Origin 8.5 Getting Started Booklet

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Table of Contents

1 Installation and Startup

1.1 Introduction

Welcome and thank you for using Origin 8.5! In this guide, unless otherwise noted, "Origin" will be used to refer to both Origin and OriginPro.

Origin 8.5 is a Windows application. You can run Origin on an Intel-based Mac if you have installed virtualization software and set up a virtual computer with Windows installed on it. For more information, see the OriginLab website.

There are three steps that must be completed to prepare Origin for use:

- Installation
- Selection of a User Files Folder
- License Management

An Administrator log in account is required to install Origin. However, for selection of a User Files Folder and for completing the license management, Administrator permissions are not needed.

1.2 Installing Origin

Both the Origin 8.5 Product and the Upgrade install into a new program folder - the Upgrade does not update a previous version. Thus, if installing an Origin Upgrade, you do not need to have your previous version of Origin installed, although you can have it installed.

The startup program that launches when you insert the Origin 8.5 DVD in the DVD drive includes an Origin 8.5 installation button. If this startup program does not run automatically, you can browse the DVD to launch the startup program, or browse the DVD to launch the Origin 8.5 installer.

In addition to the Origin 8.5 script-based installer that runs from the DVD startup program, an MSI installer is provided on the DVD. The MSI installer is ideal for use at Origin 8.5 multi-user sites, as you can use the MSI installer to build an Origin installation package for distribution. Sample MSI transforms are provided on the DVD.

For more information on multi-user site deployment, see the Support area of the OriginLab website.

1.2.1 Installation Settings

The following information is entered or selected during an Origin 8.5 installation:

- User and organization name
- Origin serial number

- Origin destination program folder
- Whether to install Origin Help documentation
- Whether to install pre-compiled Origin files
- Whether to install data import filters
- Whether to allow this Origin to be available for all Windows log-in users on the computer, or just the current Windows log-in user
- Program folder for the Origin program icons

1.2.2 How to Proceed if you already have the Origin 8.5 Evaluation Installed

If you already have the Origin 8.5 Evaluation installed on your computer, you can convert the Evaluation into a Product or Upgrade. To do this, you must log into the computer with an Administrator account.

Run the Origin 8.5 Add or Remove Files program located in the Origin program icon folder. Alternatively, simply re-run the Origin 8.5 installer. In both cases, the Origin Setup program displays, providing options to Modify, Remove or Repair. Select the Modify option and click Next. Then select "Install Product (requires serial number)" and click Next. Proceed as prompted to complete the conversion process.

1.2.3 How to Make Corrections and Changes After you Complete an Installation

If you installed Origin with an incorrect serial number, or if you did not install the Help files or the pre-compiled Origin files and you later want them installed, you can make these changes by running the Origin 8.5 Add or Remove Files program located in your Origin program icon folder. In both cases, select the Modify option in the Origin Setup program and click Next.

- To correct a serial number, click Yes to change your serial number and proceed as prompted.
- To install the Help or pre-compiled Origin files, click No to change your serial number and proceed as prompted.

If you selected "Current user only" in the All Users or Current User Setup page and you meant to select "All users", or the other way around, you can correct this by editing the InstInfo.INI file located in your Origin 8.5 program folder. This file contains an [OriginUsers] section with one line of text:

LogonUserName=*value*

You can set *value* to AllUsers or you can set it to the log-in user name you want to restrict access to. After you make this change and restart Origin, you may see a licensing dialog box again. In this case, repeat the licensing process as directed.

1.3 Selecting a User Files Folder

After installing Origin, each Windows log-in user that runs Origin must select a User Files Folder at their first Origin startup. The User Files Folder is the default location for saving and opening files for that log-in user.

Consider these points in selecting your User Files Folder:

- If you have a mobile computer, it is best to select a User Files Folder location on your computer rather than on your network.
- For non-mobile computers, you can select a User Files Folder location on the computer or the network, as long as you have stable access to the folder.
- Do not select the same User Files Folder as other Origin users, unless you want to share your custom files. For more information, see **OriginLab:Sharing Origin Files**.
- If you upgraded from Origin 8.1 or 8.0, you must select an Origin 8.5 User Files Folder different from your Origin 8.1/8.0 User Files Folder. To learn how to transfer files from your 8.1/8.0 folder to your 8.5 folder, see **Notes for Upgrade Users**.

At each Origin startup, Origin will check that your User Files Folder is accessible. If Origin cannot connect to the User Files Folder, you must select a new folder. Also, a **Tools:Change User Files Folder** menu command is provided to easily change the User Files Folder location.

If you are deploying Origin to multiple computers, or if there will be multiple log-in users running Origin on a computer, you may consider presetting the User Files Folder location. This can be done by editing the Path key in the [User Files] section of the Origin.INI file, located in the Origin program folder. Comments are provided in the Origin.INI file to assist you.

For more information on multi-user site deployment, see the Support area of the OriginLab website.

1.4 Licensing Origin

All Origin packages include license management. The type of license management provided with your package is determined at the time of your Origin purchase. License management models include, but are not limited to, the following:

- Node-locked license management - Each Origin computer requires a license file to run. The number of licenses available is restricted to the purchased number.
- Concurrent network management - A FLEXnet license server is set up to provide the license management. All Origins connect to the FLEXnet license server to check out a license. The license server counts and restricts the number of Origins that can run concurrently.
- Dongle - A dongle (USB hardware key) is provided with the Origin package and must be present in the computer's USB port to run Origin.

For concurrent network and dongle management, the licensing process does not require a Windows log-in account with Administrator permissions. However, for node-locked packages, Administrator permissions are required. Once Origin is properly licensed, then it is licensed for all log-in users on that computer.

For all packages that except dongle management, a licensing dialog box will display when you first start Origin. This same licensing dialog box will display on future startups if Origin remains unlicensed. You must complete the licensing process to use Origin.

- For a node-locked package, use the licensing dialog box to obtain a license for the computer from the OriginLab website. If the computer does not have internet access, select that option in the dialog box to learn how to complete the process.
- In the concurrent network package, use the licensing dialog box to enter the location of the FLEXnet license server.

For information on setting up the concurrent network license management, see the guide provided in your Origin concurrent network package or see the Support area of the OriginLab website.

1.5 Registering Origin

Registering Origin is a prerequisite for Origin support from OriginLab and the team of Origin Distributors. Also, registration activates the Origin **Help:Check for Updates** menu command. Check for Updates allows you to check if a patch or updated Help files are available for your Origin, and to obtain those updates. Thus, although registration is optional, it is recommended.

If you have an Origin package with node-locked license management, your Origin is automatically registered after you successfully complete the licensing process. You can verify this by selecting **Help:About Origin**. The About Origin dialog box will display the Registration ID assigned to your Origin package.

For all other license management packages, a Registration dialog box displays when starting a licensed - but unregistered - Origin. Use the Registration dialog box to register your Origin on the OriginLab website. During this process, a Registration ID is issued. Enter or copy/paste this Registration ID into the Registration dialog box to complete the process. The **Help:About Origin** dialog box will now display your Registration ID.

1.6 Setting the Origin Display Language

Origin packages sold to organizations in a limited number of countries including Japan, Germany, Switzerland, Austria, and Liechtenstein may support running Origin with English display or with Japanese or German display. This language control is available by selecting **Help:Change Language**.

1.7 System Transfers - Deactivating a License

1.7.1 Node-locked Licenses (Computer ID-based)

A system transfer is required if you plan to replace your licensed Origin computer with a different computer.

- If Origin can still run on your computer:

Run Origin and select **Help:Deactivate License**. After successful deactivation, your Computer ID will be removed from Originlab's server so that you can install and activate on another computer.

- If your licensed Origin computer is no longer available:

You must contact your local Origin Distributor or OriginLab Technical Support to complete the system transfer process.

1.7.2 Concurrent Networks

A system transfer is only required if you need to replace the FLEXnet license server. It is not needed when replacing an Origin computer.

To obtain a replacement FLEXnet license server license file, contact your local Origin Distributor or OriginLab Technical Support.

1.7.3 Dongles

A system transfer is not needed when replacing a dongle-managed Origin computer.

1.8 Uninstalling Origin

To uninstall Origin, run the Origin 8.5 Add or Remove Files program located in the Origin program icon folder, or use the Windows "uninstall a program" tool. In both cases, the Origin Setup program displays providing options to Modify, Remove or Repair. Select the Remove option and complete the wizard as prompted.

The Remove program deletes all folders and files that were installed by the Origin 8.5 setup program. It also deletes folders and keys created by the installer in the Windows Registry.

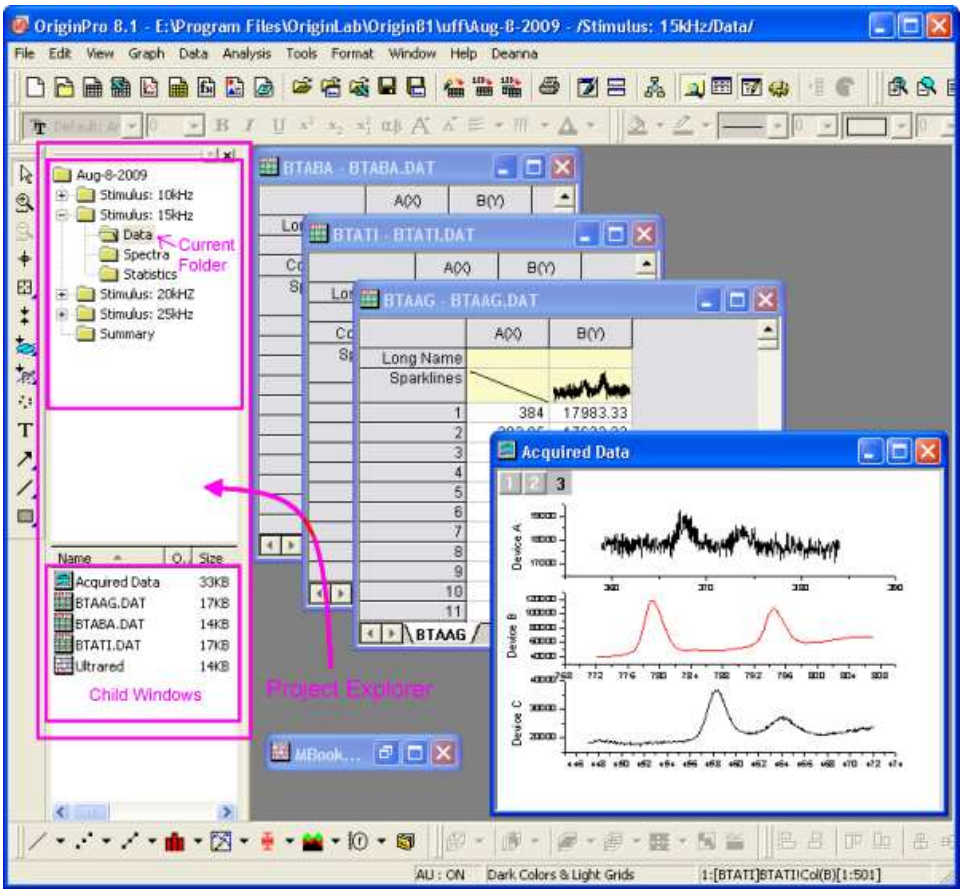
2 Introduction to Origin

2.1 The Origin Project

The **Origin Project** file (.OPJ) combines data, notes, graphs, and analysis results in one flexibly structured document. All components of an **Origin Project** can be interactively accessed when the project file is opened in Origin. **Origin Project** files can also contain attachments of internally saved Microsoft Excel files or links to external Excel files, LabTalk script and Origin C code files, and third party files.

Combined with the ability to recalculate results on a change of input data or change of analysis parameter settings, the **Origin Project** can function as an **Analysis Template** for performing repeat analysis on multiple sets of similar data.

The dockable **Project Explorer** window in the Origin interface helps you organize and interact with various components of an **Origin Project**. Components such as workbooks, matrix books, graph pages, and notes windows can be organized in a user-defined folder structure with the flexibility of adding subfolders to any desired level. In a given Origin session, only one **Origin Project** file (or **OPJ**) can be opened in Origin, although you can append multiple files from a disk, or save a particular folder (and the subfolders there-in) to a separate OPJ file on the disk. Individual windows, such as workbooks and graphs, can also be saved to the disk and opened in order to be added to the currently open project.



Project Explorer is similar in form and function to Windows Explorer. The component windows can be sorted by name, date, size, or time, and options are provided to display additional properties such as window Long Names, or window order within a given subfolder. Context menus in **Project Explorer** provide various options including launching a slide show of all the graphs contained within a folder, or appending other Origin Project files from a disk.

Recognition and understanding of the organizational structure of the **Origin Project**, combined with a good understanding of the structure and features of the Origin Workbook and Matrix book, are important in order to make efficient use of these features to organize your data and associated graphs, notes, and analysis results in the optimal form based on your specific needs.

2.2 Hierarchy of Origin Objects

The following sections provide basic information on the hierarchy of the **Workbook**, **Matrix Book** and **Graph Window** objects in Origin. Further details on the hierarchy of these and other objects can be found in the Origin Help file.

2.2.1 Workbooks

The Origin **Workbook** is organized as a collection of **Worksheets**. A workbook can contain multiple worksheets, also known as **Layers**, each of which is identified by a unique name and can be referenced by name or index, numbered left to right.

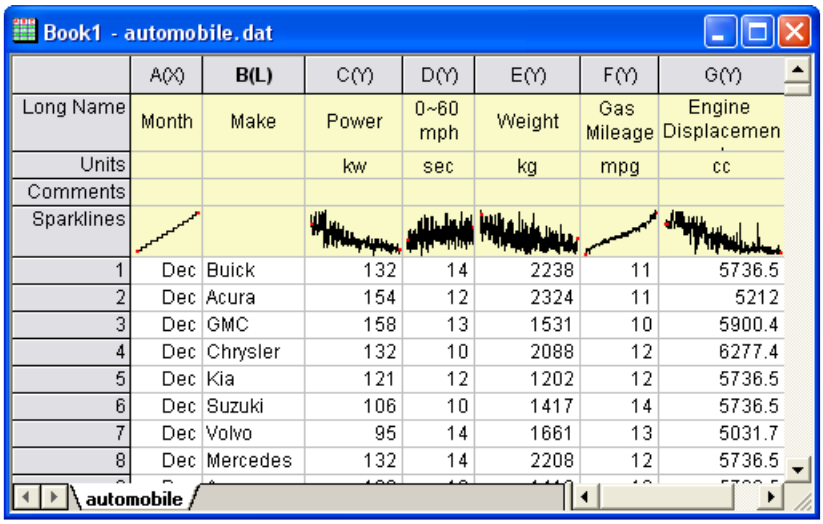
A worksheet contains a collection of **Columns**. Each column can be set to one of many data formats such as **Text & Numeric**, **Numeric**, **Text**, **Date**, and **Time**. Individual cells or groups of cells in a column can be formatted by customizing properties such as font, color, or number of decimal digits to display. However, a single column can contain only one type of data at a given time. Columns can be referenced by name or index, numbered left to right.

All columns have fixed properties (or metadata) situated in **Label Rows** at the top of each column, that include a **Short Name**, a **Long Name**, **Units**, and **Comments**. The values of these properties are used to address and represent the data columns within the Origin graphical interface, including various dialogs. Such properties are also utilized to annotate graphs when graphs are created from data stored in worksheet columns. You can also add custom label rows called **User Parameters** that can be assigned arbitrary names.

Numeric data stored in a column can be graphically displayed in the column header, in a special label row named **Sparklines**. A column's sparkline is a small inset plot of the data in that column, plotted as the dependent variable (Y) against the row number as the independent variable (X). Origin displays sparklines by default when data is imported into the columns. The display of sparklines can also be turned on or off by the user from the Column menu or from the context menu available when you right-click on the column header.

Worksheet columns also have a **Plot Designation** property that includes the designations **X**, **Y**, **Z**, **Y Error** and **Label**. This plot designation property allows graphs to be quickly created by selecting columns, and is also used by various dialogs in Origin to automatically recognize and assign input data for various operations such as curve fitting.

The **Column Properties** dialog allows you to customize various properties of the column including name, plot designation, format and subformat. This dialog is accessible by double-clicking on the column header and also from the right-click context menu.

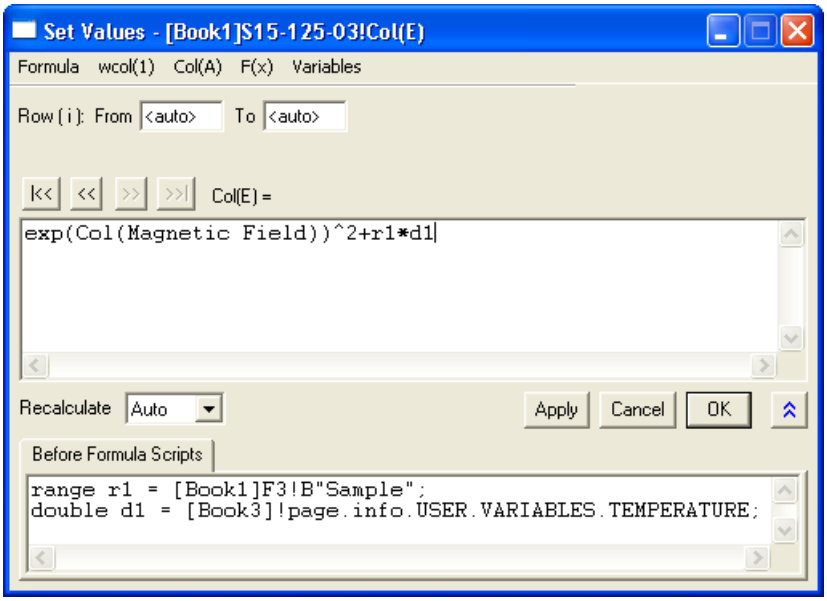


Book1 - automobile.dat

	A(X)	B(L)	C(Y)	D(Y)	E(Y)	F(Y)	G(Y)
Long Name	Month	Make	Power	0~60 mph	Weight	Gas Mileage	Engine Displacemen
Units			kw	sec	kg	mpg	cc
Comments							
Sparklines							
1	Dec	Buick	132	14	2238	11	5736.5
2	Dec	Acura	154	12	2324	11	5212
3	Dec	GMC	158	13	1531	10	5900.4
4	Dec	Chrysler	132	10	2088	12	6277.4
5	Dec	Kia	121	12	1202	12	5736.5
6	Dec	Suzuki	106	10	1417	14	5736.5
7	Dec	Volvo	95	14	1661	13	5031.7
8	Dec	Mercedes	132	14	2208	12	5736.5

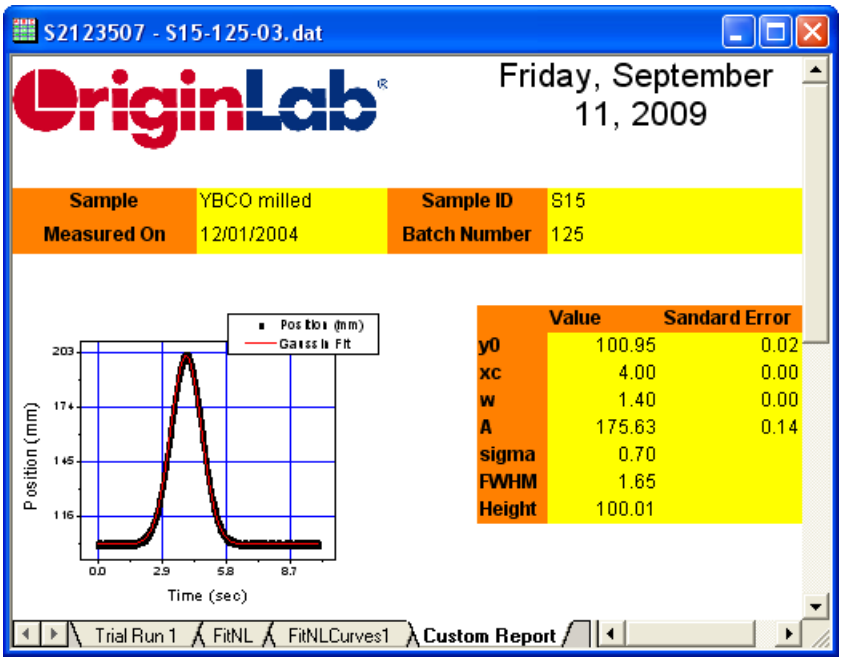
automobile

The **Set Column Values** entry in the **Column** menu opens a **Set Values** dialog which can be used to fill a column with values. The formula can refer to other columns in the same sheet, and can utilize various mathematical, statistical, and other functions available from the **F(x)** menu in the dialog. The **Before Formula Script** panel at the bottom of the dialog can be utilized to execute any LabTalk script prior to computation of the main column formula. The **Variables** menu provides a flexible interface in which to insert LabTalk script commands to access columns and other metadata contained in any sheet or book in the Origin Project.

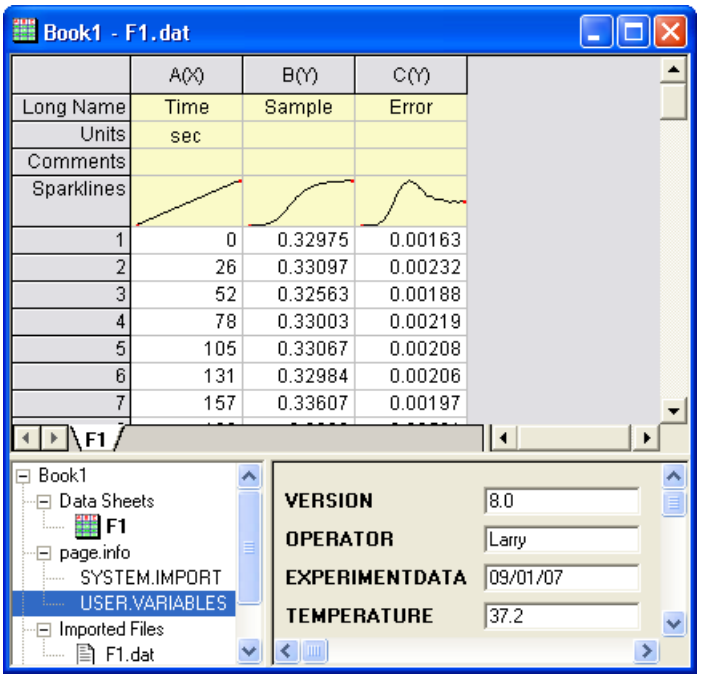


Various properties of the workbook can be customized using the **Worksheet Properties** dialog

accessible from the **Format** menu. Worksheet cells can contain links to cells in other worksheets or report sheets, and can also contain embedded graphs and images from external disk files, or images corresponding to matrix objects contained in the Origin Project. Groups of cells in a worksheet can be merged, allowing for objects such as embedded graphs to be displayed over a larger area. These features, when combined, allow for the worksheet to be utilized as a flexible document for creating custom reports that summarize graphs, images, and results. Such custom reports created using the worksheet can then be exported as image files, such as PDF or JPEG, and can also be used for presenting results as part of **Analysis Templates**.

