or *include phases*, this option is marked automatically, i.e. if periods or phases are included in the diagram, contexts must be shown as well. If you choose to *ignore phases and periods* during the group hierarchy display, you may optionally only show the group hierarchy, without contexts.

After confirming the hierarchy configuration dialogue with the *OK* button, *Stratify* tries to create the hierarchy display. If cycles in the hierarchy are detected (for example group G1 is part of G2, G2 is part of G3, and G3 is part of G1), then the hierarchy cannot be displayed and an error message is issued.

### **The group hierarchy display**

If no errors are found, a hierarchy similarly to the directory structure displayed in the Windows Explorer is created. In the Windows Explorer, there are various symbols for directories, different sorts of files, and media. The *Stratify* group hierarchy uses three different kinds of symbols,  for phases or periods,  for groups, and  for contexts. In addition, the symbol is displayed in brighter colours if the unit, group, or phase/period is currently active.

At first, all phases/periods (if selected), groups, and contexts (if selected) are shown. You may hide the members of a group by clicking on the - symbol. Then, the + symbol to the left of the group indicates that the members of this group are hidden. Click on this symbol to expand the hierarchy again.

With group hierarchy display, some main menu entries are deactivated: Filtering, merging units, combining units, and testing the stratigraphic relationships between two units.

The hierarchy diagram is redrawn after nearly every editing operation, therefore, this mode is not recommended if you work with a large diagram and want to change or add a lot of data.

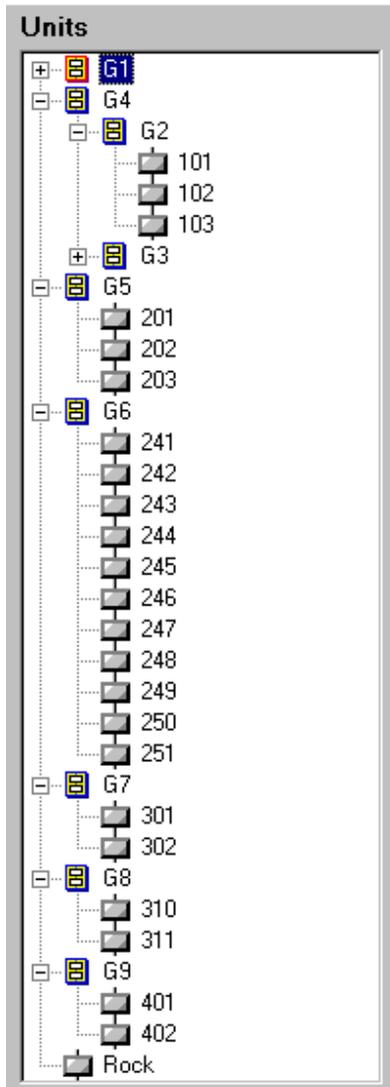
You may create a printout of the hierarchy.

When laying out a Harris diagram showing groups, *Stratify* tries to build up a group hierarchy. The checks described above are carried through. If a group hierarchy is displayed when the layout is started, then the hierarchy configuration options may be changed due to the requirements of the *Stratify* layout procedure.

You may return to unit list display by selecting *Configure | Show unit list* from the main menu.

If you want to change the hierarchy configuration (include/exclude contexts, include/exclude periods or phases), then you must switch to unit list display first.

## Group hierarchy example



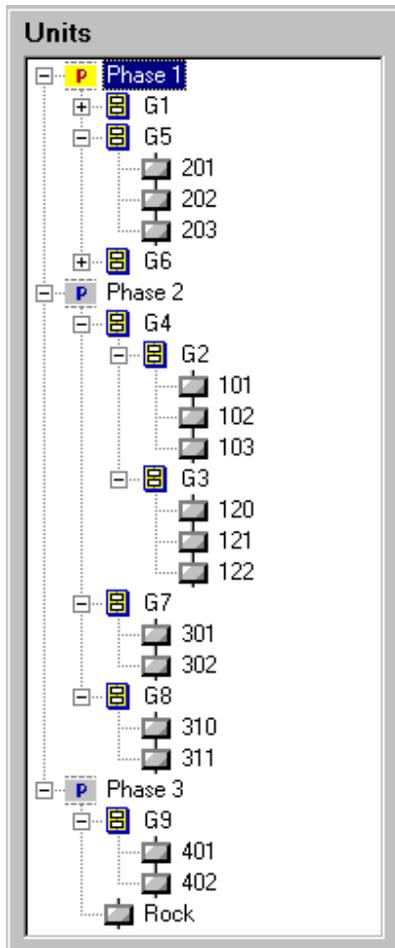
This example shows a group hierarchy without phases or periods but including contexts. In this example, group names start with character 'G', there are groups G1, G2, G3 and so on. Group G4 consists of two groups, G2 and G3. Three contexts form G2, namely 101, 102, and 103. Not all members of all groups are visible: The + symbol to the left of group G1 indicates that the members of this group are hidden. The members of G3 are hidden as well.

Note that different symbols are used to designate groups or contexts.

See also:

[Group hierarchy example showing phases](#)

## Group hierarchy example showing phases



This example shows a group hierarchy with three phases and including contexts.

In this example, phases are called 'Phase 1', 'Phase 2', and 'Phase 3'.

Group names start with character 'G', there are groups G1, G2, G3 and so on. Phase 1 consists of groups G1, G5, and G6.

Group G4 includes two groups, G2 and G3. Three contexts form G2, namely 101, 102, and 103. Not all members of all

groups are visible: The + symbol to the left of group G1 indicates that the members of this group are hidden. The members of G6 are hidden as well.