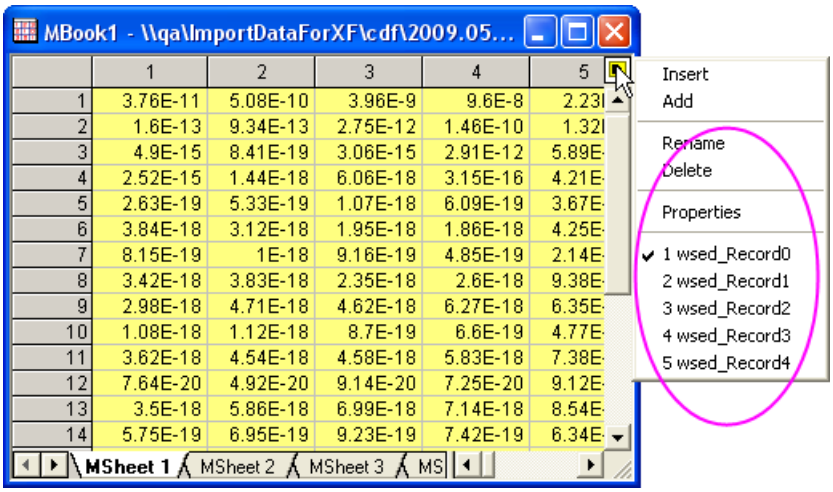


The workbook can contain additional metadata, such as properties of data files imported into the worksheet, including variables that may have been extracted from header lines contained in the data file. Such metadata can be viewed in the **Workbook Organizer** panel accessible in the context menu that opens when you right-click on the worksheet window title. The metadata is then available for access in dialogs such as the **Set Values** dialog for setting column values.

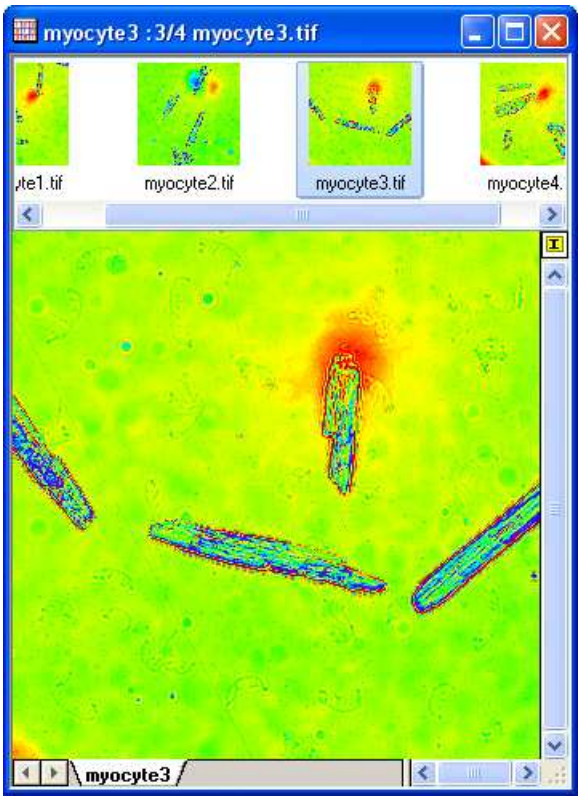


2.2.2 Matrix Books

The **Matrix Book** in Origin is a collection of **Matrix Sheets** or **Layers**. Each matrix sheet can in turn contain multiple **Matrix Objects**. Each matrix object is a two-dimensional array of numbers. The data types supported include floating point, integer and complex.

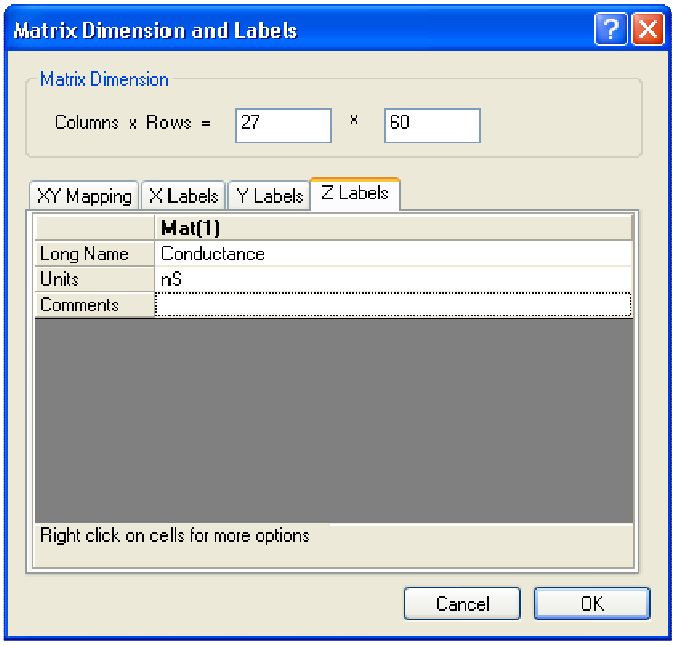


Matrix objects in a matrix sheet can also be viewed as image thumbnails. With the matrix sheet active, select **View: Show Image Thumbnails** from Origin's main menu, or from the right-click context menu of the matrix window title bar.

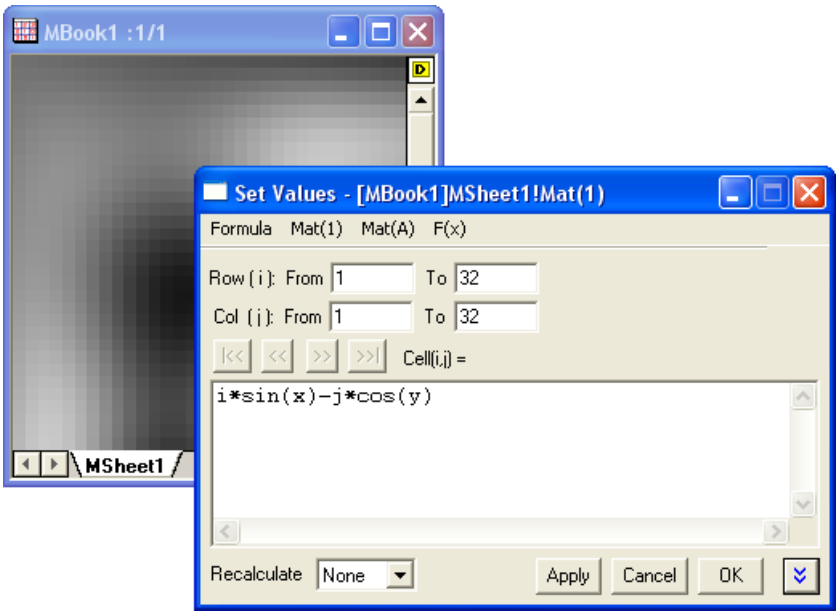


Each matrix object has associated X and Y coordinates. You can assign arbitrary begin and end values for X and Y coordinates, and those values will be used to create a linear map of coordinate values in X and Y. The coordinate values are used by Origin to set the axes when creating plots such as 3D Surface or Contour plots from the matrix data, and also by analysis operations such as surface fitting.

The matrix dimensions, coordinates and X/Y/Z Labels, including Long Name, Units and Comments, can be customized using the **Matrix Dimension and Labels** dialog. The matrix data type, display, and Z Labels can be controlled using the **Matrix Properties** dialog. Both dialogs are accessible from the **Matrix** menu. All matrix objects contained in a given matrix sheet share the same dimensions property (number of cells in X and Y) and X/Y Labels, although each can have different settings for properties such as data type, display and Z Labels.



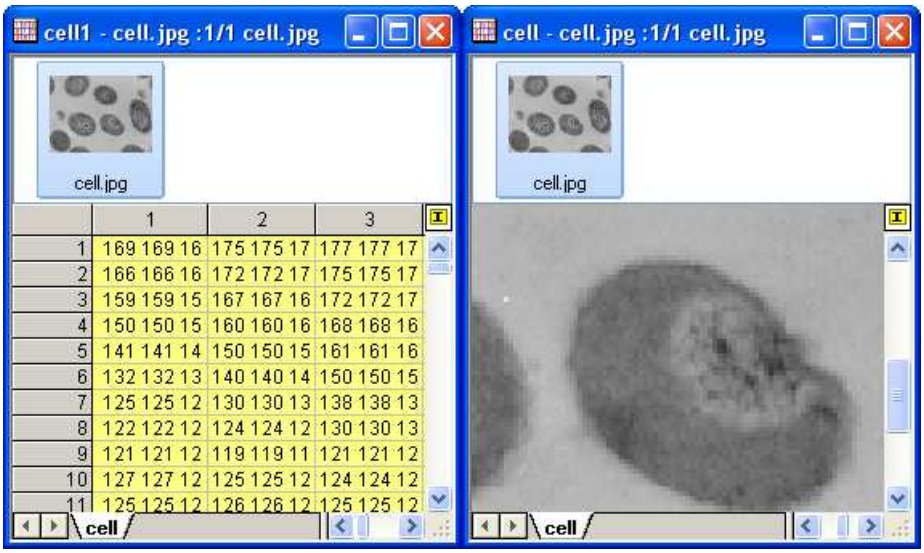
The **Set Values** dialog also accessible from the **Matrix** menu, and allows you to specify a formula for generating the numbers in a matrix.



When a matrix contains numeric data, the top right corner of the window displays a **D** icon. A

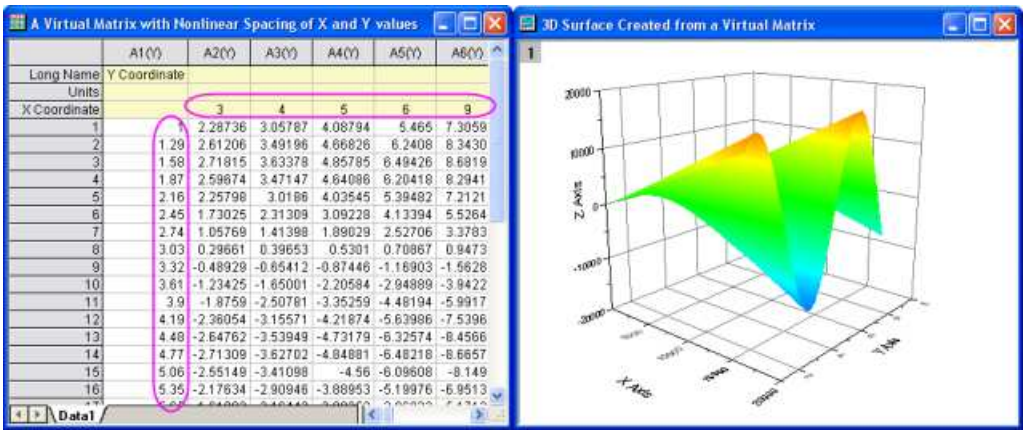
matrix object can also contain an image, such as an image imported from a disk file, instead of numeric data. When a matrix object contains an image, the top right corner displays an **I** icon. Basic image processing tools in Origin can operate on images stored in matrix objects. Images can be converted to numeric data and vice versa using menu items under the **Image** menu.

As mentioned earlier, all matrix objects in a matrix sheet can be viewed as thumbnail images. The bottom panel of the matrix window can display only one matrix object from one matrix sheet at a given time. Depending on whether the matrix object contains an image or numeric data, the display can be toggled between **Data Mode** and **Image Mode**, using the **View** menu. In **Data Mode** the display can also be toggled to either show the X and Y index or the actual X and Y coordinates, using the **View** menu.



2.2.3 Virtual Matrix

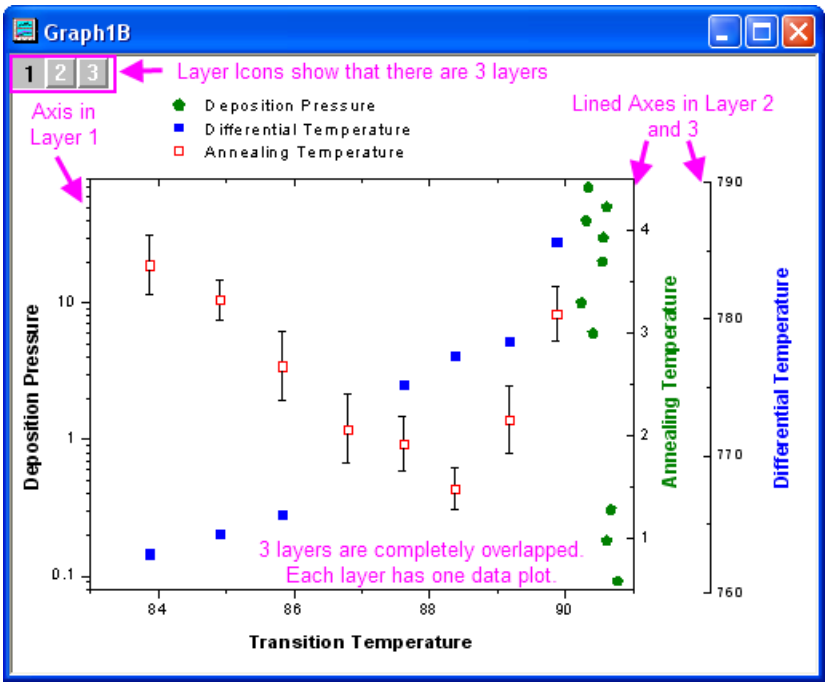
Data arranged in a group of worksheet cells can be treated as a **virtual matrix**, and such data can be used to create 3D plots, such as color mapped surfaces or contour plots. The X and Y coordinate values can be contained in data rows/columns or label rows of the worksheet. Nonlinear spacing of X and Y values is also supported.



2.2.4 Graph

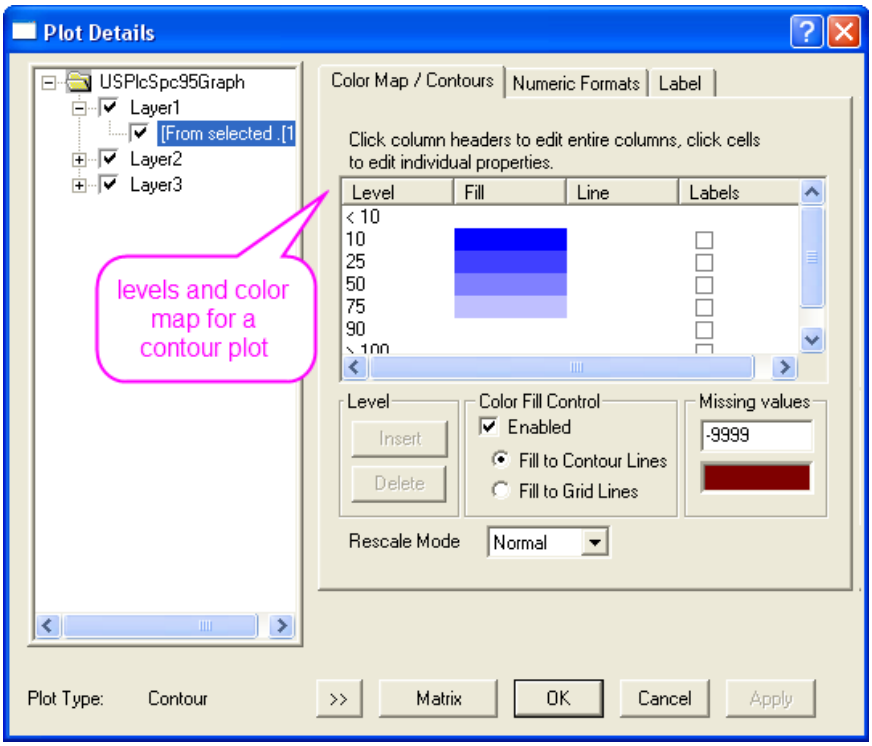
An Origin **Graph Page** can contain multiple **Graph Layers**, where each layer is comprised of a set of axes. Each graph layer can in turn contain multiple **Data Plots**. A **Data Plot** is simply a plot of one data set.

Graph layers can be separate from each other or can physically overlap in the graph page. The axes in one layer can also be linked to axes of other layers. This hierarchy provides a very flexible way to present multiple data plots in one graph in multiple layers, at the same time maintaining desired relationships between the data plots.

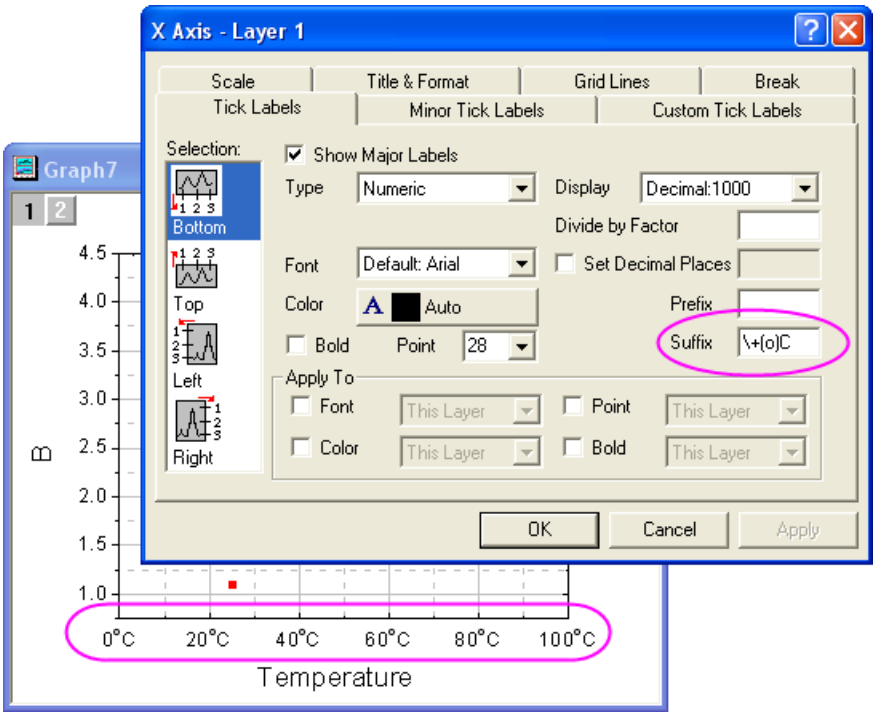


The **Plot Details** dialog, accessible from the **Format** menu or by double-clicking on a data plot, provides a hierarchical interface for setting properties of the graph, such as:

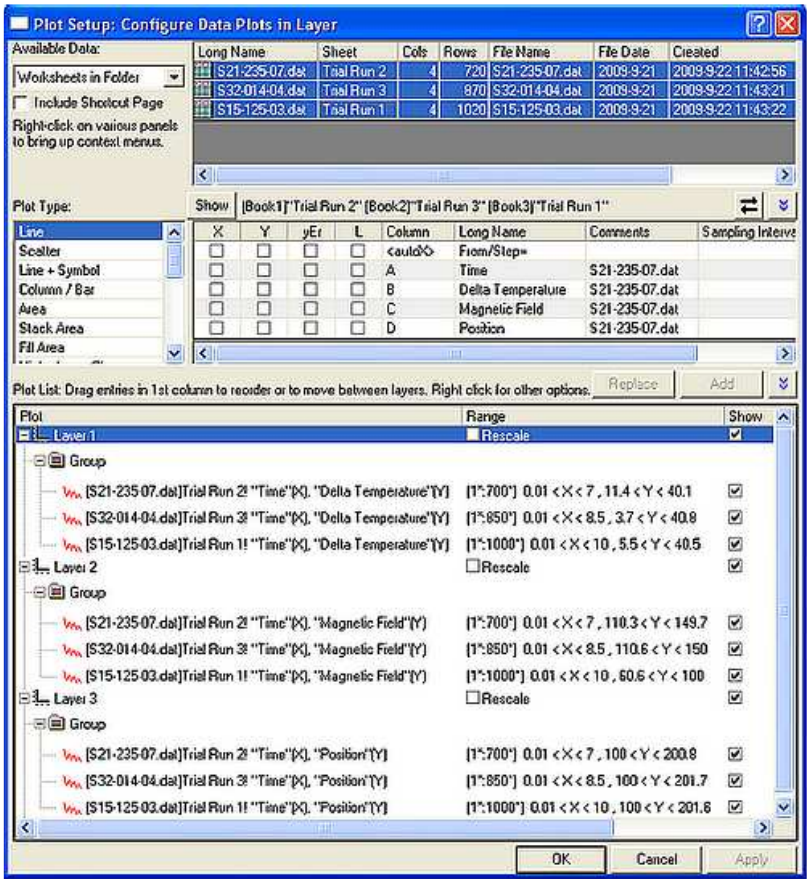
- Page level - Page dimensions, colors, legend, etc.
- Layer level - Layer dimensions, linking, colors. etc.
- Dataplot level - Specific formatting for each plot style.



Double-clicking on any axis of a layer opens the **Axis Dialog**, which can be used to set properties of the axes such as tick directions, grid lines, and display format of tick labels.



The **Plot Setup** dialog, accessible by double-clicking on the **Layer Icon**, provides a flexible interface for adding or removing data plots from the graph layers, reordering data plots, and other operations such as grouping or un-grouping plots in a layer. This dialog also opens when the user selects a particular graph template without pre-selecting data columns. In this mode the dialog becomes the primary tool for creating new plots using an existing template, and it offers the flexibility of selecting multiple data sheets in the project, and also flexible assignment of data columns, such as the ability to select which column to use for X and which column to use for Y, in the case of a 2D plot.



2.3 Operations and Recalculation

Starting with version 8, results of various operations in Origin can be updated when source data is changed, such as when new data is imported to replace old data, or when a user decides to recall and change parameters of the operation. This feature is referred to as **Recalculation**. Dialogs for various operations, such as setting values of columns based on other columns, extracting worksheet data based on conditions of the data, or nonlinear curve fitting of data, provide a control for users to specify whether the **Recalculate** feature should be turned on, and whether the output should automatically update (**Auto**) or update when manually triggered (**Manual**).

If **Recalculate** is set to **Auto** or **Manual**, Origin saves all pertinent information related to the operation. For instance, if **Recalculate** is set in the **Set Values** dialog for setting column values, information about the source column(s), the formula itself, and any Before-Formula

script are saved. If the operation is related to curve fitting, the details of the operation, including source data, what reports have been generated, and all settings relevant to the fitting, are saved.