Note that different symbols are used to designate phases, groups, or contexts.

See also:

[Group hierarchy example without phases](#)

## Simulating stratigraphic data

File | Simulate

The aim of the Harris matrix simulation procedure is to show the accuracy in relative chronology which can be obtained with Harris matrix analysis. The simulation creates an ideal situation without errors of observation of the 'earlier than', 'later than' or 'contemporary' relationships, without complex archaeological contexts like pit interfaces [and without any redeposition of finds, where finds are considered as well - finds simulation not yet supported].

### Mathematical model applied for simulation

It is very difficult to describe three-dimensional contexts mathematically. To keep things simple, each context is considered to consist of small cubes which are adjacent to each other. If the cubes are small enough, one may use this simplification to build a model of an actual site with very little error. In our model, we consider a rectangular area of NxM cubes which represents the excavation area. The first cube of the first context is assigned a random position within this rectangle, then the context grows cube by cube in arbitrary directions. All the other contexts follow. If a new context is created, the probability that its first cube is at the lowest position within the rectangle is highest. Furthermore, the context tends to grow in the direction of its lowest cube neighbour. This simulation technique tends to create complex context shapes like hot wax poured into cold water. Where a cube of a context overlies a cube of another context, the appropriate time relationship is stored in the relationship data base used by *Stratify*. In general, quite a few redundant relationships are established. Moreover, the simulation procedure is able to create contemporary contexts: If five contexts are to be contemporary, five non-overlying positions for the first cubes of the contexts are determined, and the cube growing process ensures that the cubes of these contexts will not overlie each other.

### Parameters of simulation

If you want to simulate a stratigraphic data set, select *File | Simulate* from the main menu. If another project is still open, close it before creating the new project with simulated data. Enter the name of the project file and other options in the simulation control form.

### Project file

The project file controls the project configuration. It is obligatory to enter a project file name for each simulation result. Using the *Search* button to the right of the project file edit box, you open a standard dialogue box for creating a project file. If you prefer to type in the name in the edit box, please enter the full path of the file, otherwise *Stratify* will create the file in the current directory.

### Excavation

It is obligatory to enter a non-blank excavation name.

### Total number of contexts

The total number of simulated contexts must be in the range 10..99999.

### Number of contexts with contemporary relations

The number of contexts with contemporary relations must be in the range 0..total number of contexts. If you choose to create any contemporary relations at all, the actual number of

contexts with contemporary relations may deviate from the parameter entered. This is due to the fact that a random process is involved. Particularly with small data sets and small numbers of contemporary relations there may be some deviation from the value entered.

### **Mean number of contemporary relations**

This number has no effect if you have chosen to create 0 contexts with contemporary relationships. If you create only a small number of contemporary relationships, the actual average may differ from the number given due to random effects. The average number of contemporary relations is an integer in the range 1..48 if the total number of contexts exceeds 96, otherwise the upper bound is half of the total context number.

### **Vertical units (Y) and horizontal units (X)**

In the simulation model, the excavation area is represented by a rectangle measuring NxM units, the contexts consist of adjacent unit cubes.

#### Example:

Suppose you set the number of vertical units to 25 and the number of horizontal units to 40, you need at least ten contexts consisting of 100 unit cubes each to cover the whole excavation area. Both parameters must be in the range 10..180.

### **Mean number of cubes per context**

Each context is constructed by sticking adjacent unit cubes together (see Mathematical Model). The number of unit cubes per context may vary between 1 and twice the mean number of unit cubes. Note that the higher this number the higher the probability that an arbitrary top plan within the excavation rectangle shows only a single context. By increasing the area of the rectangular model excavation while the number of cubes per context remains constant, more contexts will be needed to cover the whole area, and the probability that contiguous contexts will overlap will decrease. This means that the Harris diagram will be long and narrow provided the number of cubes per context is approximately the same as the total size of the excavation rectangle. To create a wide and fairly short Harris diagram, make sure that the contexts are widespread, so that contexts successive in chronology rarely overlap: Choose the mean number of cubes far less than the excavation rectangle size (< 10%). The mean number of cubes must be in the range 2..999.

### **Upright structure factor**

The higher the probability for upright structures, the more likely it is that a context will grow upwards rather than in the four horizontal directions. This is what *Stratify* does: Let a context already consist of some cubes. A new neighbour cube of the last cube added is to be found. The last cube added is called the current cube. The simulation procedure evaluates the four neighbours of this cube in the four horizontal directions (north, east, south, and west). Wherever a neighbour is higher than or on the same level as the current cube, the probability that this neighbour is chosen is 0. Where a neighbour is lower, the probability of choosing this neighbour is proportional to the difference in height units between the neighbour and the current cube. But the current cube may also grow in a fifth direction, namely upwards. The upright structures probability  $p$  gives equal probability to a move upwards and to a move to a neighbour cube which is  $p$  units below the current cube. The upright structure factor must be in the range 1..5.

### **Context names and context name prefix**

The default context names are F001, F002 and so on, with F001 being the earliest context in the project. The number of digits depends on the number of contexts to be created: two digits for any context number up to 99, three digits for context numbers up to 999 and so on. The default prefix is F, but you may choose any other prefix with up to three characters.

### **Number of periods**

You may assign artificial periods to the contexts simulated. For example, if you choose 10 periods for a project of 500 contexts, then the first 50 contexts in the simulated chronological sequence will be allocated to Period 1, the next 50 contexts belong to Period 2 and so on. In case contemporary relationships are simulated, this rule must be adjusted so as to prevent that contemporary contexts are assigned to different periods.

If the number of contexts is not a multiple of the number of periods, then the last period will consist of more contexts than the other periods. If you do not want to simulate periods, then enter 0 in this edit box. The number of periods must be in the range 0..20.

### **First year / Last year**

Each context is assigned a date i.e. the year when the context was created according to the simulation. This date is stored in the *mean year* field. The first year and the last year entry determine the date range for the mean years. Negative numbers may be chosen to simulate BC dates. It is checked that the first year is smaller than the last year. The oldest context F001 is assigned the earliest mean year, sorting the contexts by mean year results in the same order as sorting the contexts by context name. Simulation does not ensure that the mean years of contemporary contexts are the same.

### **Average interval length**

Normally, not the exact creation year but only date ranges for contexts are known, and the size of these date ranges are controlled by the average interval length. The mean years are the centers of the date intervals.

### **Random number generator seeds**

With different random number generator seeds *Stratify* produces different simulation results even if the other parameters remain constant. A random generator seed may be any positive or negative integer of up to 9 digits. Each random number seed initialises a random process. *Stratify* uses seven random processes where contemporary relationships and year intervals for each context are to be simulated. The seven random processes are:

- (1) Selection of the position of the initial cube of a new context
- (2) Selection of adjacent cubes for a context under construction
- (3) Determination of the number of cubes for a context
- (4) Determination of the number of contemporary relations for a context
- (5) Deciding if a context has contemporary relations at all.
- (6) Determination of the mean year of a context
- (7) Determination of the year interval of a context

### **Shuffle button**

With the *Shuffle* button you may initialise the random number generator seeds to new values. This takes less time than typing in five nine-digit numbers. The shuffling process depends on the system time, which means that whenever you press the *Shuffle* button, different values will be displayed.

## Data base structure

*Stratify* stores stratigraphic units and their relationships in a relational database. The database for each project consists of

- a unit table with fields describing the stratigraphic units, and
- a relationship table.

Additionally, a term table may be used.

All tables are in Paradox file format. A Paradox table has a .db file extension. Paradox index files have a .px (primary index) or a .x?? .y?? (secondary index) extension. So if you want to backup a Paradox table, you should backup all these files (see also: Backup or copy the project data). You can edit these Paradox tables in another program but you must take care, because no checks are performed on opening an existing project that the data are consistent.

### Unit Table

The most important fields in the unit table are the *excavation name* and the *unit name*, in combination these two fields provide a unique identifier for each unit. Several context recording sheets have been published, and the unit entry form in the *Stratify* program is a synthesis of those sheets that have come to the author's notice. Some institutions use special recording sheets for features like burials or interfaces, but there seems to be no agreement on this subject in the stratigraphic community. So these special cases are ignored in the current version of *Stratify* but may play a role in future developments.

The unit table allows storing contexts as well as groups and work areas.

The unit table is sorted alphabetically by excavation name. The names of units belonging to one excavation are in alphabetical order.

The unit table file name starts with the project file name, adding the suffix `_unit`. For example, if the project file name is `test.syp`, then the unit table name will be `test_unit.db`.

### Relationship Table

The relationship table stores "earlier than", "later than", "contemporary with", "equal to" and "part of" relationships. A relationship consists of the identifiers of the two units (the source unit and the target unit) which are related, as well as the relationship category. In addition, a short relationship comment may be entered. If an "earlier than" relationship is entered, the opposite "later than" relationship is added automatically. Similarly, a new "contemporary with" or "equal to" relationship may result in the creation of additional contemporary or equal relationships.

Often, a change in the unit table will affect the associated relationships, for example, if a context is erased, all its relationships will be deleted as well. When two contexts are merged, their relations must also be merged.

The relationship table is sorted alphabetically by source unit (i.e. excavation name and unit name of the source unit). If a source unit has several relationships, these will be ordered by target unit.

The relationship table file name starts with the project file name, adding the suffix `_rel`. For example, if the project file name is `test.syp`, then the relationship table name will be `test_rel.db`.

### Term Table

The term table allows the user to store for each text field a list of terms and their definitions. An example file (`SampleTerms` in the `Sample` directory) mainly reproduces terms and their explanations given by Adams and Roskams (Adams 2000, pp. 98-99; Roskams 2001, p. 193).

This term table may be created on the fly, while entering the data, and can be reused in other projects. If the user enters date intervals for periods or phases, these data will be copied automatically into the unit entry form when the corresponding phase or period term is selected. Thus, the term table helps to avoid typing mistakes and may assist first-time users in choosing a term. The term file also plays a role when creating a thematic Harris diagram.

The term table is sorted alphabetically by the target field. If several terms are available for one target field, these are in alphabetical order.

See also:

Term file details

### **Layout files**

The Harris diagram layout is stored in two tables, both table names start with the project file name, one adding the suffix `_UnitLayout`, the other one has the suffix `_RelLayout`. For example, if the project file name is `test.syp`, then the tables will be called `test_UnitLayout.db` and `test_RelLayout.db`. A binary parameter file with the suffix `_LayoutCtrl` and a `.bin` file extension is also needed if you want to display a Harris diagram which was created previously.

### **Temporary tables**

If you enter new data or change an existing unit or a relationship, these changes are first stored in two temporary tables, `Unitentry.db` and `Relentry.db`, which are created automatically in the project directory. When a term file is used, a temporary table named `Termentry.db` is created in the term table directory. If phases or periods are to be indicated in the diagram, the temporary table `_Perrel.db` is used. Contracted groups and their relationships are stored in temporary tables called `__ContractUnit.DB` and `__ContractRel.DB`.