Operations that have **Recalculate** enabled are marked by displaying a lock on all output objects, such as worksheet columns and graph layers, related to the operation. The lock icons look like this:

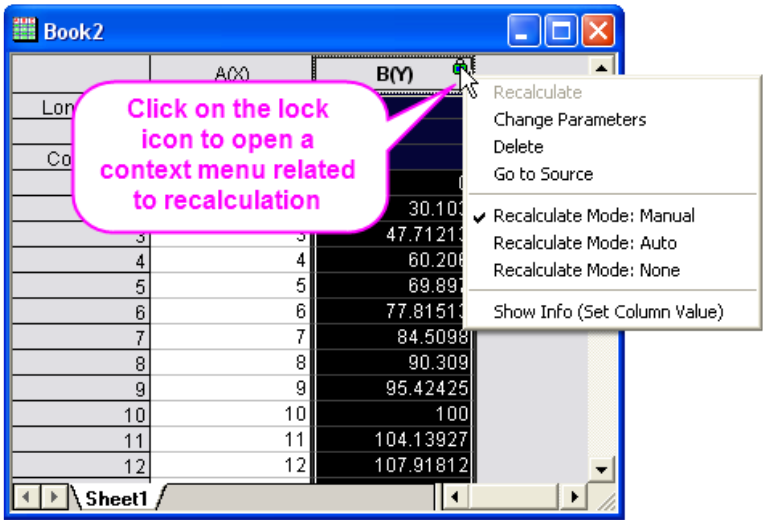
Recalculate Auto	Recalculate Manual	Recalculate Manual—Needs Updating
		

A green lock means that output is based on the most current data. A yellow lock means that the output is based on previous data, and needs updating. Various options for managing the operation are available via the context menu displayed when clicking on the lock. For example, the user can click on the lock and select **Change Parameters**, which will then display the dialog associated with the operation, loaded with the exact settings used at the time the operation last executed. Users can change the settings and close the dialog to update the output with results from the changed settings.

The lock icon is object-specific— each worksheet column or graph layer for which recalculation is turned on will have its own lock, indicating whether the data has been updated or needs updating. There is also a project-level indicator for recalculation on the Standard Toolbar:

All Outputs Updated	Outputs Need Updating
	

If one or more outputs in the current project need recalculation, this icon will become yellow. Clicking this button will update all operations for which input data has changed. This button is grayed out if recalculation is not active anywhere within the project.

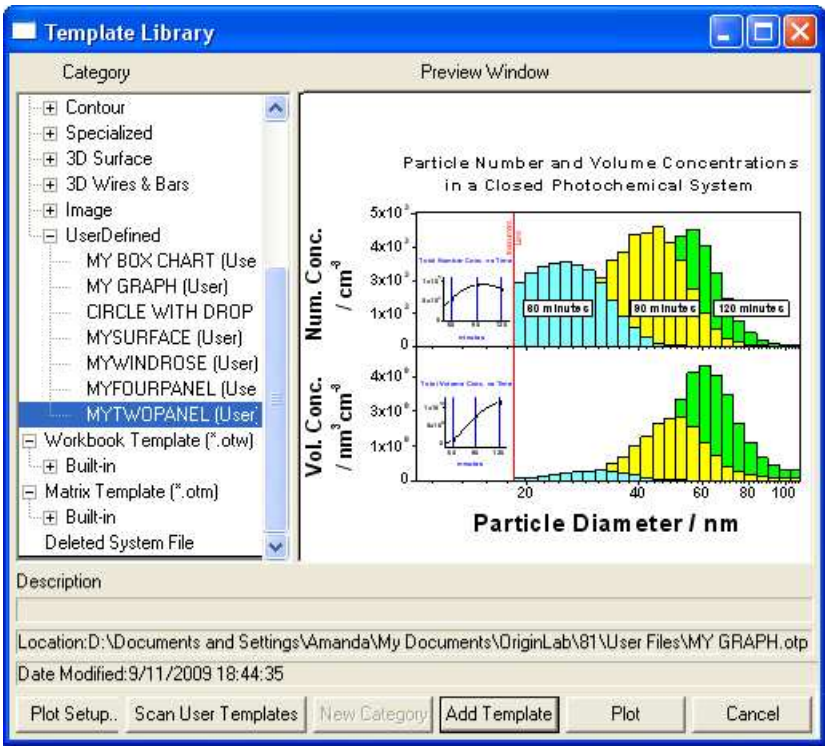


2.4 Themes and Templates

The hierarchy of Origin objects (such as graph pages), combined with extensive object properties, lends itself to creating custom settings for repeat use. Origin provides the concept of **Templates** and **Themes** for customization, and these are described briefly in the following sections. For detailed information please refer to the Origin Help file.

2.4.1 Templates

Customization performed on objects such as a Graph page or a Worksheet can be saved as a **Template** for repeat use. For instance you can customize a graph page to add multiple layers, set relationships between layers, and further customize data plots and then save all of these as a **Graph Template** (.OTP) for repeat use. In fact, Origin is shipped with close to 150 graph templates already built in. You can further customize them or create new ones for your specific needs. Once you customize a graph, a graph template can be saved using the **Save Template As** menu item under the **File** menu. The template can then be accessed for plotting, using the **Template Library** menu item available from the **Plot** menu.



The concept of templates extends to workbooks (.OTW) as well as matrix books (.OTM), where custom settings such as font, color, display format, custom header rows in the case of workbooks, and custom dimension and coordinate settings in the case of matrices, can all be saved as a template for repeat use.

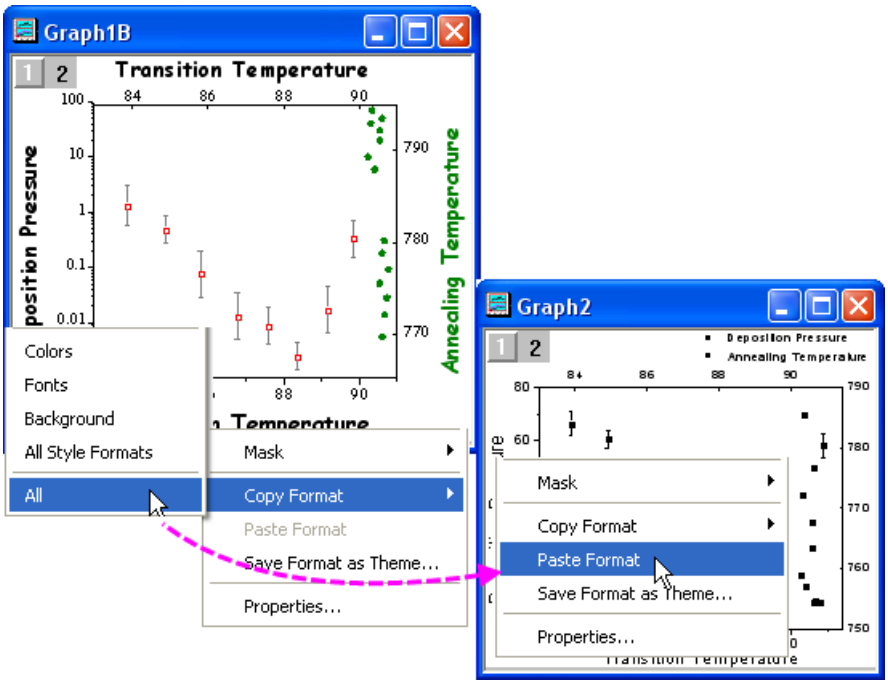
Origin also extends the template concept to **Analysis Templates**, where operations on data, even such complex ones as curve fitting with custom report sheets, can all be saved as a template for repeat analysis of similar data. The Analysis Template, and the ability to perform batch processing using such a template, is described in another section in this booklet.

2.4.2 Themes

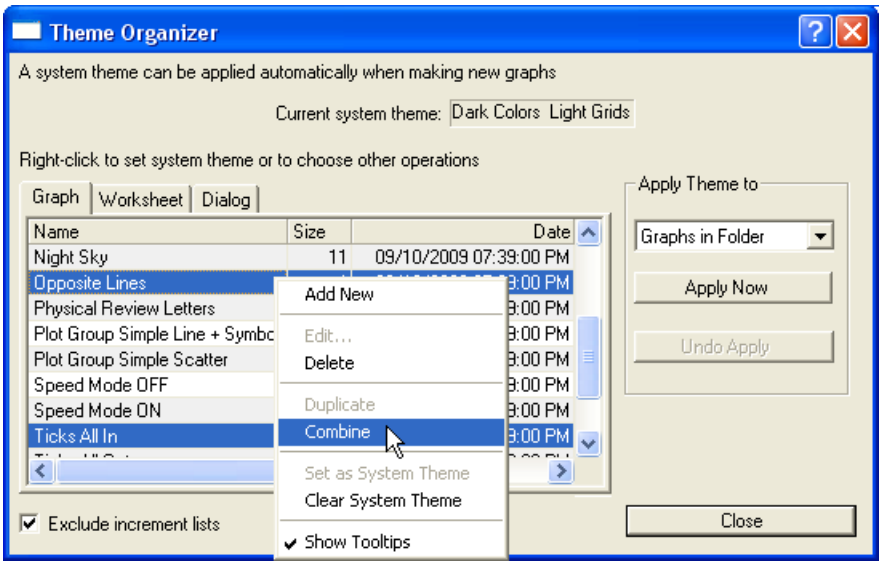
Origin also provides a **Theme** concept, wherein a set of object properties can be saved as a theme file for repeat use. In the case of a graph window, a theme could be as simple as settings for direction of the axes tick marks, or can be as extensive as desired containment of multiple graph object properties. Themes can also be saved from a worksheet.

In the case of graphs, the theme concept provides you with the ability to quickly change the look of a graph. One could for example apply a **Black and White** graph theme to a graph containing elements of various colors, to make the graph ready for publication. Properties of objects in one graph can be applied to another graph in the same Origin Project using the theme concept. You can right-click on a graph window and select the **Copy Format** context menu to select either all or certain collections of properties, such as font settings, and then

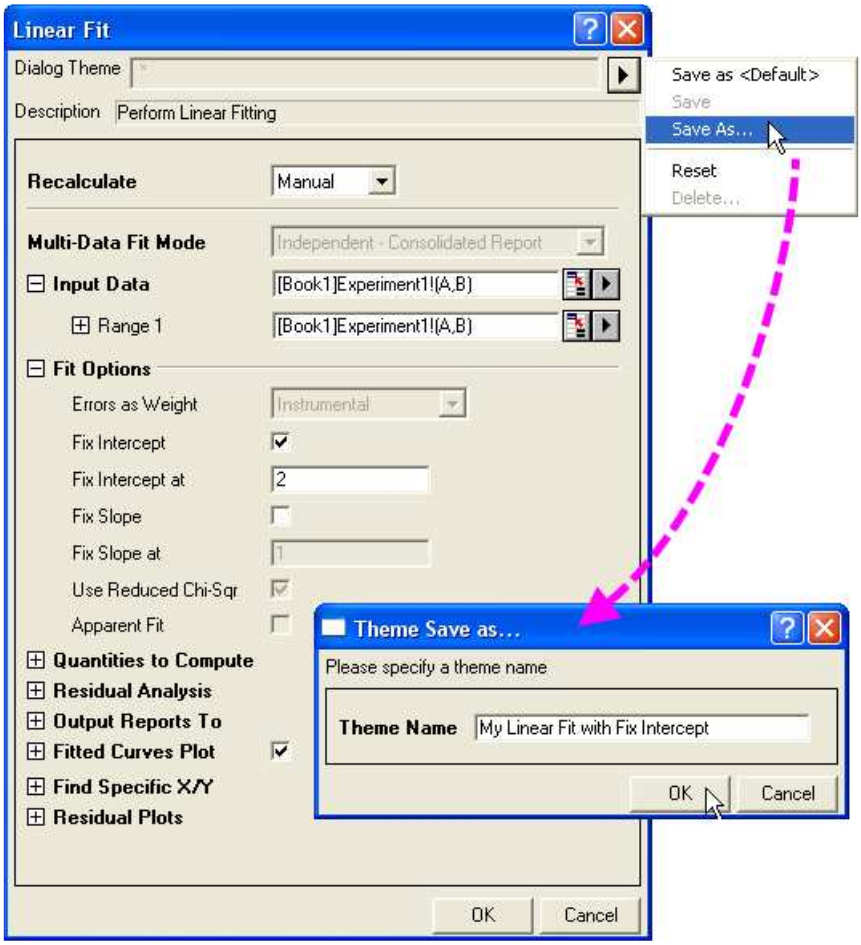
right-click on another graph and select **Paste Format** to apply the settings to that graph. Such a copy and paste format procedure can be applied to single elements, for example copying only the settings of a scatter plot from one graph to another.



The **Theme Organizer** dialog, accessible from the **Tools** menu, can be used to organize and apply themes to graphs and worksheets. This dialog can be used, for example, to apply a specific graph theme to all graphs contained in the Origin Project. Multiple graph themes can also be combined by first control-selecting desired themes and then accessing the **Combine** context menu item available in the right-click menu. This context menu also provides an option to edit a theme, allowing the user to add or delete properties to/from an existing theme.



Origin also extends the concept of themes to dialog settings. You can thus customize settings of a dialog, such as the **Smoothing** dialog under the **Analysis: Signal Processing** menu, and then save your desired settings to the disk, as a named theme file. Multiple theme files can be saved for each dialog and then recalled from the dialog, allowing each dialog to be customized in different ways, i.e. for processing data from different experiments.



2.5 Sharing Origin Files

During the course of using the product, you may customize Origin for your specific needs and may want to share your customization with other Origin users. Such customization can include **Graph Templates** (.OTP) and **Themes** (.OTH), **Analysis Templates** (.OGW or .OPJ), **Dialog Themes** (.OIS), **Curve Fitting Functions** (.FDF), **Import Wizard Filters** (.OIF), **LabTalk Script** files (.OGS) and **X-Functions** (.OXF). For a complete list of Origin file types please refer to the Origin Help file.

2.5.1 Drag and Drop Sharing

A quick and easy way to share a particular file with another user is to simply send them the file, such as via e-mail, and the file can be added to their Origin installation by dragging and dropping it onto Origin. Files such as an Origin Project (.OPJ) or Graph Template (.OTP) simply open when dropped onto Origin, and other files such as Fitting Functions are installed. For instance, if a new Fitting Function (.FDF) is dropped onto Origin, a dialog opens, asking for the name of the fitting function category to which the new function should be added. Drag-and-drop is supported for most Origin file types.

2.5.2 Sharing Files with Multiple Machines for Single Users

If you are a single user and have installed Origin on multiple machines and wish to share customization across those machines, you can set up the **User Files Folder** (UFF) to be on a shared location, such as a network drive, or even a USB flash drive, and use the same UFF path with each installation. Please refer to the Origin Help file for information on how to change the current UFF path.

2.5.3 Sharing Files with Other Users in a Network

If your Origin installation is part of a concurrent network, Origin provides a **Group Folder** mechanism to share files amongst multiple users. There can be multiple groups within a concurrent network, and each group can have a specific user acting as the group manager, who can utilize the **Group Folder Manager** tool to publish custom files for sharing with other members of the group. Please refer to the Origin Help file for more information.

2.5.4 Packaging Files

Origin provides a **Package Manager** tool to package multiple files into a single **Origin Package** (.OPX) file. This tool is accessible from the **Tools** menu, and provides a convenient way to distribute custom applications that may contain multiple Origin files, such as templates, X-Functions, and LabTalk script files. The .OPX file can be unpacked and installed by dragging and dropping it onto Origin. Options are provided for specifying where the files will be unpacked to, as well as executing LabTalk script before and after the installation. The Group Folder mechanism can also be used to distribute applications using .OPX files. For further details please refer to the Origin Help file.

2.6 Analysis Templates and Batch Processing

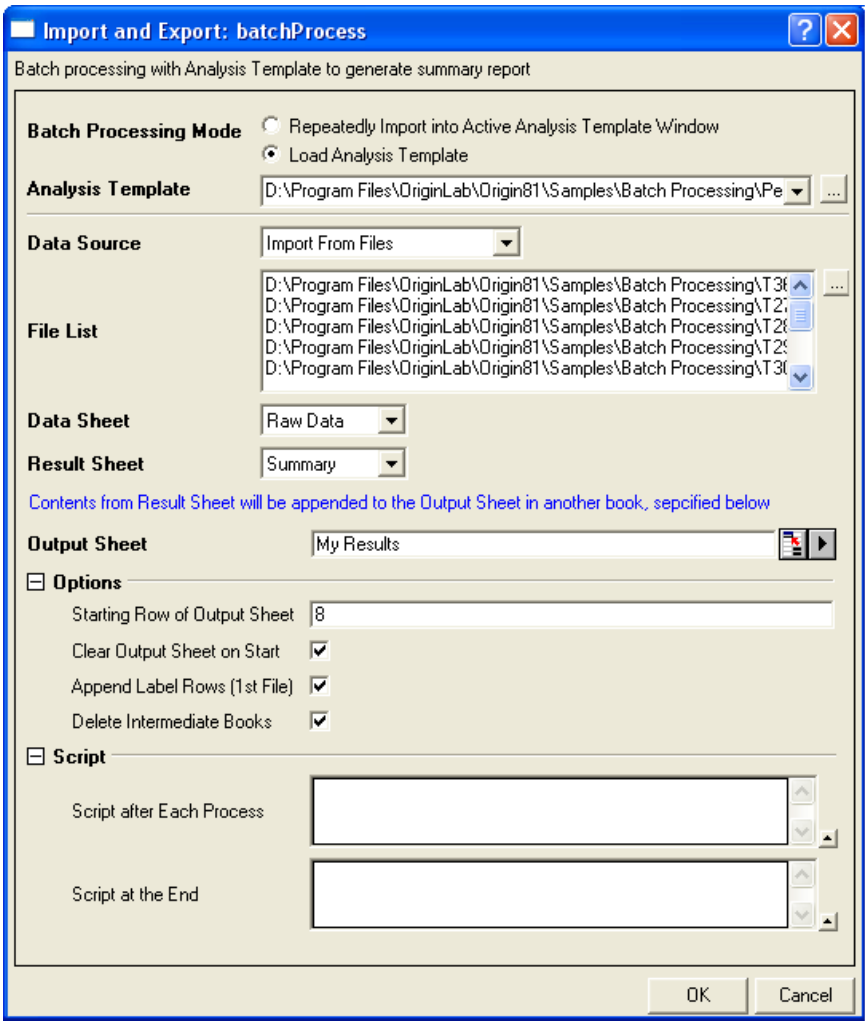
Once an **Operation** such as **Set Values** for columns, or **Nonlinear Curve Fitting** has been performed, and the user has set **Recalculation** to **Auto** or **Manual**, the workbook containing the operation, the source, and the output can be saved as an **Analysis Template**, from the **File: Save Workbook as Analysis Template** menu item. Origin clears all input and output data related to the operation and saves the workbook to the disk, as a file (.OGW).

Once an **Analysis Template** has been saved to the disk, it can be used at any time by opening a copy, using the **File: Recent Books** menu item. The user can then import new data into the appropriate source columns of the workbook, and the output columns and sheets will update automatically if the **Recalculation** status was set to **Auto**, or can be updated manually if the **Recalculation** status was set to **Manual**.

An **Analysis Template** workbook (OGW) can contain multiple operations, such as a series of operations that are related to one another. For example, the first operation could be extracting part of the data from the raw data sheet using specific conditions specified in the **Extract Worksheet Data** tool, and the next operation could be **Nonlinear Fitting** on the extracted data. When new data is brought into the raw data sheet of a book created from the template, the **Extract Worksheet** operation will trigger first, and then the updated output of this first operation will in turn trigger the second operation to perform the curve fitting. **Analysis Templates** thus provide an easy way for users to create custom analysis routines and then reuse them for repeat analysis of similar data.

The entire Origin Project (OPJ) containing multiple operations can also be saved as an **Analysis Template**, using the **File: Save Project as Analysis Template** menu item. Using the entire project in this manner may be useful or necessary in cases where the desired options involve more than one workbook, or involve multiple window types, such as workbooks and matrices, which cannot be combined into one workbook.

Origin 8.5 also provides a tool for performing **Batch Processing** of multiple data sets, using an **Analysis Template**. This tool is accessible from the **File: Batch Processing** menu item, and it supports workbook-based templates. The tool can either perform batch processing of multiple data files on the disk, or it can process data that already exist in the project, such as multiple Y columns in a worksheet, or multiple XY data curves in multiple sheets and books. When creating the **Analysis Template**, the user can add an optional **Summary** sheet, where they can copy desired quantities from the output, such as parameter values from fitting results, and paste-link them to the summary sheet. The **Batch Processing** tool can optionally collect the information from the summary sheet for each file or data set, and append that information to create a summary report for all the data, which is then available for further plotting or post processing.



Tutorials are available in this booklet, and also from the **Help: Tutorials** menu item in the product, which demonstrate how to create and save an **Analysis Template** and then use such a template for performing **Batch Processing** of multiple data files or data sets.

2.7 OriginPro

The professional version of Origin, **OriginPro**, offers all of the features of Origin plus additional analysis tools and capabilities in the specific areas of **Peak Analysis**, **Statistics**, **Signal Processing**, **Image Processing**, and **3D Surface Fitting**. Please refer to the **Products** area of the OriginLab website (www.OriginLab.com) for details regarding additional features available in OriginPro.

If you have purchased the standard version of Origin, you can upgrade your version to OriginPro by contacting your Origin representative.

2.8 Programming in Origin

Origin provides two programming languages:

- **LabTalk**
- **Origin C**

LabTalk is a scripting language that provides access to most of the functionality of Origin. Using LabTalk, one can access and change properties of various Origin objects, such as worksheet columns, graph layers, and data plots. In addition to accessing objects in Origin, one can also access **X-Functions** from LabTalk, for performing various tasks such as importing data, analyzing data, exporting graphs and worksheets, and performing batch processing.

Origin C is a full-featured high-level programming language, closely based on the **ANSI C** programming language syntax. In addition, Origin C supports a number of **C++** features and a few **C#** features. Origin C provides full access to all aspects of Origin, including data import, data handling, graphing, analysis, and export capabilities. Origin C functions can be accessed from user interface controls such as buttons, toolbars and menu items, or by creating X-Function-based dialogs.

Version 8.5 is shipped with a printed **LabTalk Scripting Guide** and an **Origin C Programming Guide**. These guides are also available as help files from the Origin **Help** menu. They provide an overview of scripting and Origin C programming, along with numerous examples for all key areas and operations in Origin. Detailed language reference help files for LabTalk and Origin C are accessible from the Help menu.

The OriginLab wiki site **wiki.OriginLab.com** has the most up-to-date documentation on LabTalk and Origin C, including extended examples for various Origin-specific areas.

The choice of which language to use for programming in Origin is mainly a question of complexity of the task. LabTalk scripting is well-suited for simple operations such as importing and manipulating data in worksheet columns, or performing analysis tasks such as smoothing, interpolation or curve fitting. In fact, when performing column transformations using the **Set Column Values** dialog, the formula as well as the **Before Formula Script** panel use LabTalk script.