Please do not delete any temporary tables while running *Stratify*.

## Why automatic layout?

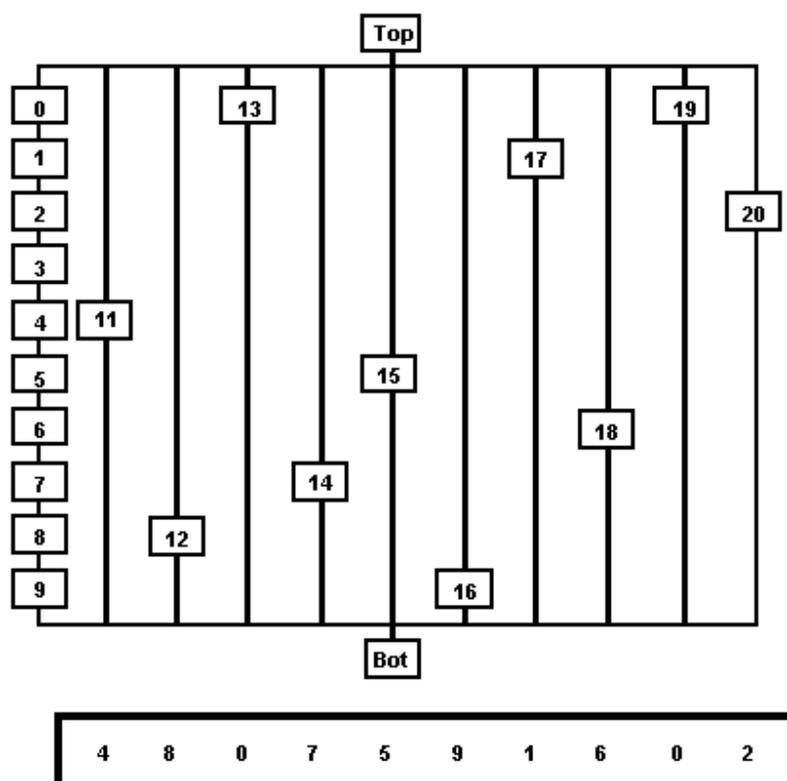
The aim of *Stratify* is to assist the user in the analysis and display of stratigraphic relationships in large data sets of 500 contexts or more.

Ideally, the Harris diagram is drawn on site. But this diagram normally is checked and changed during post-excavation processing. Groupings and phasing lead to a more accurate picture of the relative chronology of the site. *Stratify* does not only assist in this process but also provides a consistent toolbox for checks and building groups and phases. Additionally, it may be used to analyse stratigraphic units from non-ideal excavations: There is still a huge backlog of unpublished excavations where stratigraphic relationships may be derived from section drawings only.

Some of the currently available computer programs for Harris diagram generation are based on a graph editor, where the user may position the boxes manually. When the matrix covers about 100 sheets of letter paper, a graph editor is inconvenient, because it is very difficult to obtain an overview of the whole matrix, even on a large computer screen. The insertion of a new stratigraphic unit may necessitate changing nearly all the positions of the other contexts in the diagram, so graph editor assisted layout can be very tedious or errors may remain undetected. Therefore, it is the purpose of *Stratify* to lay out the Harris matrix automatically taking all the available chronological information into account.

## Why additional information?

Mathematically speaking, stratigraphic contexts and their earlier / later relationships form a partially ordered set. As the expression "partially ordered" implies, the stratigraphic relationship network does not establish a relative chronological sequence including all contexts, let alone an absolute chronology. Archaeologically speaking the so-called multilinear, or floating, sequences (Harris 1984, p. 128) may lead to a diagram that displays two nearly contemporary layers on widely different levels, although no stratigraphic relationship was omitted from the matrix.



In this fairly small example, the number of potential layouts exceeds ten billion. There is a one-to-one correspondence between the ten digit number at the bottom of the figure and the current layout: Context 11 is on the same horizontal level as context 4, therefore the first digit of the number is 4. The position of context 12 is chosen so that it appears contemporary to context 8, for this reason the second digit of the number is 8, and so on. Hence every 10 digit number has exactly one counterpart in the set of possible layouts. This means that there are at least 0 to 99,999,999 possible layouts.

In effect, context 11 may be placed on an intermediate level between 4 and 5, for this reason ten billion is only a lower bound for the number of possible layouts.

The Harris diagram presenting the stratigraphic units of a large excavation is normally one of millions of possible layouts that can be created on the basis of the stratigraphic relationships. Therefore additional information is needed to ensure that the Harris diagram represents the true historical sequence as exactly as possible.

## What kind of additional information may be available?

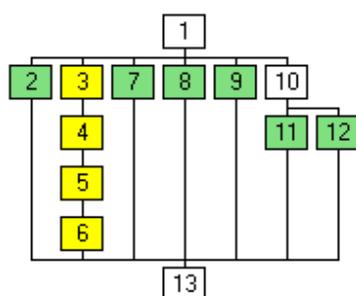
Two methods are applied by archaeologists to ensure that the Harris diagram represents the true historical sequence as exactly as possible: on the one hand additional dating evidence is used, on the other hand groups of contexts which can form new groups etc. are created. Moreover, coordinates may be used to control the layout. For example, the excavator who draws the diagram tends to choose the horizontal sequence of the context boxes such that spatially close contexts in the field appear in proximity to each other in the Harris diagram.

### Dating evidence

Extra dating information could be dendrochronological or radiocarbon, for instance. Most commonly, however, one relies on datings from finds in the layers, which can be determined using different methods. Care must be taken in using only those finds for dating which were deposited in their surrounding layer shortly after their production. In some cases, refittings of stone flakes, bone fragments or sherds help to determine roughly contemporaneous layers.

### Groupings

The grouping process is another part of post-excavation analysis. Low level groups are, for example, postholes, each of which consists of a cut and a fill. Examples for intermediate groups are houses inferred from the layout of the postholes. Finally, a specific phase of the settlement can be seen as a high level group (example taken from Clark 2000, p. 157). Even though the debate on the number of group levels required and their terminology is still going, archaeologists agree as to the necessity to form context groups in the post-excavation interpretation phase. Only groups allow a concise presentation of the main features of an excavation. According to Bruce Watson (Watson 2000, p. 154), the primary aims of the stratigraphic work during the assessment stage of the project should be to produce a valid group sequence for the whole site. A group display is more appropriate for publication than a huge matrix, diagrams showing the stratigraphic relations within groups may supplement this display. Additionally, publication on the Internet becomes more attractive if a hierarchical display of the matrix is provided. Groups influence not only the vertical distribution of context boxes in the diagram, but also their horizontal positions.



This small example shows a yellow and a green group of contexts. While the yellow group is compact, the vertical and horizontal positions of the contexts must be changed to ensure that the green group can also be displayed in a rectangular box (see another example).

### Phases

Phases are special groups, and their limits are often indicated by horizontal lines across the full width of the final Harris diagram (see example). If a program is to draw these dividing lines automatically, each stratigraphic unit must be part of a phase and the phases must not overlap.

### **Coordinates**

*Stratify* supports a layout technique which takes the spatial positions of the layers into account. The method is based on the center coordinates of the contexts, which may be calculated by a GIS and imported into *Stratify* format. These context centers are projected onto a plane which corresponds to a section through the midpoint of the excavation. *Stratify* suggests a section position which accounts for the maximum variance within the point coordinates. This projection reflects the three-dimensional positions of the contexts in an optimal way on a two-dimensional plane. Moreover, the user can change the angle of the section interactively, i.e. rotate the whole data set. This rotation facility may also be used as an exploration tool, for example to find outliers or areas of missing data.

The horizontal positions of the projected context centers determine the horizontal sequence of the corresponding Harris diagram boxes. An exception are those contexts with only one "later than" and one "earlier than" relationship. The positions of these contexts in a chain are calculated by a different method.

In addition, coordinates may be used to check stratigraphic relationships (see check coordinates).

## **Bibliography**

### **General Descriptions of the Harris Matrix:**

- Eggert, M. K. H., 2001, *Prähistorische Archäologie. Konzepte und Methoden* (Stuttgart 2001).
- Harris, E. C., 1975, The stratigraphic sequence: A question of time. *World Archaeology* 7 (1), 109-121.
- Harris, E. C., 1977, Units of Archaeological Stratification. *Norwegian Arch. Review* 10 (1-2), 84-94.
- Harris, E., 1989, *Principles of Archaeological Stratigraphy*. 2<sup>nd</sup> ed. (London 1989).
- Orton, C. 1980, *Mathematics in Archaeology*. Collins, London.
- Roskams, S., 2001, *Excavation*. Cambridge Manuals in Archaeology (Cambridge 2001).

### **Other Papers on Recording and Evaluation of Stratigraphic Data:**

- Adams, M., 1992, Stratigraphy after Harris: Some Questions. In: K. Steane (ed.), *Interpreting Stratigraphy: a Review of the Art*. CLAU Arch. Report No. 31 (Lincoln 1993), 13-16.
- Adams, M., 2000, The Optician's Trick: an approach to recording excavation using an Iconic Formation Process Recognition System. In: S. Roskams (ed.), *Interpreting Stratigraphy. Site evaluation, recording procedures and stratigraphic analysis*. BAR Int. Ser. 910 (Oxford 2000), 91-101.
- Bibby, D., 1993, Building stratigraphic sequences on excavations: an example from Konstanz, Germany. In: E. Harris et al. (eds.) *Practices of archaeological stratigraphy* (London / San Diego 1993), 104-121.
- Bibby, D. I., 2001. CAD based excavation recording systems and the Harris Matrix. Some possibilities and limitations. Paper presented at the Workshop 6 "Archäologie und Computer" in Vienna. Powerpoint file on CD. Phoibos Verlag, Vienna 2002.
- Bibby, D. I., 2002. Permutations of the Multilinear Stratigraphic Sequence: Nature, Mathematics and Consequences. Paper presented at the Workshop 7 "Archäologie und Computer" in Vienna. Powerpoint file on CD. Phoibos Verlag, Vienna 2003.
- Bobowski, B., 2007. Archaeoscope - interface for 3D stratigraphy visualisation. In: A. Figueiredo, G. Velho (eds.), *The World is in your eyes*. Proceedings of the XXXIII Computer Applications and Quantitative Methods in Archaeology Conference, March 2005, Tomar, 151-153.
- Clark, P. R., 1993, Sites without Principles; post-excavation analysis of 'pre-matrix' sites. In: E. Harris et al. (eds.) *Practices of archaeological stratigraphy* (London / San Diego 1993), 276-292.