LabTalk script can be easily executed from the Command and Script windows or from toolbar buttons and menu items, allowing for quick operations on data and Origin objects. Multiple lines of script can be saved to a disk file, optionally organized in sections, and called for execution from the interface. LabTalk script can include calls to X-Functions that perform advanced data processing and analysis. In short, if you are beginning to explore programming in Origin, it is good to start with LabTalk script.

As your Origin programming needs grow, or you find yourself in need of more advanced customization involving extensive coding, switching to the Origin C programming environment is recommended. Origin C provides access to all Origin objects and properties. Origin C code is organized as a set of functions with support for passing arguments, including various Origin

objects. Origin C functions are compiled to object code and then loaded and executed inside of Origin. Origin C thus provides greater reliability and management capability, for developing and debugging code of greater scope and complexity.

Origin C is also the language used to create X-Functions, which are self-included XML files that can be loaded in Origin as a special type of global function. X-Functions provide users with a way to expand the functionality of Origin by adding custom data processing features. Custom tools can also be created using Origin's **Developer Kit** to build dialog resources, and then Origin C can be used to access such dialogs from within Origin.

In addition to the two programming languages, Origin can also be accessed as an **Automation Server**. Client applications such as National Instruments **LabVIEW**, Microsoft **Excel** or custom VB/VC/C# applications can use methods and properties exposed by Origin to exchange data back and forth with Origin, as well as send commands to be executed in Origin.

3 Origin Resources

The following sections summarize key Origin resources available to you. If you purchased Origin from a local distributor, your Origin distributor may provide additional resources. Please contact your distributor to learn more.

3.1 Help Files

Help files for various features in Origin, including programming, are accessible from the Origin **Help** menu. Help files are typically updated at every service release. You can check for availability of updated help files by selecting **Help: Check for Updates**.

The most up-to-date online versions of our help files can be accessed from the Support area of the OriginLab website (www.OriginLab.com) and from the OriginLab wiki site (wiki.OriginLab.com).

3.2 Tutorials

This booklet includes ten tutorials that cover some of the key features of Origin 8.5. Additional tutorials are available by selecting **Help: Tutorials**. The most up-to-date set of tutorials can be accessed from the OriginLab wiki site.

3.3 Multimedia Movies

A collection of multimedia movies are available from the home page of the OriginLab website as well as from the Support area of the website. The movies provide an easy way to learn key features and tips on using Origin. We frequently add to the collection of movies, so we recommend that you check back periodically to view new additions.

3.4 User Forum

The Origin User Forum is accessible from the home page of the OriginLab website. Our forum is very active with many posts from customers asking questions and providing answers, as well as sharing tips on using Origin. The forums are also monitored by our technical staff on a regular basis.

3.5 Case Studies

The OriginLab website provides a collection of Case Studies, exploring how Origin users in various fields are using key features for their data analysis and graphing needs. We recommend that you view the case study collection to obtain ideas and suggestions about how to best utilize Origin for your field of work.

3.6 Graph Gallery

An extensive collection of user-created graphs are presented in our Graph Gallery, which is accessible from the home page of the OriginLab website. The graphs illustrate the wide variety of graph templates and advanced customization options available in Origin.

3.7 Wiki Site

The OriginLab wiki site (wiki.OriginLab.com) hosts the most up-to-date version of our documentation for Tutorials, Quick Help, LabTalk script programming, and Origin C programming. The wiki site also offers release notes with detailed information on features added in each version and service release, as well as information regarding other areas, such as installing and licensing the product, and notes for upgrade users.

3.8 Software Updates

OriginLab publishes periodic software updates, called Service Releases, for the current version of Origin. The **Help: Check for Updates** menu item in the product provides a fast and easy way to check whether a new service release is available. The Release Notes section on our wiki site provides pertinent information about what features and fixes are available in the current service release.

3.9 Technical Support

OriginLab and our team of international Origin Distributors are committed to providing timely and helpful Origin support. If you purchased Origin from a local Distributor, please contact your Distributor for support. Otherwise, contact OriginLab for support. Contact information for both OriginLab and the Origin Distributor team is available from the Support area of the OriginLab website. These web pages are accessible from Origin by selecting **Help:Support:Contact OriginLab Support** or **Contact your Distributor**.

All Origin 8.5 customers receive installation, licensing, and upgrade file-transfer support. However, support for using the Origin software is restricted to registered Origin users.

Additional Origin Support restrictions may apply. Please review the OriginLab Technical Support policy statement provided in the Support area of the OriginLab website, or contact your Origin Distributor to learn about their support policy.

If you have a suggestion for adding or improving a feature in Origin, or if you have found a bug, we want to hear from you. Please select **Help:Support:Submit a Feature Suggestion** or **Submit a Bug Report**. You can also notify us from the Support area of the OriginLab website. Suggestions and bug reports are reviewed by our Support and Development teams.

3.10 Training and Consulting

OriginLab provides Training and Consulting services to customers to make optimal use of our products. To learn more about these services, see the Support area of the OriginLab website.

4 Notes for Upgrade Users

The Origin 8.5 Upgrade installs into a new program folder - the Upgrade does not update a previous version. It is therefore not necessary to have a previous version of Origin installed prior to upgrading.

Origin license management is version-specific. Thus, after installing the Origin 8.5 Upgrade, you must complete the license management process. A license dialog will be displayed when Origin 8.5 is launched for the first time, and this dialog will step you through the process.

Origin project files (OPJ files) created in earlier versions of Origin can be opened, updated, and saved in Origin 8.5. We do not recommend, however, opening and working with Origin 8.5 project files in earlier versions of Origin, as you may suffer some loss of information or data that is specific to the new version. For more information, please visit the Support area of the OriginLab website.

If you have custom Origin files from your previous version, such as graph templates, themes, fitting functions, LabTalk Script, or Origin C files, you can transfer them to your Origin 8.5 User Files Folder. Use the **Tools:Transfer User Files** menu item to view, select, and transfer files.

Key new features and improvements in Origin 8.5 are listed below. To learn more about these features, please view tutorials, help files, and web pages in the Products area of our website (www.OriginLab.com).

1. Transparency and Gradient Fill Control for Graph Objects
2. Zoom and Pan on Worksheets and Graphs
3. Embedding of MS-Word, Excel and Equation Objects in Origin Graphs
4. New Gadgets: Regional Stats, Differentiation, and Interpolation
5. Fitting Function Builder
6. 3D Graphing: Vectors, Error Bars, and Multiple Intersecting Surfaces
7. Matrix Improvements: Headers, Thumbnails, and Color Map
8. Contour and Surface Plot from a Virtual Matrix
9. Improved Image Profile Tool
10. Redesigned Data Information Window
11. 2D Plotting Enhancements: Label Customization and Flexible Ternary Scale
12. Non-linear Z-axis, and Color Map Support for Waterfall Plots

5 Tutorials

The following tutorials highlight some of the key features in Origin, including some of the new features introduced in version 8.5.

For a complete collection of Origin tutorials, please access the **Help: Tutorials** menu in Origin. Tutorials are maintained on our wiki site and are updated periodically. Please visit wiki.OriginLab.com for the most up-to-date tutorials.

Our main website www.OriginLab.com also offers Multimedia Movies about key Origin features.

- Tutorial 1 - Importing Data
- Tutorial 2 - Setting Column Values
- Tutorial 3 - Creating a Graph
- Tutorial 4 - Plotting Overlapping Data and Setting Transparency
- Tutorial 5 - Creating Intersecting Surface Plots from Worksheets
- Tutorial 6 - Customizing a Graph
- Tutorial 7 - Contour Plots and Color Mapping
- Tutorial 8 - Merging Graphs and Arranging Graph Layers
- Tutorial 9 - Working with Excel
- Tutorial 10 - Descriptive Statistics
- Tutorial 11 - Nonlinear Curve Fitting
- Tutorial 12 - Batch Processing using Analysis Template

5.1 Importing Data

5.1.1 Summary

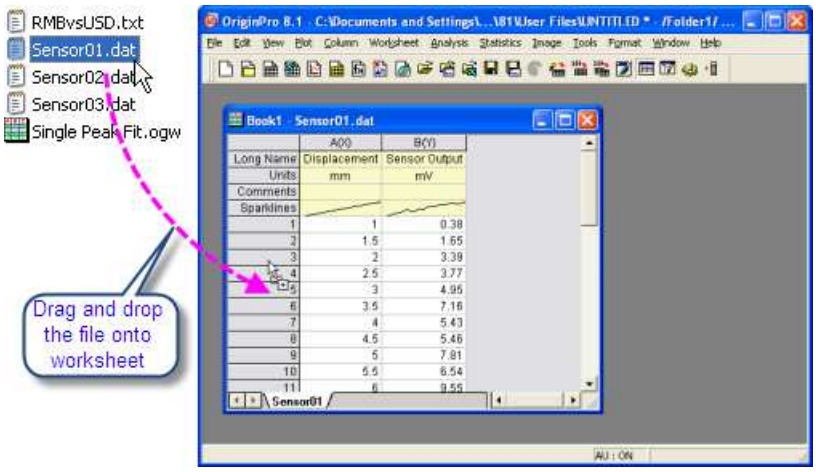
Origin provides flexible ways of importing data, including simply dragging and dropping data files, using the ASCII import dialog to customize settings, and using the Import Wizard for advanced customization, extracting variables from header lines, and supporting custom file formats for many third-party files. This tutorial will highlight some of these features.

This tutorial will show you how to:

- Import files by drag-and-drop
- Import multiple ASCII files by customizing settings
- Save settings for future use
- Use the Import Wizard and import filters

5.1.2 Drag-and-Drop Importing of ASCII Files

1. Start with an empty worksheet. Open Windows Explorer to the ***\Samples\Curve Fitting*** subfolder of your Origin system folder. Drag and drop the file **sensor01.dat** from the Windows Explorer window into the empty Origin worksheet.



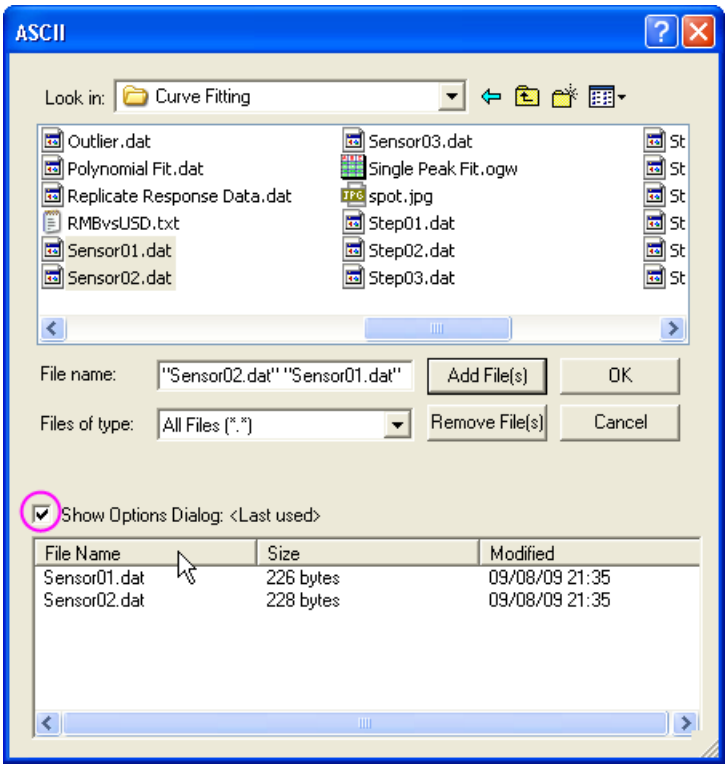
2. Data appears in the sheet. Now select two files: **sensor02.dat** and **sensor03.dat** and drag-and-drop them into the same worksheet. You will see that the first file replaces the data already in the worksheet, and the other creates a new workbook, as the default setting is to create new books, starting with the second file.

The default setting when dragging and dropping is to replace existing data. If you have some other data already in the sheet, you can drop the file onto the gray area outside of any window, or into a graph window, and Origin will create a new book and import the data into it.

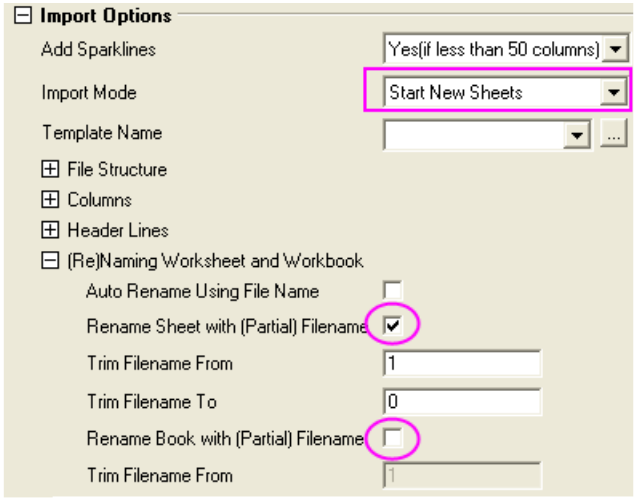
5.1.3 Customizing ASCII Import Dialog Settings and Saving a Theme

ASCII import and custom-file-format import both provide an *options* dialog, wherein a user can customize import settings and then save settings to use later on similar files.

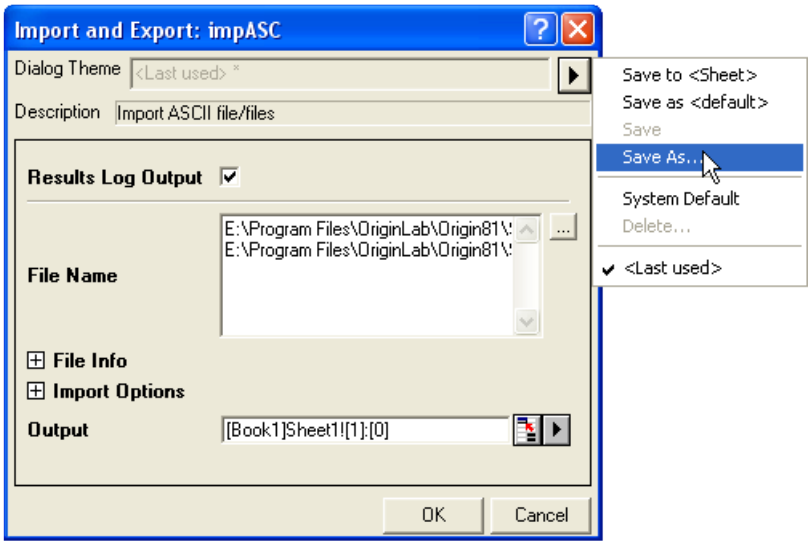
1. Start with a new book and click the **Import Multiple ASCII** button on the standard toolbar.
2. Select the files **sensor01.dat**, and **sensor02.dat** from ***\Samples\Curve Fitting*** and add them to the lower panel of the file dialog. Click the file name column header in the lower panel to sort the files by name. Keep the **Show Options Dialog** box checked and click **OK**. This will open a dialog for import settings.



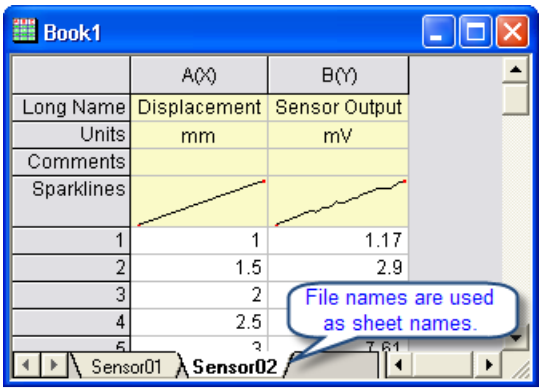
3. Change import mode to **Start New Sheets**. Expand the **(Re)Naming Worksheet and Workbook** node and change the settings so that only the sheet gets renamed.



4. Click on the right arrow button at the top of the dialog and select **Save As**, then give it a name like **My Multifile Import** and click **OK**. This saves your settings to a theme file on the disk.



5. Click **OK** and the first file gets imported into the current sheet, and a new sheet is created for the second file. File names are used as sheet names.



6. Now start a new book and invoke the menu **File: Recent Imports: impASC: My Multifile Import**. In the file dialog pick the three files: **step01.dat**, **step02.dat**, and **step03.dat** from ***\Samples\Curve Fitting***. Click the file name column header in the lower panel to sort the files by name. Click **OK**. The settings from the theme you saved and selected here are used to perform the importing.

5.1.4 Saving ASCII Import Settings to Worksheet

Custom ASCII import settings can be saved either to the disk as a theme file, or into the worksheet itself.

1. Start with a new book and invoke **File: Import: Single ASCII** from the menu, then select the file **sensor01.dat** from the ***\Samples*\Curve Fitting** subfolder. Keep **Show Options Dialog** checked and click **OK**.
2. In the **Import Options** dialog, select **No** from the **Add Sparklines** drop-down list. Expand the **(Re)Naming Worksheet and Workbook** node and change the settings so that only the sheet gets renamed by file name, and not the book.
3. Click on the Top Arrow icon, select **Save to <Sheet>** and click **OK**. Then your custom settings get saved to the sheet and data are imported.
4. Select **File: Save Template As** from the main menu. Enter **SensorImport** as the template name, and click **OK** to save the workbook template. This template contains both the import settings and the worksheet property settings.
5. Now we create a new workbook from this template. Click the **Open Template** button on the **Standard** toolbar. Select SensorImport.otw under your User Files Folder and then click **Open**. A workbook is created from the template.
6. With this book active, drag-and-drop the file **sensor02.dat**. The data gets imported and only the sheet name changes to the new file name. The sparklines were not turned on.

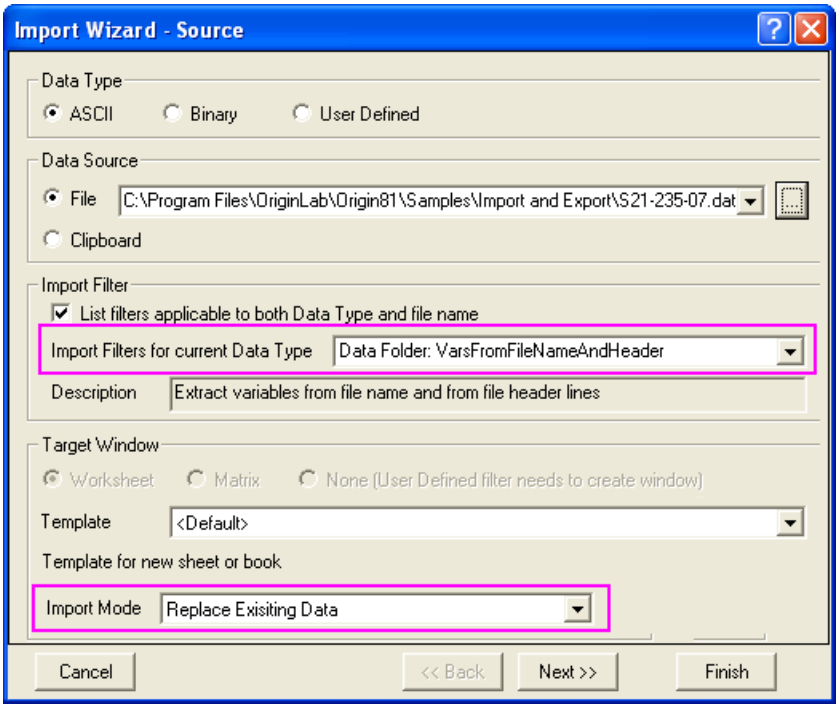
When saving custom settings to a worksheet, it is useful to then save the sheet, along with other desired analysis operations, as an **Analysis Template** for repeat analysis of similar data from multiple files. See the Batch Processing tutorial for details.

5.1.5 Import Wizard and Import Filters

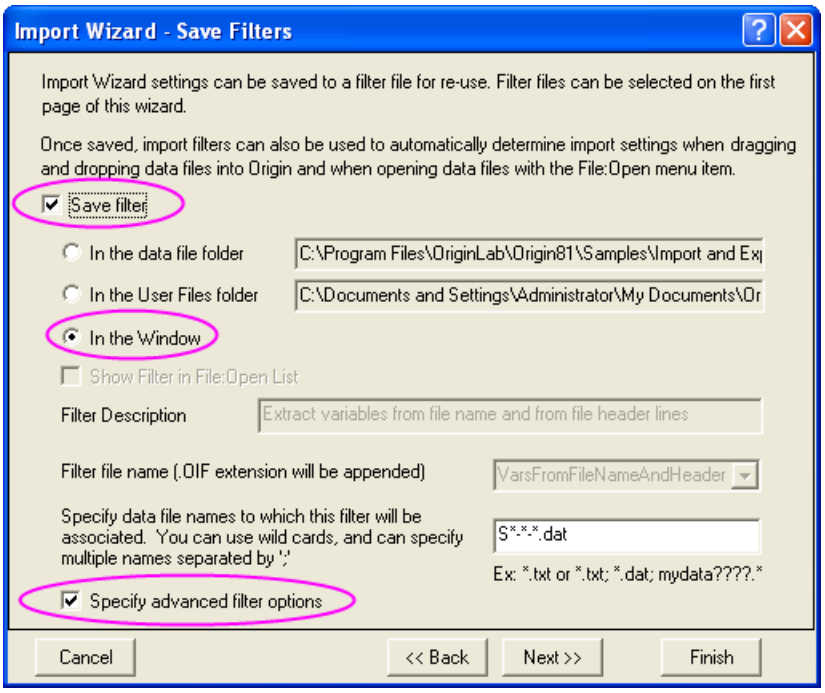
The Import Wizard allows you to step through your data file, customize settings, including how to parse header lines to create variables, and then save all of your custom settings as an

import filter (.OIF) file for repeat use. The filter file can reside in the data folder, in the ***\Filters*** subfolder of your **User Files Folder**, or can even be saved to the worksheet itself for use with **Analysis Templates**. The Wizard is typically useful when the file has header lines that need to be parsed, or the file needs custom settings such as fixed width, or for executing LabTalk script at the end of the import for post processing.

1. Start with a new book. Click on the Import Wizard button  in the standard toolbar to launch the wizard.
2. Select the file ***\Samples\Import and Export\S15-125-03.dat***.
3. Note that the **Import Filter for Current Data Type** drop-down changes to show ***Data Folder: VarsFromFileNameAndHeader***. This is a filter already created for this file and shipped with Origin, and it is automatically picked up from the same folder as the data file you chose. Next change **Import Mode** to **Replace Existing Data**.