- Clark, P., 2000, Post-Excavation Analysis: moving from the context to the phase. In: St. Roskams (ed.), *Interpreting Stratigraphy. Site evaluation, recording procedures and stratigraphic analysis*. BAR Int. Ser. 910, 157-159.
- Davies, B., 1992, Spot Dates as Qualitative Data? In: K. Steane (ed.), *Interpreting Stratigraphy: a Review of the Art*. CLAU Arch. Report No. 31 (Lincoln 1993), 30-39.
- Davies, M., 1993, The application of the Harris Matrix to the recording of standing structures. In: E. Harris et. al. (eds.) *Practices of archaeological stratigraphy* (London / San Diego 1993), 167-180.
- Gerrard, R. H., 1993, Beyond crossmends: stratigraphic analysis and the content of historic artefact assemblages on urban sites. In: E. Harris et. al. (eds.) *Practices of archaeological stratigraphy* (London / San Diego 1993), 229-249.
- Day, W., Cosmas, J., Ryan, N., Vereenooghe, T., Gool, L. van, Waelkens, M., Talloen, P., 2007. Linking 2D Harris Matrix with 3D Stratigraphic Visualisation: An Integrated Approach to Archaeological Documentation. In: A. Figueiredo, G. Velho (eds.), *The World is in your eyes. Proceedings of the XXXIII Computer Applications and Quantitative Methods in Archaeology Conference, March 2005, Tomar*, 155-160.
- Doneus, M., Neubauer, W., 2004. Digital Recording of Stratigraphic Excavations. In: *Enter the Past. The E-way into the Four Dimensions of Cultural Heritage. CAA 2003. Proceedings of the 31st Conference, Vienna, Austria, April 2003*. BAR International Series 1227: 113-116.
- Hammer, F., 2000a, The Structuring of Records: different systems in use from excavation through to publication. In: S. Roskams (ed.), *Interpreting Stratigraphy. Site evaluation, recording procedures and stratigraphic analysis*. BAR Int. Ser. 910 (Oxford 2000), 143-149.
- Hammer, F., 2000b, From Field Record to Publication with a Minimum Archive Report. In: S. Roskams (ed.), *Interpreting Stratigraphy. Site evaluation, recording procedures and stratigraphic analysis*. BAR Int. Ser. 910 (Oxford 2000), 161-172.
- Harris, E. C., 1984, The analysis of multilinear stratigraphic sequences. *Scottish Arch. Review* 3 (2), 127-133.
- Harris, E. C., 2001. The Only Way to See: GIS and the Future of Archaeological Recording. Paper presented at the Workshop 6 "Archäologie und Computer" held in Vienna. PDF file on CD. Phoibos Verlag, Vienna 2002.
- Holst, M. K., 2004. Complicated Relations and Blind Dating: Formal Analysis of Relative Chronological Structures. In: Buck, C. E., Millard, A. R. (eds.) *Tools for Constructing Chronologies. Lecture Notes in Statistics 177*. Springer, London/Berlin/Heidelberg: 129-147.
- Jablonka, P., 2000, Computergestützte Rekonstruktion und Darstellung der Stratigraphie von Troia. *Studia Troica* 10, 99-122.
- Jablonka, P., 2004. Reconstructing Sites and Archives: Information and Presentation Systems at Troy. In: *Enter the Past. The E-way into the Four Dimensions of Cultural Heritage. CAA 2003. Proceedings of the 31st Conference, Vienna, Austria, April 2003*. BAR International Series 1227: 281-285.
- Mantegari, G. / Mosca, A. / Cattani, M. 2008, Formal Knowledge Representation and Automated

Reasoning for the Study of Archaeological Stratigraphy. Paper presented at the Workshop 12 "Archäologie und Computer. Kulturelles Erbe und Neue Technologien" held in Vienna 2007. PDF file on CD. Phoibos Verlag, Vienna 2008.

Pearson, N. / Williams, T., 1993, Single-context planning: its role in on-site recording procedures and in post-excavation analysis at York. In: E. Harris et. al. (eds.) Practices of archaeological stratigraphy (London / San Diego 1993), 89-103.

Rauxloh, P., 2000, Stratigraphy, Residuality and a Relational Database. In: S. Roskams (ed.), Interpreting Stratigraphy. Site evaluation, recording procedures and stratigraphic analysis. BAR Int. Ser. 910 (Oxford 2000), 213-216.

Renfrew, C. / Bahn, P., 1996, Archaeology. Theories, Methods, and Practice. 2<sup>nd</sup> ed. (London 1996).

Spence, C., 1993, Recording the archaeology of London: the development and implementation of the DUA recording system. In: E. Harris et. al. (eds.) Practices of archaeological stratigraphy (London / San Diego 1993), 23-46.

Triggs, J. R., 1993. The seriation of multilineal stratigraphic sequences. In: E. Harris et. al. (eds.) Practices of archaeological stratigraphy (London / San Diego 1993), 250-273.

Watson, B., 2000, MAP 2 Nine Years On: a review of post-excavation procedures. In: St. Roskams (ed.), Interpreting Stratigraphy. Site evaluation, recording procedures and stratigraphic analysis. BAR Int. Ser. 910 (Oxford 2000), 151-155.

### **Papers on *Stratify***

Herzog, I., 2002, Possibilities for Analysing Stratigraphic Data. Paper presented at the Workshop 6 "Archäologie und Computer" held in Vienna 2001. PDF file on CD. Phoibos Verlag, Vienna 2002.

Herzog, I., 2004, Group and Conquer – A Method for Displaying Large Stratigraphic Data Sets. In: Enter the Past. The E-way into the Four Dimensions of Cultural Heritage. CAA 2003. Proceedings of the 31st Conference, Vienna, Austria, April 2003, 423-426.

Herzog, I., 2004, Datenstrukturen zur Analyse archäologischer Schichten. Archäologische Informationen 26/2, 2003, 457-461.

Herzog, I., 2006, No News from Stratigraphic Computing? Paper presented at the Workshop 10 "Archäologie und Computer. Kulturelles Erbe und Neue Technologien" held in Vienna 2005. PDF file on CD. Phoibos Verlag, Vienna 2006.

Herzog, I., Hansohm, J., 2008, Monotone Regression – A Method for Combining Dates and Stratigraphy. Paper presented at the Workshop 12 "Archäologie und Computer. Kulturelles Erbe und Neue Technologien" held in Vienna 2007. PDF file on CD. Phoibos Verlag, Vienna 2008.

### **Other Computer Programs for the Analysis of Stratigraphic Data:**

Ancona, M. / Gianuzzi, V. / Migliazzi, M., 1999, Computer Supported Cooperative Work in the field archaeology: the Ade system. In: Barceló, J. A. / Briz, I. / Vila, A. (eds.), *New Techniques for Old Times*, CAA 98. *Computer Applications and Quantitative Methods in Archaeology*. BAR Internat. Ser. 757 (Oxford 1999), 123-126.

Bobowski, B., 2007. Archaeoscope - interface for 3D stratigraphy visualisation. In: A. Figueiredo, G. Velho (eds.), *The World is in your eyes*. *Proceedings of the XXXIII Computer Applications and Quantitative Methods in Archaeology Conference*, Tomar, March 2005, 151-153.

Bridger, C. / Herzog, I., 1991, Die stratigraphische Methode und ein neues PC-Programm zur Erstellung der Harris-Matrix, *Archäologisches Korrespondenzblatt* 21, 133-144.

Crescioli, M. / Niccolucci, F., 1999, P.E.T.R.A.-Data: an Integrated Environment for Archaeological Data Processing. *Computer Applications and Quantitative Methods in Archaeology 1998*, 133-136.

Herzog, I. / Scollar, I., 1991, A new graph theoretic oriented program for Harris Matrix analysis. In: K. Lockyear / S. Rahtz (eds.), *Computer Applications and Quantitative Methods in Archaeology 1990*, BAR Internat. Ser. 565 (Oxford 1991), 53-59.

Herzog, I., 1993, Computer-aided Harris Matrix generation. In: E. Harris et. al. (eds.) *Practices of archaeological stratigraphy* (London / San Diego 1993), 201-217.

Herzog, I., 1995, Combining stratigraphic information and finds. In: J. Wilcock / K. Lockyear (eds.), *Computer Applications and Quantitative Methods in Archaeology 1993*, BAR Int. Ser. 598 (Oxford 1995), 109-114.

Holst, M. K. 2004. Complicated Relations and Blind Dating: Formal Analysis of Relative Chronological Structures. In: Buck, C. E., Millard, A. R. (eds.) *Tools for Constructing Chronologies*. *Lecture Notes in Statistics* 177. Springer, London/Berlin/Heidelberg: 129-147.

Lamprell, A. / Salisbury, A. / Chalmers, A. / Stoddart, S., 1996, An Integrated Information System for Archaeological Evidence. In: H. Kamermans / K. Fennema (eds.), *Interfacing the Past*. *Computer Applications and Quantitative Methods in Archaeology CAA 95 Vol. I. Analecta Praehistorica Leidensia* (Leiden 1996), 37-41.

Maggiolo-Schettini, A. / Seccacini, P. / Serratore, C. D. / Pierobon-Benoit, R. / Soricelli, G., 1995, SYSAND: a system for the archaeological excavations of Anderitum (Javols, Lozère, France). In: J. Huggett / N. Ryan (eds.), *Computer Applications and Quantitative Methods in Archaeology 1994*, BAR Int. Ser. 600 (Oxford 1995), 229-233.

Ryan, N., 1995, The excavation archive as hyperdocument? In: J. Huggett / N. Ryan (eds.), *Computer Applications and Quantitative Methods in Archaeology 1994*, BAR Int. Ser. 600 (Oxford 1995), 211-220.

### **Internet Sites of other Programs:**

Arched: [www.mpi-sb.mpg.de/%7Earche/StartPage.html](http://www.mpi-sb.mpg.de/%7Earche/StartPage.html)

---

gnet: [www.cs.ukc.ac.uk/people/staff/nsr/arch/gnet/](http://www.cs.ukc.ac.uk/people/staff/nsr/arch/gnet/)

jnet/Strat:

[http://www.epoch.eu/index.php?option=com\\_content&task=view&id=121&Itemid=216/](http://www.epoch.eu/index.php?option=com_content&task=view&id=121&Itemid=216/)

Stratigraf (Proleg Matrix Builder): [www.proleg.com/pmatrixbuilder.htm](http://www.proleg.com/pmatrixbuilder.htm)

Tempo: <http://www.math.ku.dk/~holst/tempo/>

### **Layout algorithms:**

Dalland, M. 1984, A procedure for use in stratigraphical analysis, *Scottish Archaeological Review*, 3(2): 116-127, with comment by E.C. Harris: 127-133.

Di Battista, G. / Eades, P. / Tamassia, R. / Tollis, I. G., 1999, *Graph Drawing. Algorithms for the Visualization of Graphs* (Upper Saddle River 1999).

Kaufmann, M. / Wagner, D. (eds.), 2001, *Drawing Graphs. Methods and Models* (Berlin / Heidelberg 2001)

Paulisch, F. N., 1993, *The Design of an Extendible Graph Editor. Lecture Notes in Computer Science 704* (Berlin / Heidelberg 1993)

Sander, G., 1996, A Fast Heuristic for Hierarchical Manhattan Layout. In: Brandenburg, F. J. (ed.) *Graph Drawing. Symposium on Graph Drawing, GD '95, Passau, Germany September 1995, Proceedings* (Berlin/Heidelberg/New York 1996) 447-458.