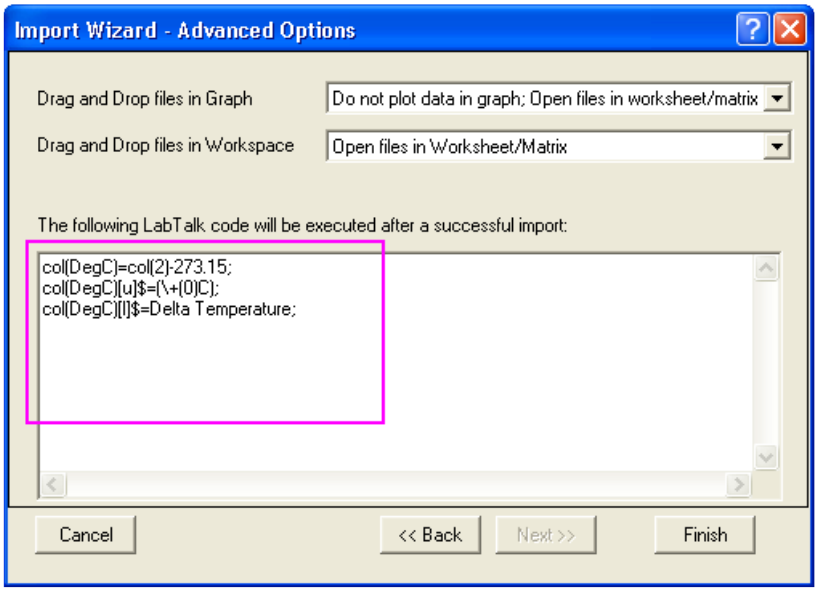


4. Click **Next** and walk through the pages. Notice controls on the **Header Lines** pages that allow flexible definitions of where the header lines end, where sub header lines are located, and what gets assigned to long name, units, etc.
5. For this file the **Variables Extraction** and **Variables Extraction by Delimiter** pages define how to parse the header lines to extract values from them.
6. Click **Next** until you get to the **Save Filters** page. Check the **Save filter** box and change the radio button to **In the Window**. This will save the filter in the active worksheet.

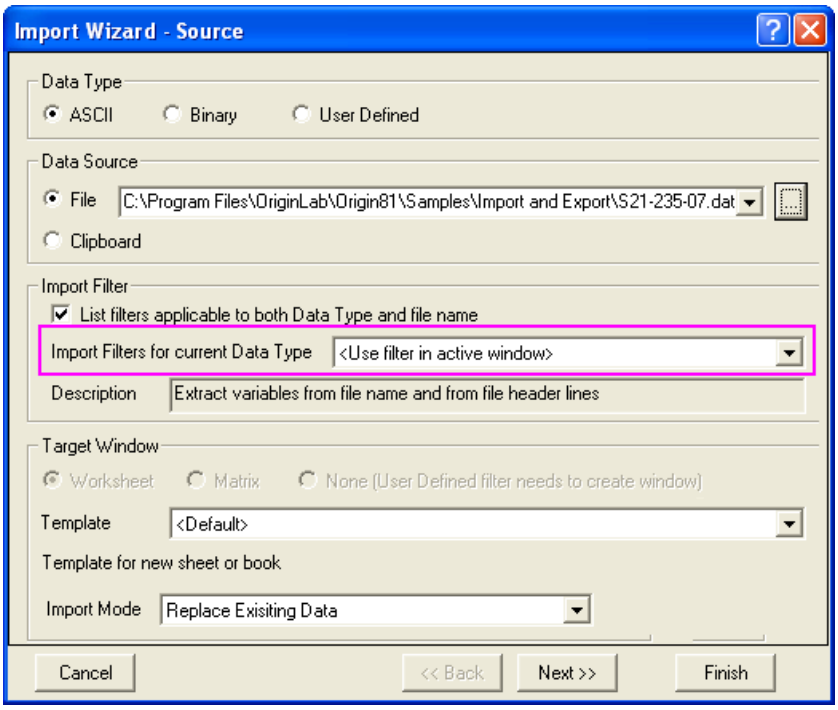


7. Now check **Specify advanced filter options**. This brings you to the last page where script (to run at the end of the import) can be specified. In the edit box enter:

```
col(DegC)=col(2)-273.15;
col(DegC)[u]$=(\+(0)C);
col(DegC)[l]$=Delta Temperature;
```



8. Click **Finish**. The file gets imported and the import filter is now saved in your worksheet. The fifth column is a column added by the script. It is the Delta Temperature data in degrees Celsius.
9. With the worksheet active, click the **Import Wizard** button again and pick the file ***\S21-235-07.dat***. Note that the **Import Filter for Current Data Type** drop-down shows ***<use filter in active window>***, so Origin picks up the filter settings that were saved in the worksheet.



10. Click **Finish**, and the file gets imported and the script gets executed (the values in column 5 are updated).

You can save the import settings to the worksheet, perform analysis on the imported data, and save the workbook as an **Analysis Template** for repeated processing of similar data files. See the tutorial on batch processing for more information.

5.2 Setting Column Values

5.2.1 Summary

Origin provides several ways to fill a worksheet column with values. Use **Auto Fill** or script commands to fill a series of values. Use the **Set Values** dialog box to define a mathematical formula to generate or transform a data set. Refer to values in other columns from the same sheet or from other sheets and books. Select from a large collection of built-in functions to compute values. Create variables from metadata stored in worksheets or column headers, and use these variables in your column formula.

This tutorial will show you how to compute column values by:

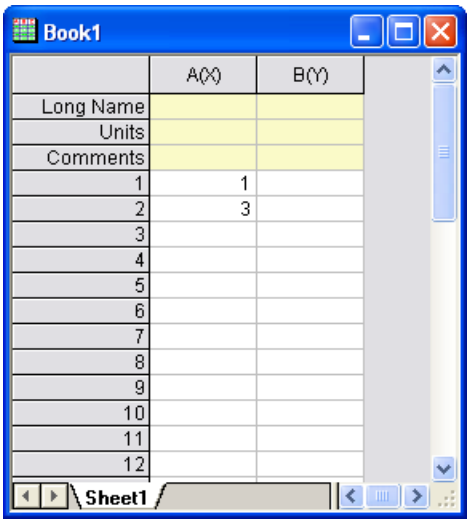
- Filling a Column with an Arithmetic Series
- Using Built-in Functions
- Using Other Columns
- Using Cell Values
- Using Variables from Workbook Metadata

5.2.2 Filling a Column with Arithmetic Series

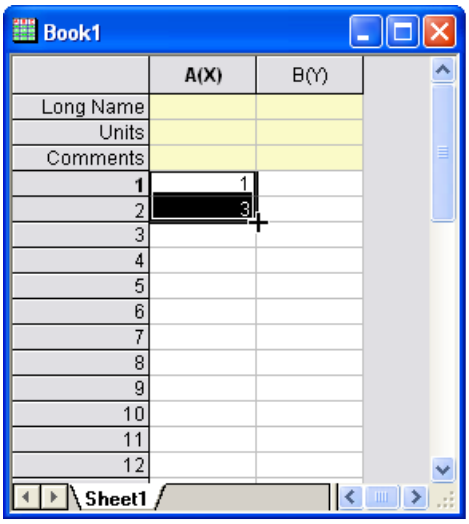
Origin provides multiple methods to fill a column with arithmetic series.

5.2.2.1 Using Auto Fill

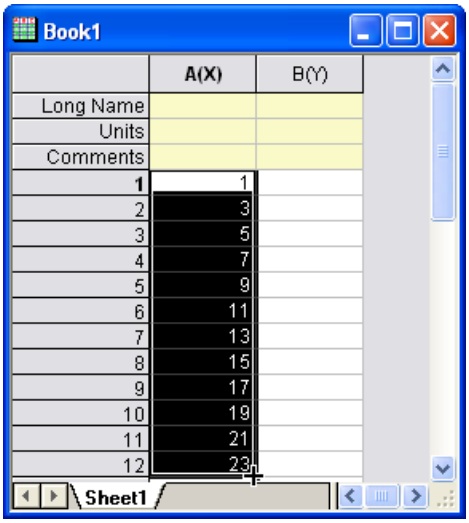
Enter a few starting values in cells.



1. Select the two cells.
2. Move the mouse to the bottom right-hand corner of the second cell. The cursor will change to display "+".



3. Hold down the Alt key and drag the mouse toward the bottom of the column. The column will be filled with 1, 3, 5, 7, ...



Note that a row can also be auto filled by dragging towards the right. To repeatedly copy values instead of generating new values, hold down the CTRL key instead of the ALT key.

5.2.2.2 Using Data List

Type the following script in the Command window.

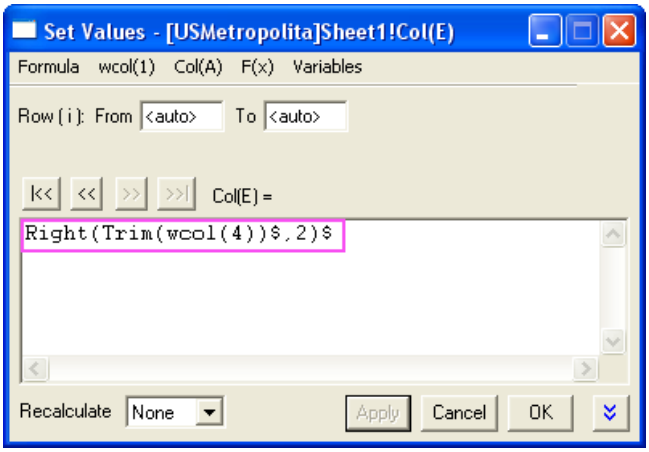
```
col(B) = {1:2:23};
```

Column B will be filled with values: 1, 3, 5, 7, ..., 23

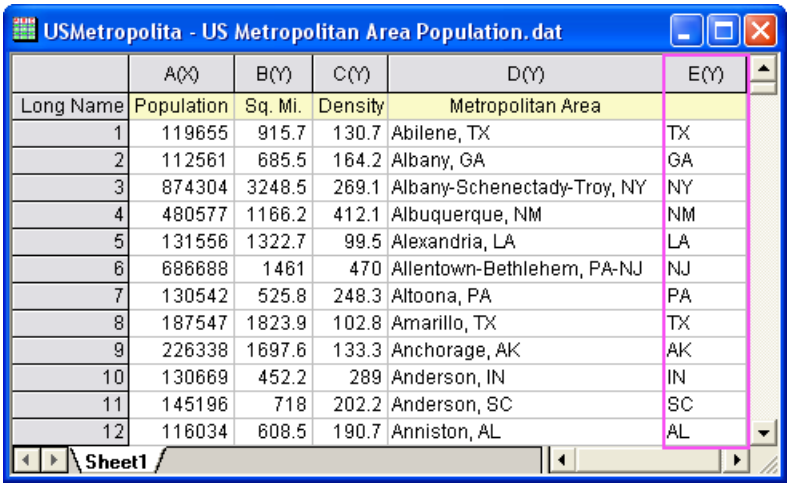
{v1:vstep:vn} produces the same result as the function data(v1,vn,vstep).

5.2.3 Using Built-in Functions

1. Create a new workbook. Import the *US Metropolitan Area Population.dat* file from the **\Samples\Data Manipulation** folder.
2. Click the **Add New Columns** button  on the **Standard** toolbar to add a new column **E**. Highlight this column and right-click on it to select **Set Column Values** from the context menu. The **Set Values** dialog opens.
3. Select **F(x): String: Right(str$,n)$** to add **Right(,)$** into the **Column Formula** panel.
4. Click in the position between the left parenthesis and the comma, then insert the **Trim** function by selecting **F(x): String: Trim(str$[,n])$**. The formula should look like: **Right(Trim()$,)$**.
5. Select **wcol(1):wcol(4)** to insert **wcol(4)** as the input of the **Trim** function. Then input **2** for the **Right** function and the expression should look like:



6. Click the **OK** button and the last column will get filled with States from column **4**.



Note that some columns had two states at the end of the Metropolitan Area name, so to get both names change the formula to:

Right(Col(Metropolitan Area),Len(Col(Metropolitan Area))-Find(Col(Metropolitan Area),",")-1)$

When referring to another column in the same worksheet, you can use index, short name, or long name to identify the column.

5.2.4 Using Other Columns

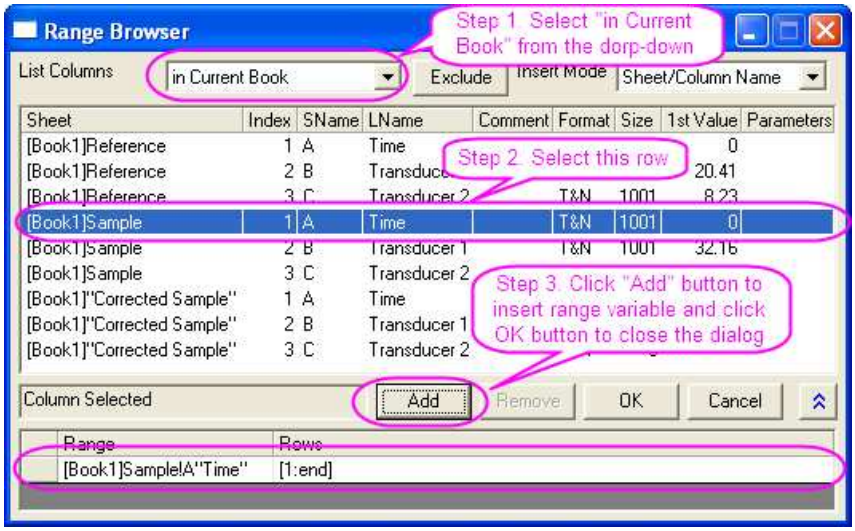
1. We will continue with the steps from above to show you how to use other columns in the Set Values dialog. Add a new column to the worksheet (right-click to the right of the last column in the worksheet and select **Add New Column** from the context menu). Change the Long Name of the column to "Population/Sq. Mi."
2. Highlight this column and right-click on it. Select **Set Column Values** to bring up the dialog. Click the Col(A) menu and choose **Col(A):Population** and then enter the **/** character. Click the Col(A) menu again and choose **Col(B):Sq. Mi.**. The formula should look like: **Col(Population)/Col(Sq. Mi.)**
3. Click OK and the column will get computed using data from the other two columns.

5.2.5 Using Columns from Other Sheets

The **Set Values** dialog provides an **Insert** menu to easily insert range variables that point to columns in other books/sheets, which can then be used to compute column values for the current column.

1. Open the project **Samples\Data Manipulation\Setting Column Values.OPJ** and switch to the **Columns from Other Sheets** subfolder.
2. Right-click on the **Sample** sheet and select **Duplicate Without Data**. Rename(by double-clicking on the current name) the new sheet as: **Corrected Sample**.

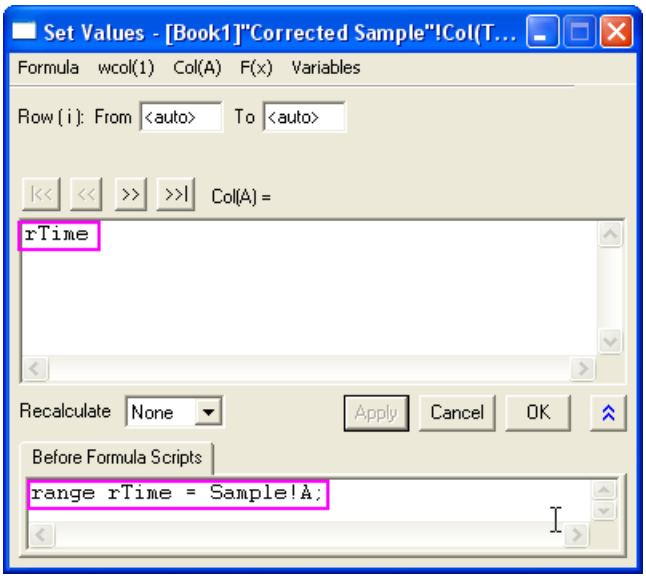
3. Now you will fill these three columns with data based on formulas that reference columns in the other sheets. Highlight the first column and right-click on it to select **Set Columns Values** to open the dialog. Select **Variables: Insert Range Variables** to open the **Range Browser** dialog. You will use this dialog to add a range variable to the **Before Formula Scripts** panel, according to the instructions in the image below:



Click **OK** to close the dialog. **range r1 = Sample!A** will be automatically inserted into the **Before Formula Scripts** panel. Please rename it as:

```
range rTime = Sample!A;
```

4. Then enter **rTime** in the **Column Formula** and click the **Apply** button to generate data for the first column.



5. Click the >> button to go to the next column. Then select **Variables: Insert Range Variables** to open the **Range Browser** dialog. You will use this dialog to insert two range variables to the **Before Formula Script** panel. Sort the data sets by long name (Click the **LName** heading to sort it). Insert two range variables that refer to **Transducer1** columns in both the **Reference** worksheet and the **Sample** worksheet. Rename them as:

```
range rRef = Reference!B;
range rSample = Sample!B;
```

6. Then input the following expression into the **Column Formula**:

```
rSample - (rSample[1] - rRef[1])
```

Click the **Apply** button to generate data for the second column of the **Corrected Sample** worksheet. Don't click the **OK** button yet.

Book1

	A(X)	B(Y)	C(Y)
Long Name	Time	Transducer 1	Transducer 2
Units	sec	mV	mv
Sparklines			
13	12	19.99	
14	13	19.78	
15	14	19.84	
16	15	20.16	
17	16	20.01	
18	17	19.51	
19	18	19.04	
20	19	19.49	
21	20	18.91	
22	21	18.52	
23	22	19.34	
24	23	19.19	
25	24	19.03	

Reference | Sample | **Corrected Sample**

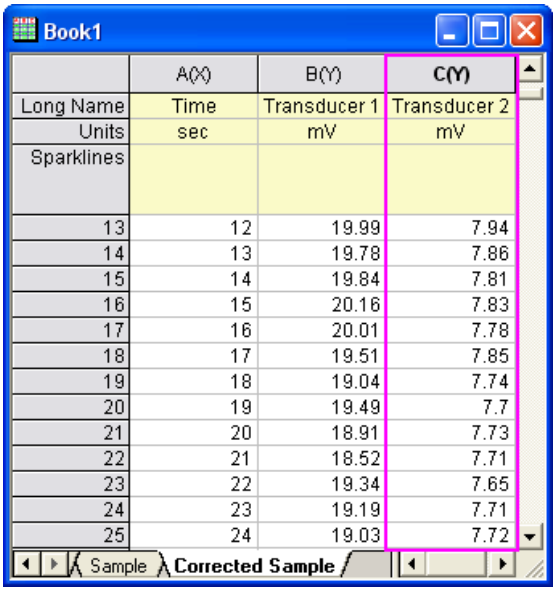
You reference a particular cell value with square brackets, so [1] in the formula above means the first element.

Your formulas can be saved and reloaded into other columns to generate new data.

1. Now we will edit the range variables in the **Before Formula Scripts** panel and use another expression to get the same results. Remove the column names **B"Transducer 1"** of the two range variables and select **F(x): Variables and Constants: wcol(_ThisNumCol)** in both lines so it looks as follows:

```
range rRef = Reference!WCol(_ThisColNum);
range rSample = Sample!WCol(_ThisColNum);
```

2. Leave the expressions in the **Column Formula** panel unchanged and click **Apply** to generate data. You will find that it gives you the same results, but the formula can now be applied to any column in the Corrected Sample worksheet, and the range variables will point to the same column, by index, in the Reference and Sample worksheets.
3. Select **Formula: Save** to open the **Save** dialog and name it "My Correction". Click the **OK** button to save it.
4. Click the  button to go to the next column. Select **Formula: Load: My Correction** and click the **Apply** button to generate data for the third column.



Book1

	A(X)	B(Y)	C(Y)
Long Name	Time	Transducer 1	Transducer 2
Units	sec	mV	mV
Sparklines			
13	12	19.99	7.94
14	13	19.78	7.86
15	14	19.84	7.81
16	15	20.16	7.83
17	16	20.01	7.78
18	17	19.51	7.85
19	18	19.04	7.74
20	19	19.49	7.7
21	20	18.91	7.73
22	21	18.52	7.71
23	22	19.34	7.65
24	23	19.19	7.71
25	24	19.03	7.72

Sample | Corrected Sample

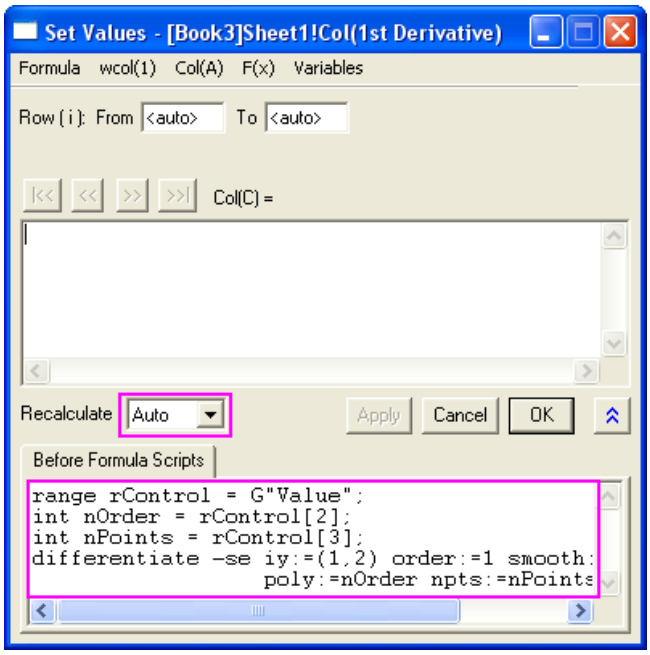
5.2.6 Using Cell Values

Values contained in specific worksheet cells can be referenced and used to compute the formula for setting column values. This provides an easy way to use worksheet cells as control cells for updating values in a column.

1. Open the project **\Samples\Data Manipulation\Setting Column Values.opj** and switch to the **Cells in a Worksheet** subfolder in Project Explorer.
2. Right-click on column C and select the **Set Column Values...** context menu to bring up the Set Values dialog.
3. Use the **Variables: Insert Range Variable...** menu item to open the Range Browser. Then select the column with the long name (LName) **Value**. Press the **Add** button to insert a variable. Press the **Close** button to close the dialog.
4. In the **Before Formula Scripts** panel, change the name of the range variable to be **rControl** and add these additional lines so that the script looks like below

```
range rControl = G"Value";
int nOrder = rControl[2];
int nPoints = rControl[3];
differentiate -se iy:=(1,2) order:=1 smooth:=1 poly:=nOrder npts:=nPoints
oy:=(1,3);
```

5. The script calls the **differentiate** X-Function and passes the cell values from column G as arguments for polynomial order and number of points, which controls the Savitzky-Golay smoothing performed during the differentiation.
6. Set the **Recalculate** drop-down to **Auto** and press OK to close the dialog.



7. Now you can try to change the values in column G, to change the output.

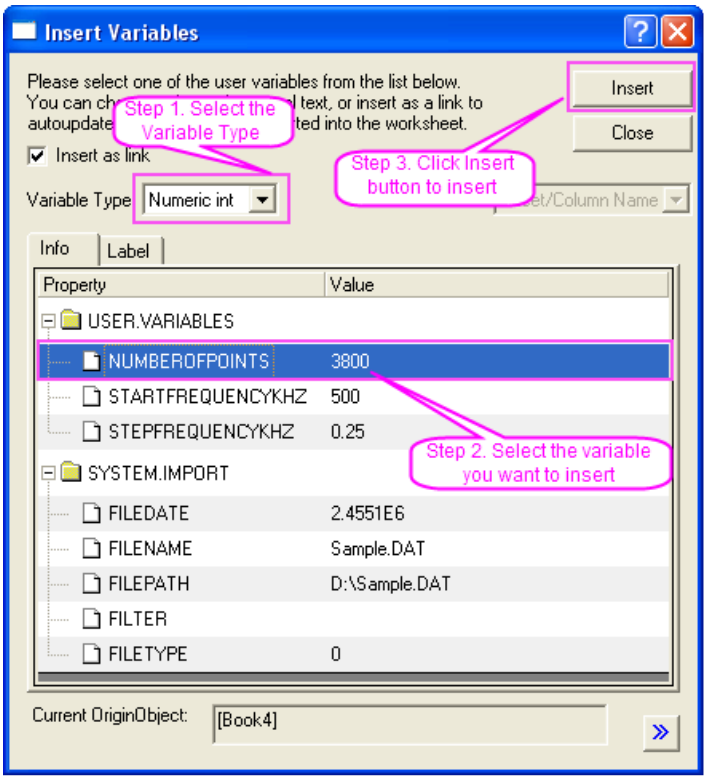
Note: Allowed values of polynomial order are 1 to 9.

The graph shown in the worksheet was first created and then embedded into the worksheet by merging a group of cells.

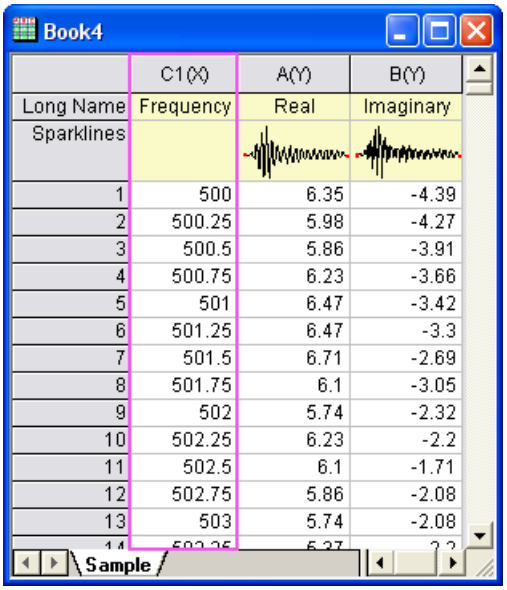
5.2.7 Using Variables from Workbook Metadata

Metadata stored in the workbook, such as variables saved when importing data using the Import Wizard, can be referenced and used for computing column values.

1. Open or continue working with **\Samples\Data Manipulation\Setting Column Values.OPJ**, and switch to the **Worksheet Metadata** subfolder from the Project Explorer window.
2. Select column A and right-click to select the **Insert** menu option. A new column is inserted to the left of column A.
3. Select the first column (this newly inserted column) and right-click on it. Then select the **Set Column Values** menu item to open the Set Values dialog.
4. Select the **Variables: Insert Info Variable** menu item to open the **Insert Variables** dialog. Select **Numeric int** from the **Variable Type** drop-down list. Then select **NumberOfPoints** and press the **Insert** button to insert this variable into the **Before Formula Scripts** panel.



5. Next, set **Variable Type** to **Numeric double**. Hold the **Shift** key down to select both **StartFrequencyKHz** and **StepFrequencyKHz**, and then press **Insert** to insert these two variables. Press the **Close** button to close the dialog.
6. In the upper **Column Formula** panel, input **{d1:d2:d1+(n1-1)*d2}** and then press the OK button to generate data and close the dialog. The column will be filled with frequency values.
7. Highlight the first and second columns, right-click on them and select **Set As: XYY** to change the plotting designations to X and Y. After you change the long name of the first column to **Frequency**, the worksheet should look like:


Book4
C1(X)
A(Y)
B(Y)
Long Name
Frequency
Real
Imaginary
Sparklines
1 500 6.35 -4.39
2 500.25 5.98 -4.27
3 500.5 5.86 -3.91
4 500.75 6.23 -3.66
5 501 6.47 -3.42
6 501.25 6.47 -3.3
7 501.5 6.71 -2.69
8 501.75 6.1 -3.05
9 502 5.74 -2.32
10 502.25 6.23 -2.2
11 502.5 6.1 -1.71
12 502.75 5.86 -2.08
13 503 5.74 -2.08
Sample

5.3 Graphing Data From Multiple Sheets

5.3.1 Summary

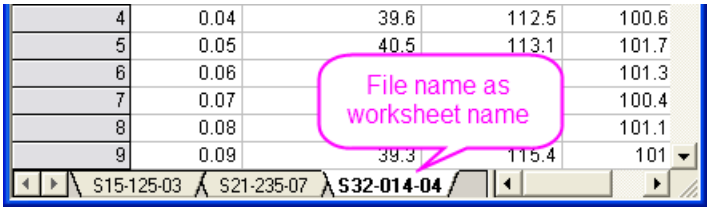
Origin provides close to 150 built-in graph templates that can be used to create a wide variety of plots. You can modify these templates or create your own to add to the collection. Creating a graph in Origin is as simple as selecting the desired data and then selecting a template from a menu or from the Graphing toolbars. The Plot Setup dialog offers more flexibility in creating plots, such as plotting data from multiple books or sheets.

This tutorial will show you how to:

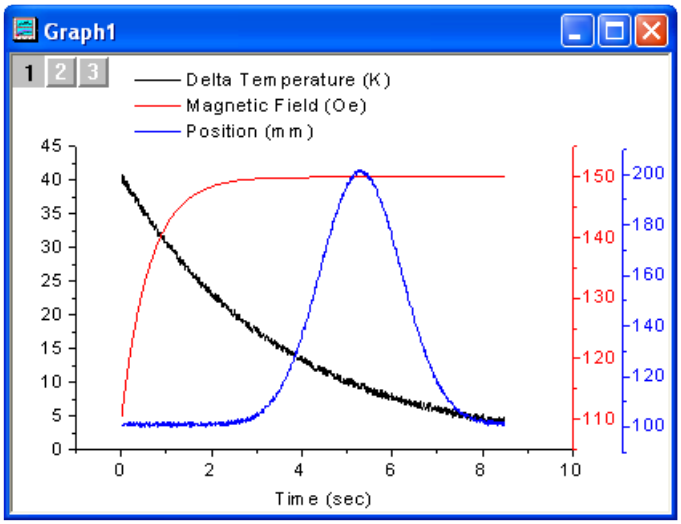
- Select data in a worksheet and quickly create a plot
- Add data to an existing graph with drag-and-drop plotting
- Use Plot Setup to plot data from multiple sheets
- Create and save a custom graph template
- Plot groups of plots by label

5.3.2 Create a Plot Quickly by Selecting Data

1. Select **File: Recent Imports: impASC: My Multifile Import** from the main menu. (**My Multifile Import** is a theme saved in another tutorial. If you have never saved it, please perform the steps in the tutorial to create it.)
2. Import the files *S15-125-03.dat*, *S21-235-07.dat* and *S32-014-04.dat* from **\Samples\Import and Export**. Note that the settings in the theme are used to import the files, so Origin will import each file to a different worksheet of the same workbook. The file names are used as the worksheet names.

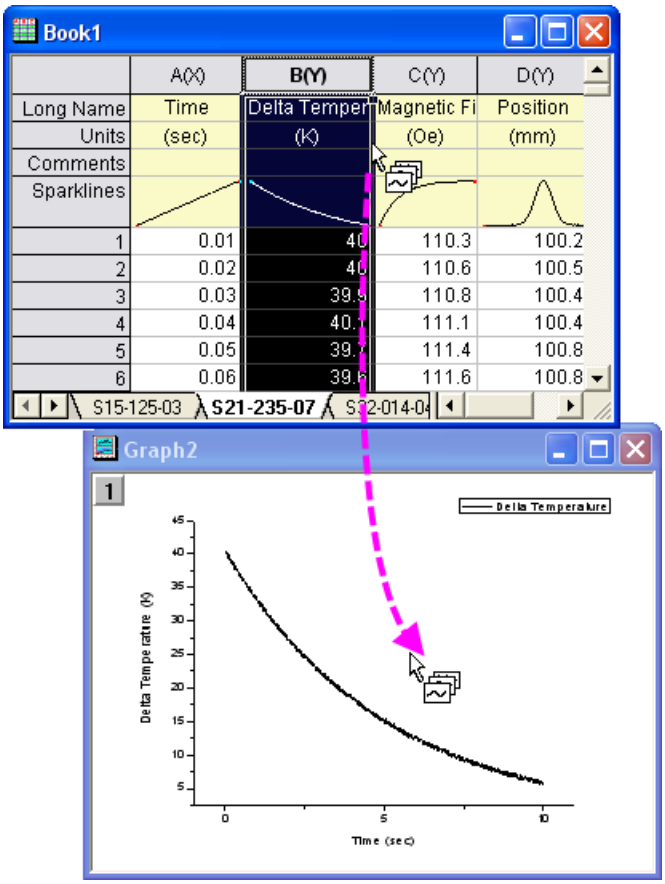


3. Make the third worksheet, S32-014-4, active. To create a three layer graph, highlight the three Y columns, Delta Temperature, Magnetic Field, and Position, and then select **Plot: Multi-Curve: 3Ys Y-YY**. Note: There is no need to highlight the Time column, as Origin will automatically plot the Y columns against the associated X column in the worksheet.

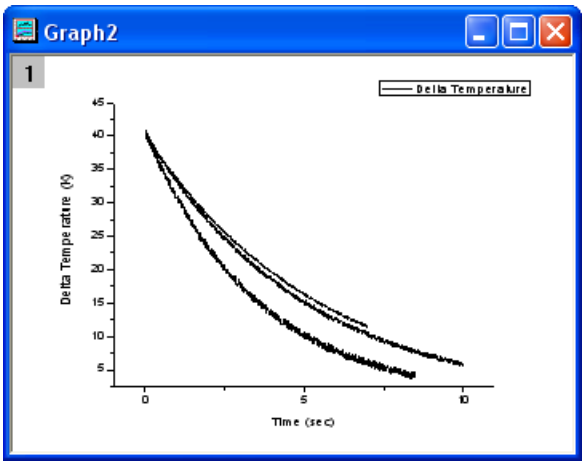


5.3.3 Add Data to an Existing Graph with Drag and Drop Plotting

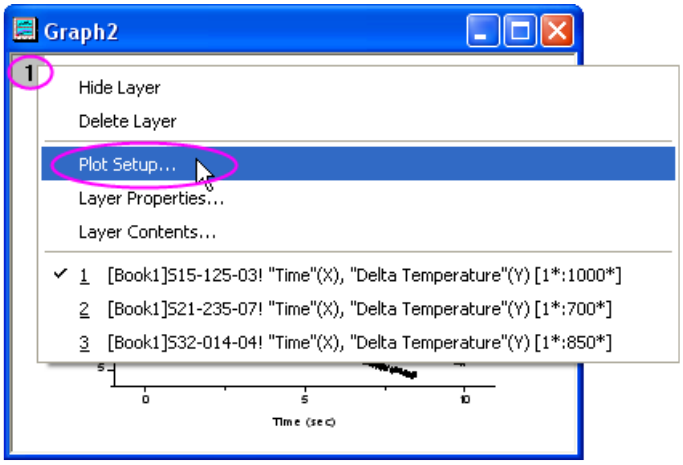
1. Go back to the book with the three sheets of data from the above example.
2. Highlight the **Delta Temperature** column (Column B) from the first sheet and then select **Plot: Line: Line** to create a line plot.
3. Go back to the workbook, and for the other two sheets, one at a time, select the **Delta Temperature** column, and position the cursor at the edge of the column, until you see the cursor turn into  .



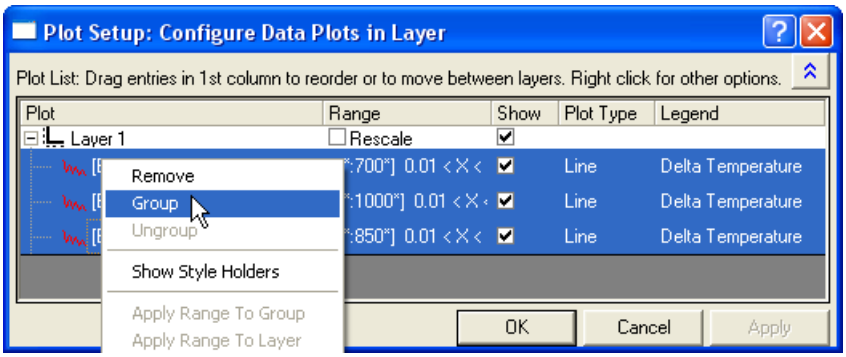
Then you can drag-and-drop the column into the graph page. Another curve will be added to the current layer.



4. After adding the other curves, double-click on the layer icon to bring up the **Plot Setup** dialog. Alternatively, right-click on the layer icon and select **Plot Setup** from the context menu.

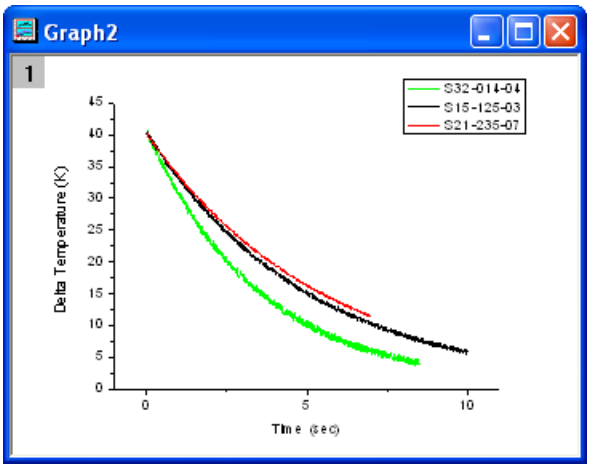


5. The **Plot Setup** dialog opens with the bottom panel visible. (Note: The **Plot List** panel is the only one you need, but if you wish, you can click the  button to expand and show the other two panels of the dialog.) Hold the **Shift** key while selecting all three data plot entries, and then right-click and select **Group**. Click **OK** to close the dialog.



Grouping the plots allows for quick creation of presentation-ready graphs, because each selection in the group is assigned a differentiating set of plot attributes (line color = black, red, green; symbol shape = square, circle, triangle; etc...).

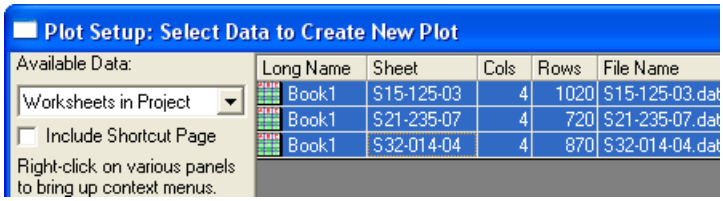
6. Select **Graph: Update Legend** to open the *legendupdate* X-Function dialog. Set the **Auto Legend Translation Mode** to *Custom*. Enter **@WS** for **Legend Custom Format**. Click **OK** and the legend will now contain the worksheet name for each data plot.



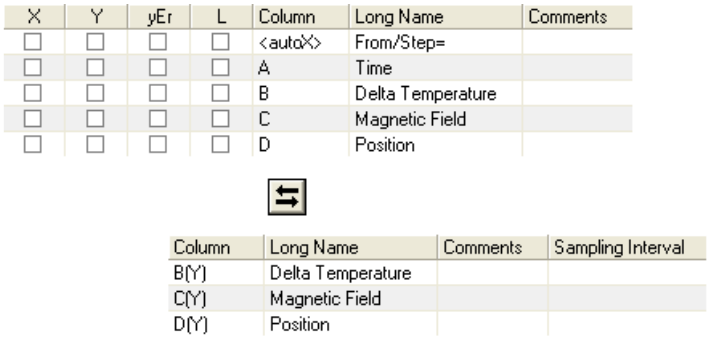
5.3.4 Create a Plot using Plot Setup

The Plot Setup dialog box is useful for a variety of plotting tasks, including creating graphs, modifying the plot type, adding plots to or removing plots from the graph, grouping or ungrouping plots, and editing the plot range.

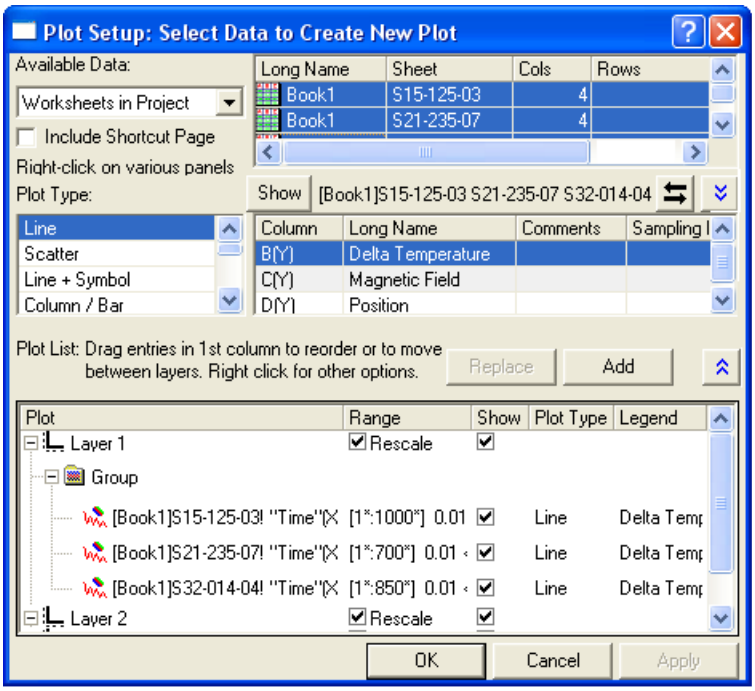
1. Using the same workbook as in the above examples, select no data. It doesn't matter what worksheet is active; what is important is that no columns are highlighted.
2. Select **Plot: Multi-Curve: 4 Panel** from the menu. Without any data selected, Origin will open the **Plot Setup** dialog, allowing you to choose the data you wish to plot.
3. Expand the top panel by clicking the  button. Hold down the **Shift** key to highlight the three worksheets. Alternatively, you can just click and drag your selection so that all three worksheets are highlighted.



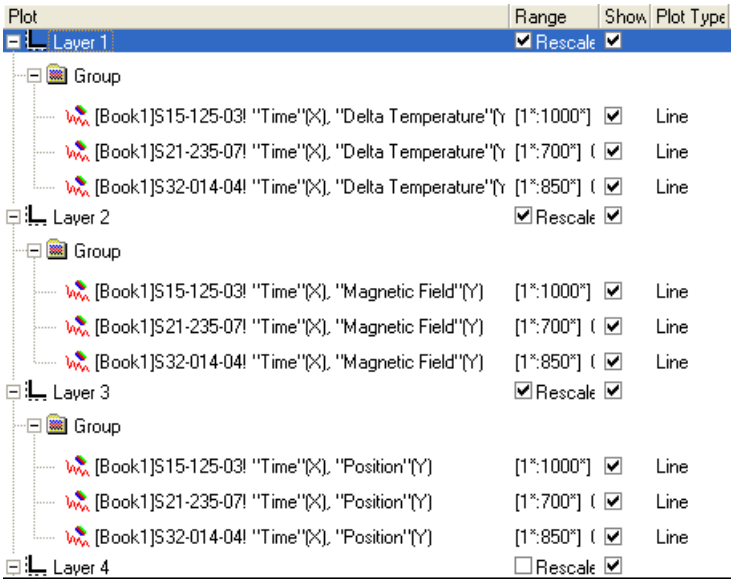
4. In the middle panel, common columns in all three sheets are displayed. In this case, all three sheets have similar data with matching column names. Click the double arrow button  to show the plot column list. This mode is easier because you don't have to check the X and Y designation check boxes.



5. Open the bottom panel of the dialog, the Plot List, if it is not already visible. **Layer 1** is highlighted. Select **Delta Temperature** in the middle panel, and then click the **Add** button. Since you already selected the three worksheets in Step 3, this will add the **Delta Temperature** column from each of the three worksheets to layer 1.

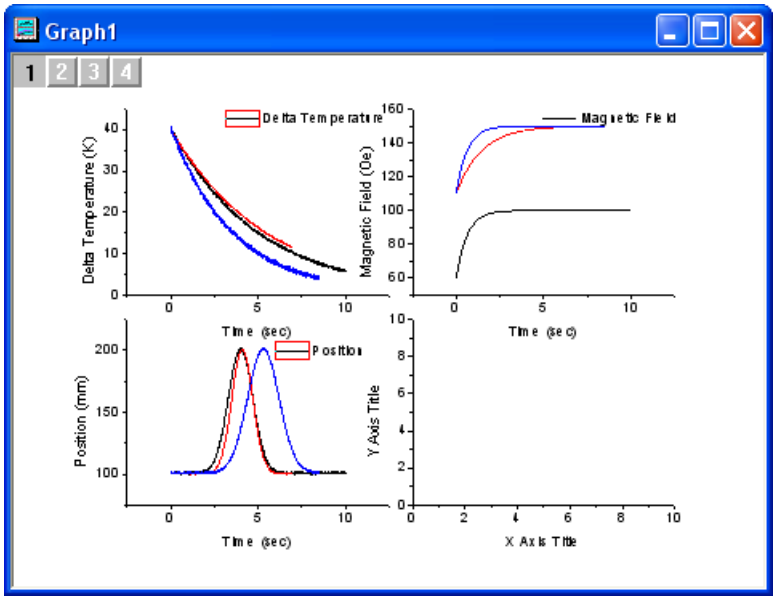


6. Repeat these steps to add **Magnetic Field** and **Position** into layer 2 and layer 3, respectively.



Note that in each layer, the three data plots are automatically grouped.