Sander, G., 1996, *Layout of Compound Directed Graphs. Technical Report A/03/96, Universität des Saarlandes* (Saarbrücken)

Sugiyama, K. / Misue, K., 1991, Visualization of Structural Information: Automatic Drawing of Compound Digraphs. *IEEE Transactions on Systems, Man, and Cybernetics* 1991, Vol. 21, No. 4, 876-892.

### **Monotone regression:**

Hansohm, J., 2007, Algorithms and error estimations for monotone regression on partially preordered sets. *Journal of Multivariate Analysis* 98, 1043-1050.

## Index

<b>A</b>	
Add another data set to the current project .....	16
<b>B</b>	
Backup or copy the project data .....	16
Bibliography .....	128
Border style .....	33
Border style change .....	97
<b>C</b>	
Check connection between two contexts .....	52
Check coordinates.....	64
Check for connected components .....	67
Check for cycles .....	68
Check strict group chronology.....	82
Chronology checks .....	66
Close a project .....	15
Colour depth .....	74
Colour or border style change.....	97
Combining group and phase layout .....	84
Context: definition .....	6
Context: new entry.....	26
Contracted group layout .....	96
Copying a term file.....	56
Count all or selected units.....	44
Create a new Stratify project .....	13
<b>D</b>	
Data base structure.....	122
Date estimation .....	59
Deleting a project.....	15
Display Harris diagram.....	97
Drawings and photos .....	112
DXF export.....	87
<b>E</b>	
Estimate center year.....	59
Excavation name.....	28
Excavation: set default.....	110
Export stratigraphic data.....	22
Export: Extended Harris List .....	23
<b>F</b>	
Filter: General information .....	102
Filter: bottom / top contexts.....	107
Filter: contexts later than/earlier than context .....	108
Filter: contexts not part of any group / work area.....	106
Filter: contexts part of a group / work area.....	109
Filter: groups / work areas without members .....	109
Filter: Relations of selected unit(s).....	109
Filter: units of a certain excavation.....	103
Filter: units of a certain unit class.....	103

---

## Stratify 1.5

---

Filter: units with a certain field condition.....	103
Filter: units with a certain field value .....	104
Filter: units with an empty field value (or with a non-empty entry) .....	104
Filter: units with number/date in a range .....	105
Filter: unrelated contexts .....	106
Filter: unrelated units.....	106
Filtering unit data.....	101
Find a unit in the diagram.....	93
Find a unit in the list.....	44

### G

Group hierarchy example .....	117
Group hierarchy example showing phases .....	118
Group layout example .....	83
Group: contract.....	95
Group: new entry .....	26
Groups and phases layout example.....	85

### H

Harris diagram fundamentals.....	8
Harris diagram layout .....	75
Harris diagram preferences.....	94
Harris diagram window .....	86
Harris program list file .....	21
HPGL export .....	88
HTML reports.....	46

### I

Import stratigraphic data.....	17
Import, set the field concordance.....	19
Import: CSV options.....	18, 19

### J

JPEG format .....	89
-------------------	----

### L

Layout and check dialogue.....	63
Layout example .....	76

### M

MapInfo export.....	90
Monotone regression .....	59

### N

Navigate through the relationships .....	57
Number of colours .....	74

### P

Path and prefix of photos and drawings.....	112
Phase example layout .....	79
Phase layout example .....	80
Phase or period date ranges .....	62
Photos and drawings.....	112, 114

---

## Stratify 1.5

---

Photos/Drawings button .....	114
Preferences, Harris diagram.....	94
Print a list of units.....	45
Print: HTML reports.....	46
Printing the diagram .....	92
Project file .....	14
Project: delete .....	15
Protocol file - check and layout.....	71

### R

Random number generator seed .....	70
Refresh unit and relationship lists.....	11
Relationship comment change.....	52
Relationship deletion .....	51
Relationship: create a new .....	48
Relationships .....	47
Relationships stratigraphic - definition.....	7
Relationships: create chainlike .....	50
Relationships: redundant .....	70

### S

Search and replace .....	39
Select fields for display in list view and form view.....	111
Set default values for field entries .....	40
Set the path and prefix of photos and drawings.....	112
Show group hierarchy / Show unit list.....	115
Show groups.....	81
Show projection of context coordinates.....	65
Simulating stratigraphic data .....	119
Split a unit.....	41
Stratify concepts .....	5
Stratify user interface.....	11
Stratigraphic relationships .....	7
Stratigraphic Unit .....	6
SVG format .....	91

### T

Term change .....	55
Term deletion.....	56
Term editing functions.....	55
Term entry .....	54
Term file creation and maintainance .....	53
Thematic box styles .....	98
Thematic context style assignments .....	99
Toolbar .....	12
Two or more excavations.....	110

### U

Unit classes.....	10, 26
Unit entry: other fields.....	29
Unit information mode .....	93
Unit name .....	28
Unit: copy .....	36
Unit: delete .....	36
Unit: edit.....	34

---

## Stratify 1.5

---

Unit: editing functions .....	35
Unit: find .....	44
Units: combine.....	43
Units: merge .....	42
Units: with consecutive numbers.....	37

### W

What other information may be available?.....	126
Why automatic layout?.....	124
Why other chronological information?.....	125
Work area: new entry .....	26