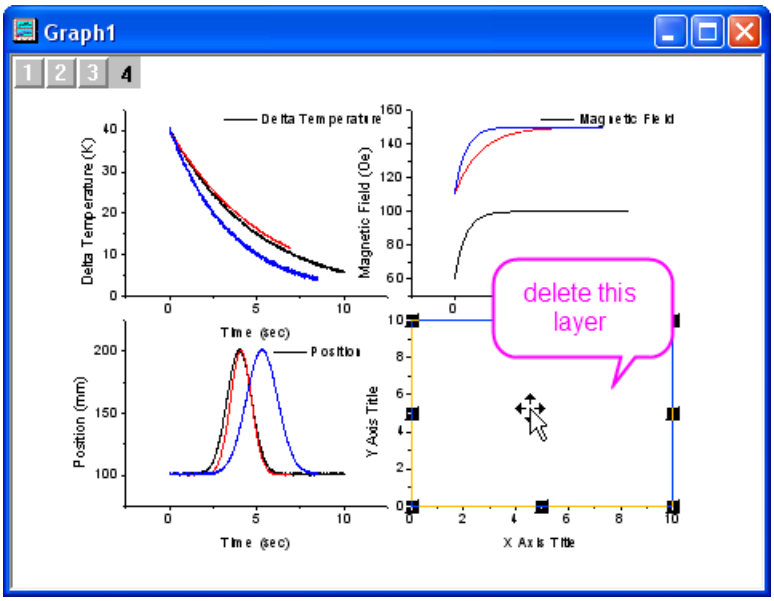
7. Click the **OK** button to create the graph.



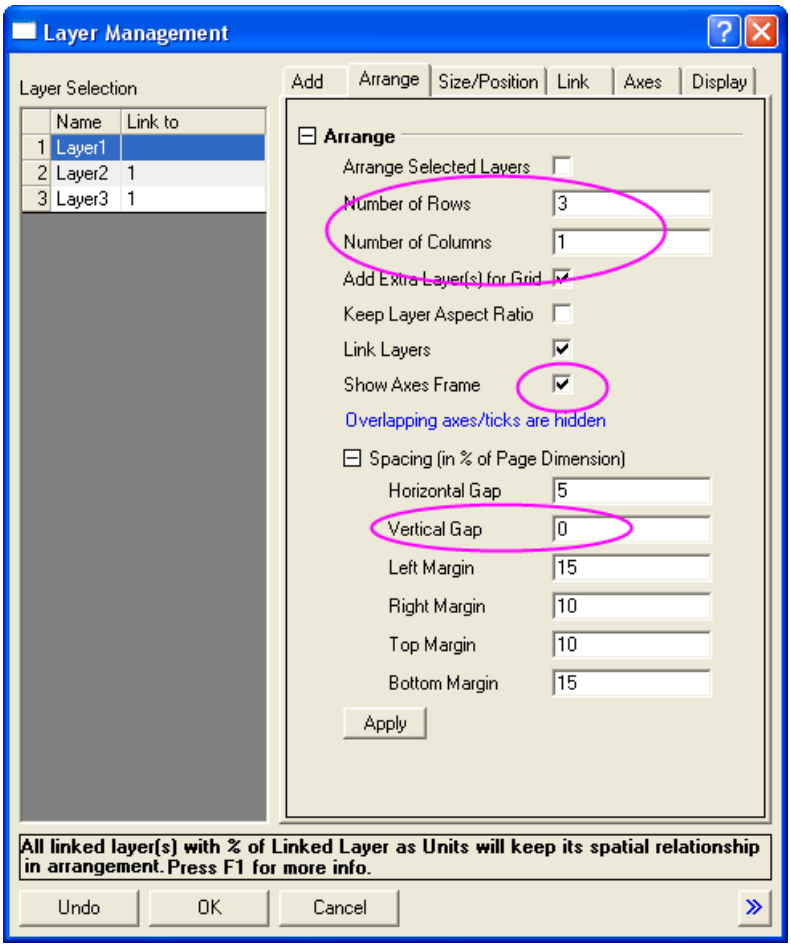
5.3.5 Customize and Save a Graph Template

In the above examples, the **3Ys Y-YY**, **Line** and **4 Panel** plots are each created from a different, specific built-in plot template. If you don't see the exact graph you need, you can often create it and save it as your own template to reuse later with similar data.

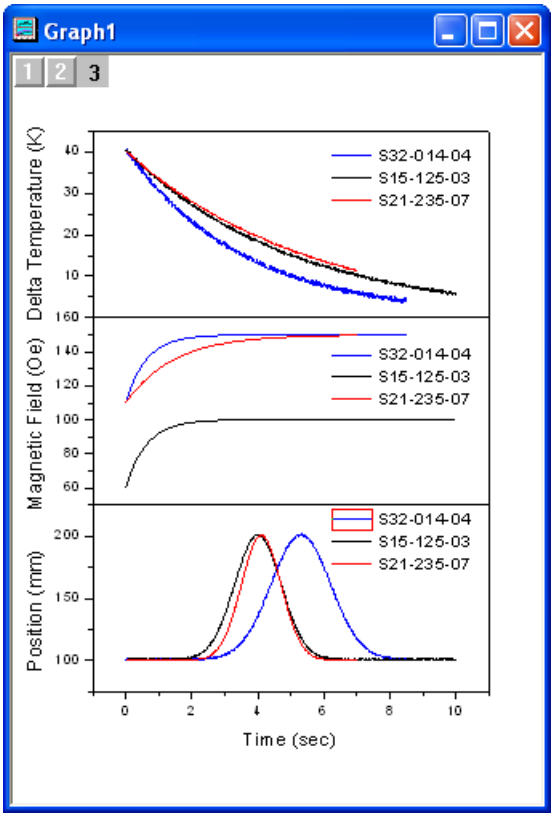
1. Continue with the 4 panel plot from above. Select the empty 4th layer and press the **Delete** key on the keyboard to get rid of it.



2. Select **Graph: Layer Management** from the menu to bring up the Layer Management dialog. On the **Arrange** tab, set column=1, row=3; check the **Show Axes Frame** check box; expand the Spacing(% of Page) branch and set the **Vertical Gap** to 0. Click **Apply** and then click **OK**.

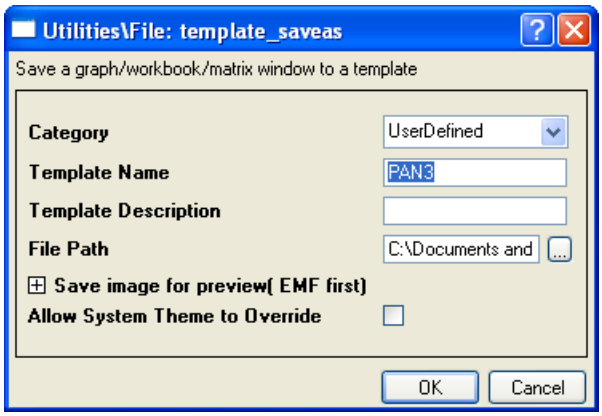


3. Select **File: Page Setup** from the menu and change the **Orientation** to **Portrait**.
4. Select **Graph: Update Legend: Open Dialog**. Leave the destination as Whole Page to update the legend in all layers on the graph page. Set the **Auto Legend Translation Mode** to *Custom*. Enter **@WS** for **Legend Custom Format**, and click OK. Your graph will look as follows:



To align the left Y-axis titles, you can hold down Shift and select them, and then use the Left Align button on the Object Edit toolbar.

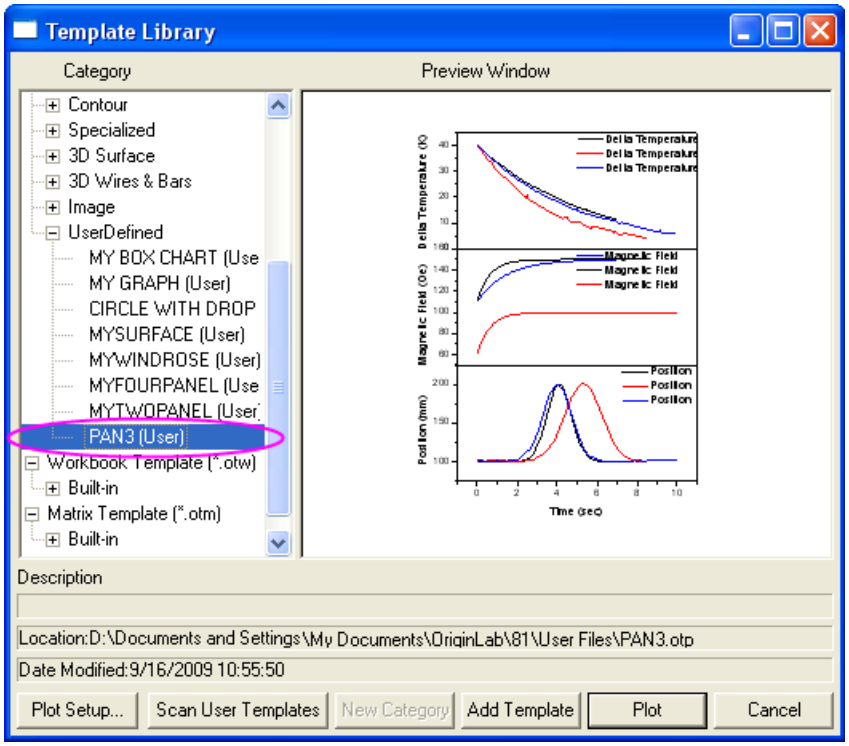
5. Now that you have customized the graph, select **File: Save Template As**. In the dialog that opens, save as a new template with a new name such as **PAN3** under the **UserDefined** category.



Now you can reuse this template in the next example.

5.3.6 Plot into a Saved Custom Template

1. Go back to the workbook, and in the menu, select **Plot: Template Library** to bring up the Template Library dialog. All of the Origin templates, including Graph, Workbook, and Matrix templates, are listed here. Expand the **UserDefined** category under **Graph Template**, and you'll see the one that you just saved in the last example.

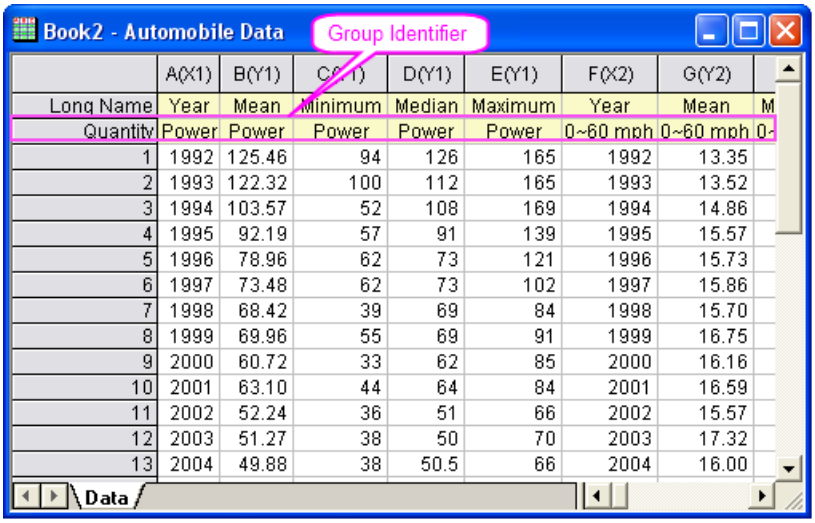


2. Click the **Plot Setup** button. Then you can use the same steps from the **Create a Plot using Plot Setup** section to create a three-panel graph directly.

5.3.7 Plot Groups

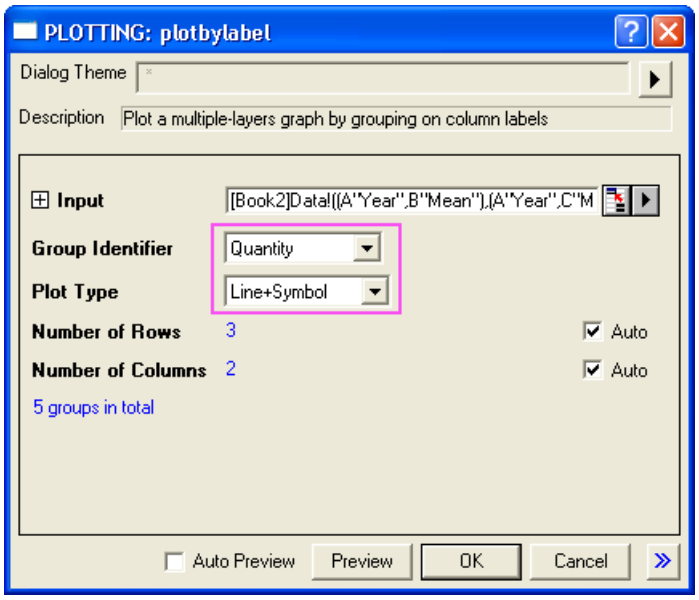
Origin offers a plotting option, **Multiple Panels by Label**, that allows you to create a multilayer graph, each layer of which contains multiple plots, identified by the same label.

1. Open the file **Samples\Graphing\Automobile Data.ogw**.

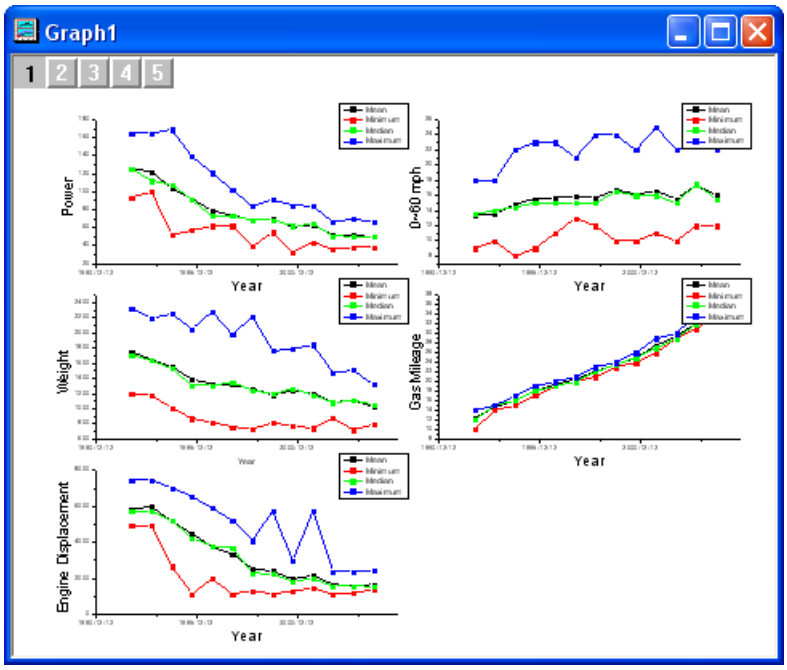


	A(X1)	B(Y1)	C(Y1)	D(Y1)	E(Y1)	F(X2)	G(Y2)	
Long Name	Year	Mean	Minimum	Median	Maximum	Year	Mean	M
Quantity	Power	Power	Power	Power	Power	0~60 mph	0~60 mph	0-
1	1992	125.46	94	126	165	1992	13.35	
2	1993	122.32	100	112	165	1993	13.52	
3	1994	103.57	52	108	169	1994	14.86	
4	1995	92.19	57	91	139	1995	15.57	
5	1996	78.96	62	73	121	1996	15.73	
6	1997	73.48	62	73	102	1997	15.86	
7	1998	68.42	39	69	84	1998	15.70	
8	1999	69.96	55	69	91	1999	16.75	
9	2000	60.72	33	62	85	2000	16.16	
10	2001	63.10	44	64	84	2001	16.59	
11	2002	52.24	36	51	66	2002	15.57	
12	2003	51.27	38	50	70	2003	17.32	
13	2004	49.88	38	50.5	66	2004	16.00	

2. Click on top left corner of the worksheet to select the entire sheet. Select **Plot: Multi-Curve: Multiple Panels by Label** to open the **plotbylabel** dialog.
3. Set the dialog options as follows, and click the OK button to create the graph.



The graph should look like this:



5.4 Plotting Overlapping Data and Setting Transparency

5.4.1 Summary

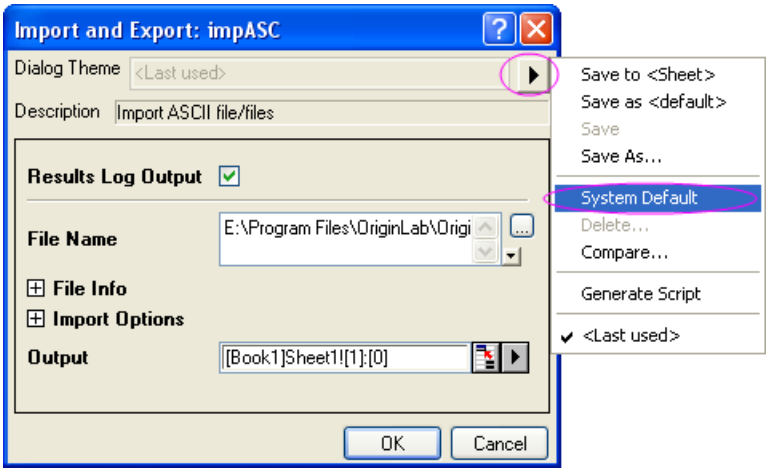
In this tutorial, we will show you how to create overlapping column plots, and then set transparency to make the overlapping parts visible.

This tutorial will show you how to:

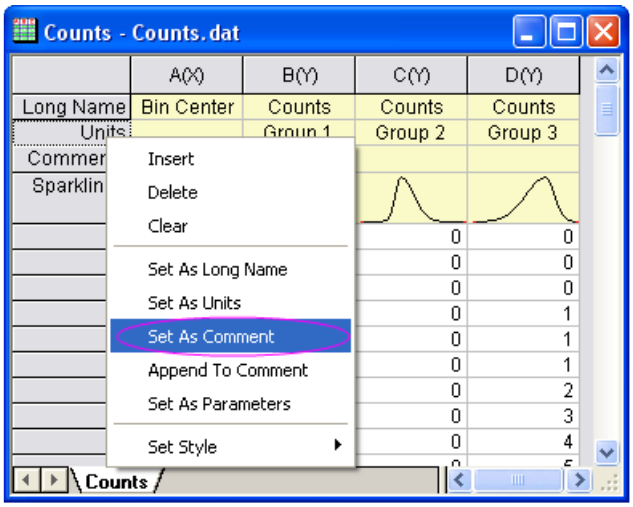
- Customize the grouped column plots
- Set Transparency

5.4.2 Plot Overlapping Data and Set Transparency

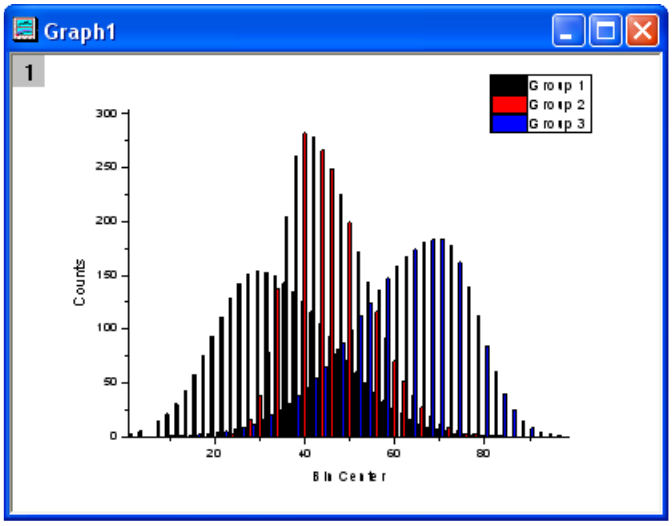
1. Start with a an empty worksheet and from the menu, select **File: Import: Single ASCII** or click the **Import Single ASCII** button  to open the file browser.
2. Choose the file *<Origin Installation Directory>\Samples\Graphing\Counts.dat*, check the **Show Options Dialog** check box, and click the **Open** button to bring up the **impASC** dialog.
3. Click the triangle button in the upper right corner, and then select **System Default** from the context menu to apply the default settings to this dialog.



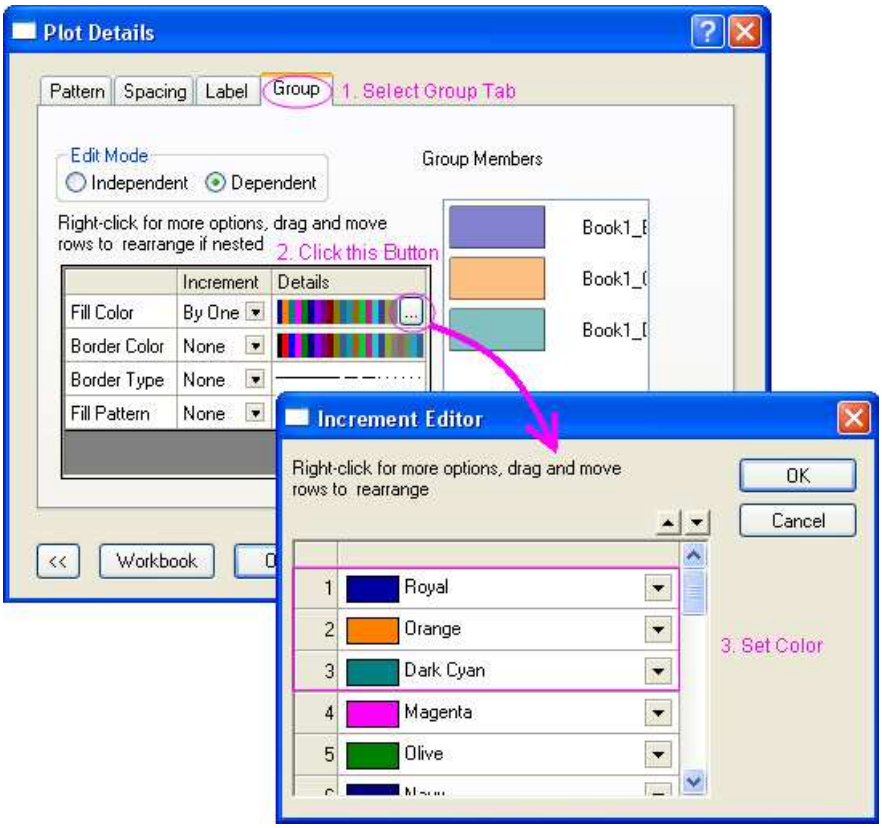
4. Click the **OK** button to import the data to the worksheet.
5. Right-click on the row header of **Units**, and then select **Set As Comment** from the pop-up menu to set the contents to be comments instead of units.



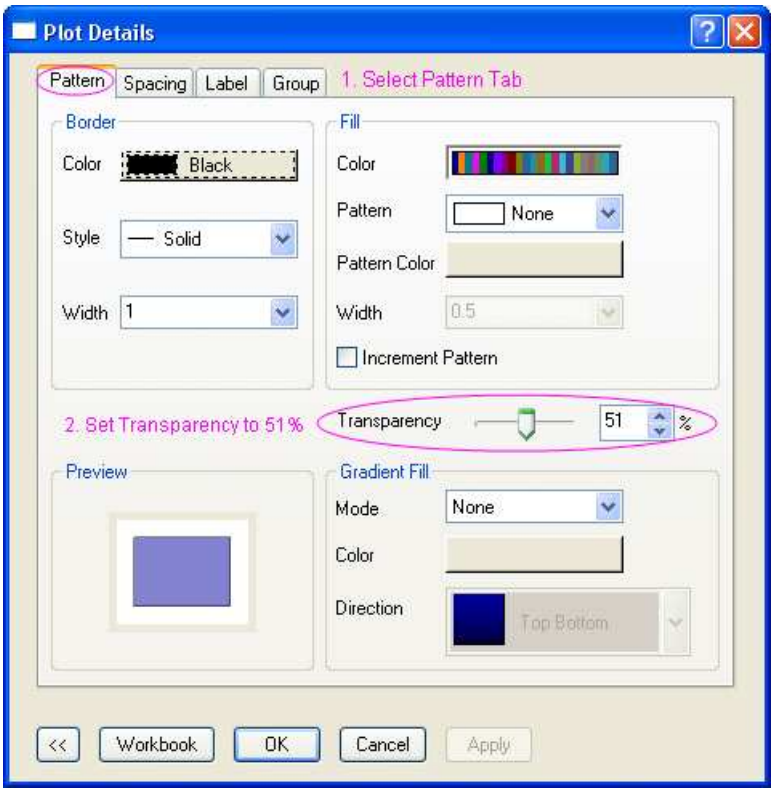
6. Highlight all columns in the worksheet, and then from the menu, select **Plot: Column/Bar/Pie: Column** to create a column graph.



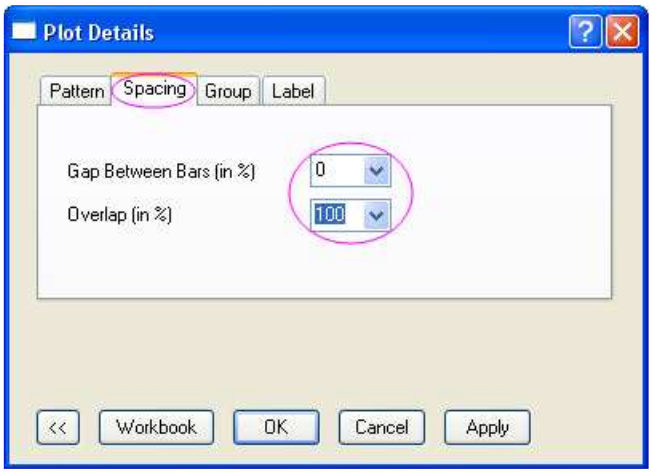
7. Double-click on the plot to open the **Plot Details** dialog. In the dialog, choose the **Group** tab. Click on the color bar under **Details** and click in the **Fill Color** row. Then click on the button that appears to open the **Increment Editor** dialog. In this dialog, you can set the first three colors to be some specific colors such as Royal Blue, Orange, and Dark Cyan. Click OK to close the dialog.



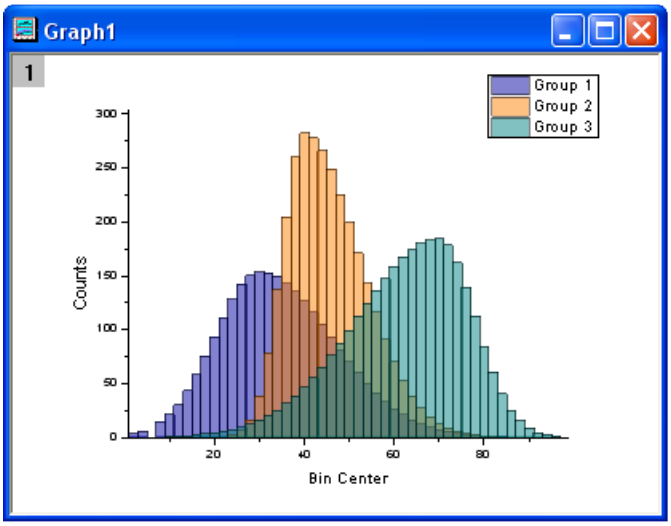
8. Select the **Pattern** tab in Plot Details, and set the **Transparency** control to 50%.



9. Select the **Spacing** tab, and set **Gas Between Bars** to zero and **Overlap** to 100.



10. Click the **OK** button to close the Plot Details dialog. The resulting graph should look like the image below:


Graph1
1
Group 1
Group 2
Group 3
Counts
300
250
200
150
100
50
0
20
40
60
80
Bin Center

5.5 Creating Intersecting Surface Plots from Worksheets

5.5.1 Summary

Many plot types, such as 3D Surface, 3D Bars, and Contour, can be created from data contained in a matrix object or from data arranged in a block of cells in a worksheet. The latter arrangement is referred to as a **Virtual Matrix**. Whereas a typical matrix object only supports a linear mapping of X and Y coordinates, a virtual matrix supports nonlinear mapping as well. In this tutorial, we show you how to create intersecting color map surface plots from virtual matrix data.

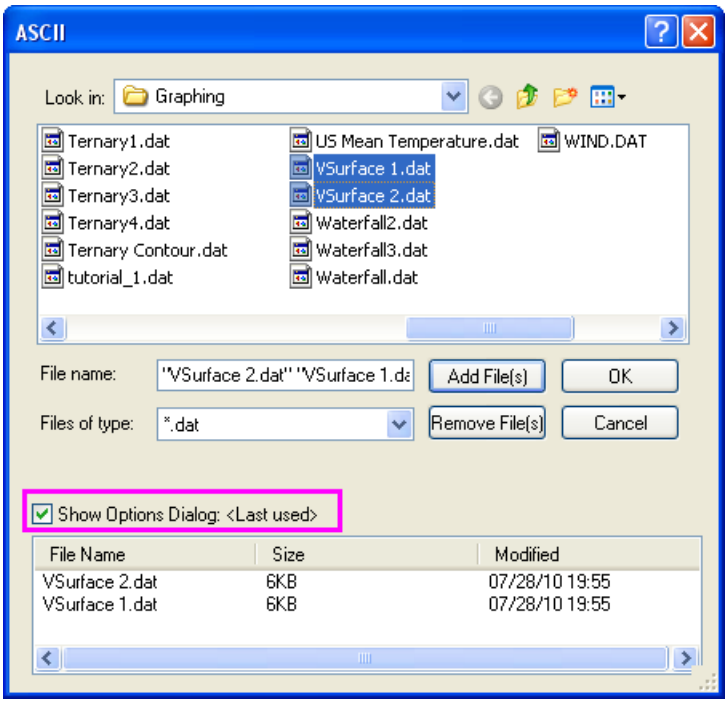
This tutorial will show you how to:

- Create a Color Map Surface plot using virtual matrix data from a worksheet
- Add one surface graph to another to create intersecting surface plots
- Customize the Color Map of one surface plot and copy and paste the settings to another plot
- Set transparency

5.5.2 Create Surface Plots from Virtual Matrix Data

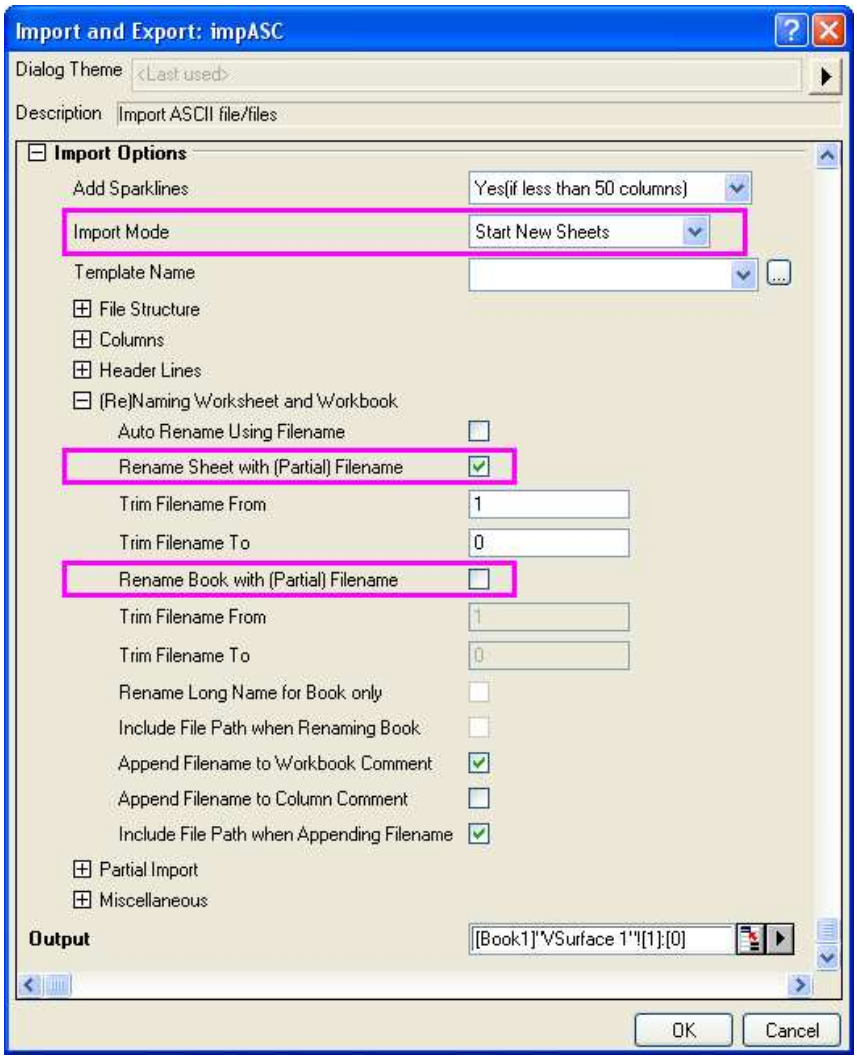
In this section, we will show you how to create surface plots from data in a worksheet.

1. Start a new project. Click the **Import Multiple ASCII** button  on the **Standard** toolbar. In the dialog that opens, navigate to the *\Samples\Graphing* folder and select *VSurface 1.dat* and *VSurface 2.dat*. Select the **Show Options Dialog** check box.

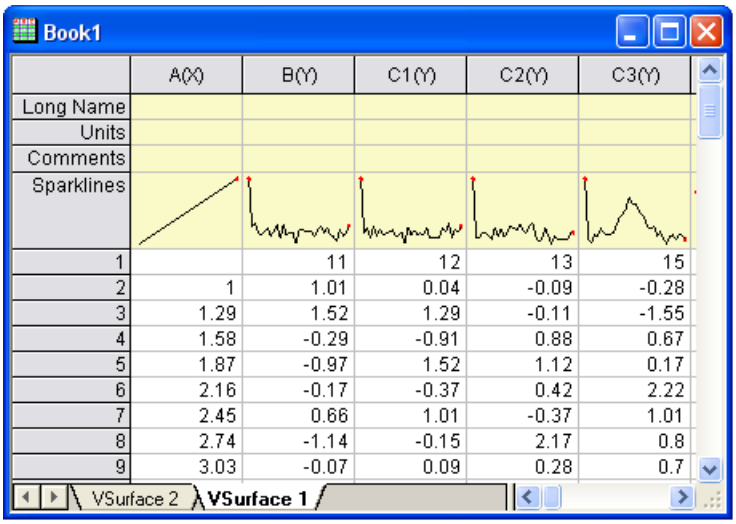


Press **OK** button.

2. In the **impASC** dialog, select **Start New Sheets** from the **Import Mode** drop-down list, to import data files to different worksheets of the same workbook. Expand the **(Re)Naming Worksheet and Workbook** branch of **Import Options**. Check **Rename Sheet with (Partial) Filename** and uncheck **Rename Book with (Partial) Filename**, to rename the worksheet with the file name.

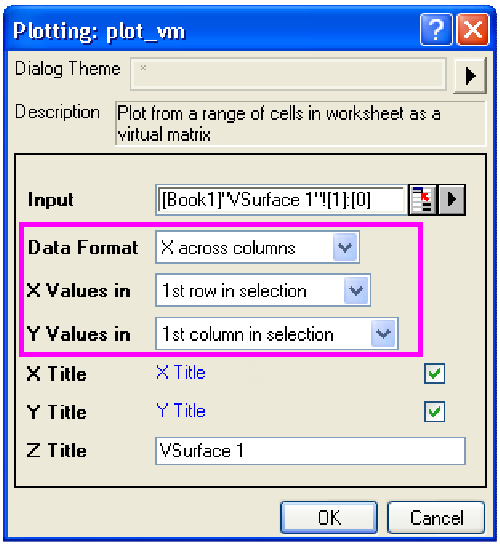


Click **OK** to import these two data files.

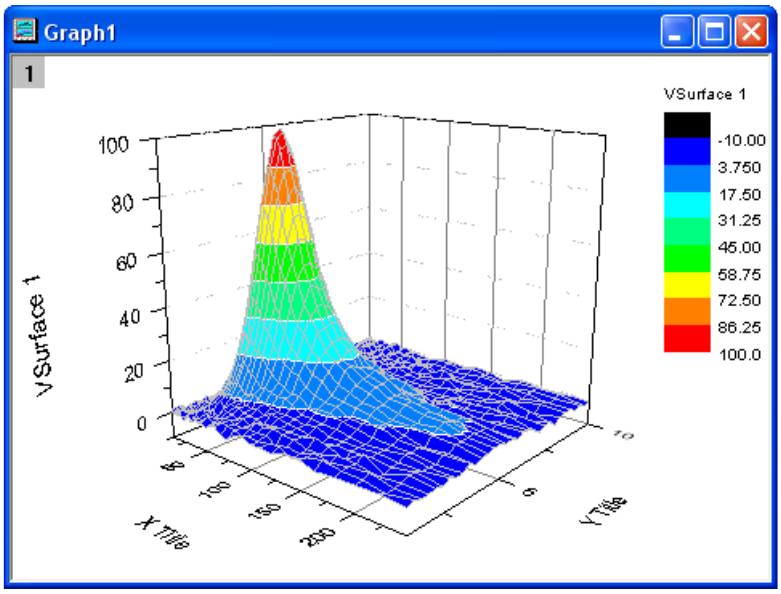


The data has X coordinate values in the top row and Y coordinate values in the first column. Note that the X coordinates have nonlinear spacing.

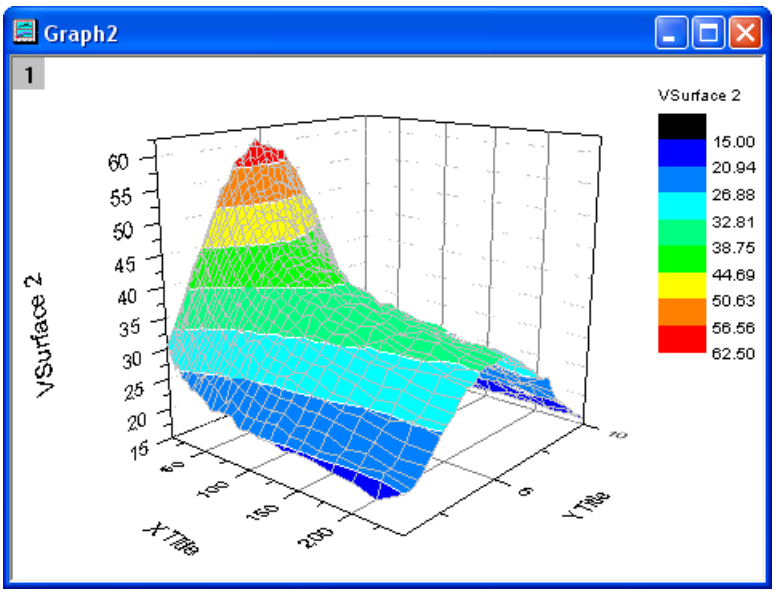
3. With the "VSurface 1" sheet active, click on top left corner of the workbook to select the entire sheet. Then select the menu item **Plot: 3D Surface: Color Map Surface**. This will open the **plot_vm** dialog. This dialog opens any time a 3D or Contour plot menu item is invoked with a group of worksheet cells (a virtual matrix) selected. The dialog allows you to define where the X and the Y coordinate values are located. In the dialog, select **X across columns** from the **Data Format** drop-down list. Set the **X Values in** drop-down list to **1st row in selection** and the **Y Values in** drop-down list to **1st column in selection**:



Click **OK** to plot a Color Map Surface plot.



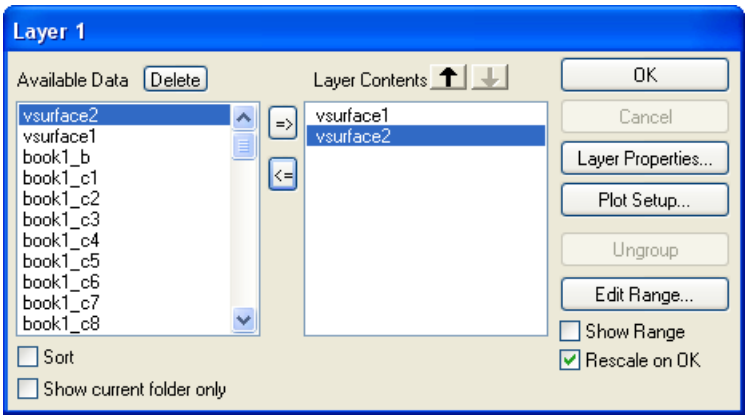
4. Repeat the last step to plot another Color Map Surface plot using data from the VSurface 2 worksheet.



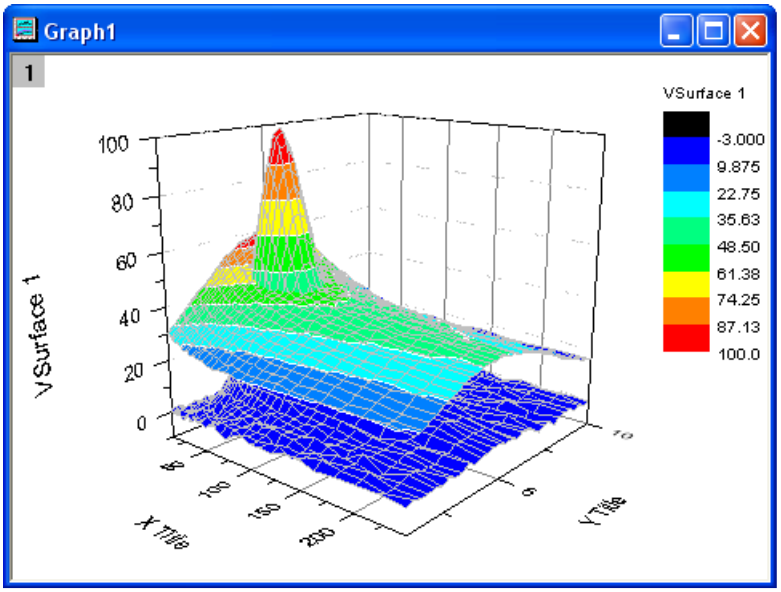
5.5.3 Add another Surface Plot to Layer

In this section, we will show you how to add a surface plot to a graph layer already containing another surface plot.

1. Activate Graph1. Right-click on the Layer 1 icon on the top left corner of the graph and select **Layer Contents** from the context menu. In the **Layer** dialog that opens, select vsurface2 in the Available Data box and add it to the Layer Contents box.

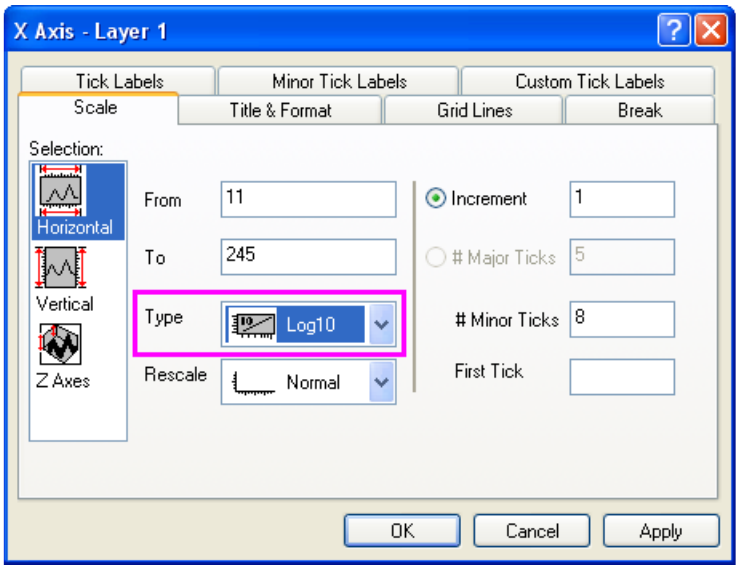


Click **OK** to add the second surface.



Note that Origin displays the two surfaces with proper intersection.

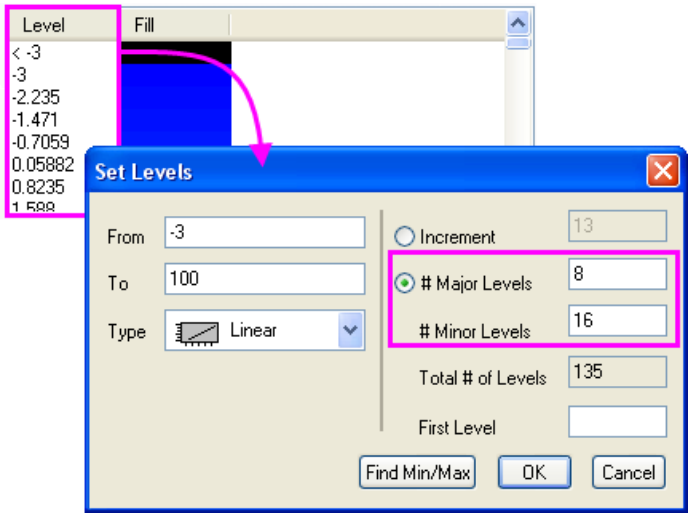
2. Double-click on X axis to open the **X Axis** dialog. On the **Scale** tab, select **Log10** from the **Type** drop-down list.

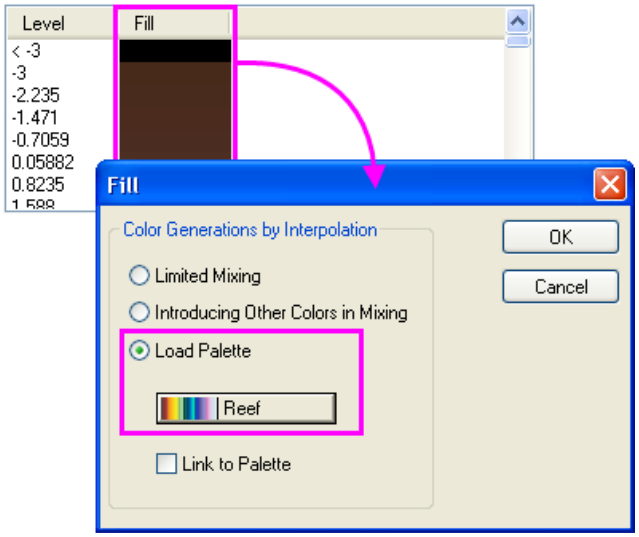


5.5.4 Customize Color Map and Copy-Paste to another Plot

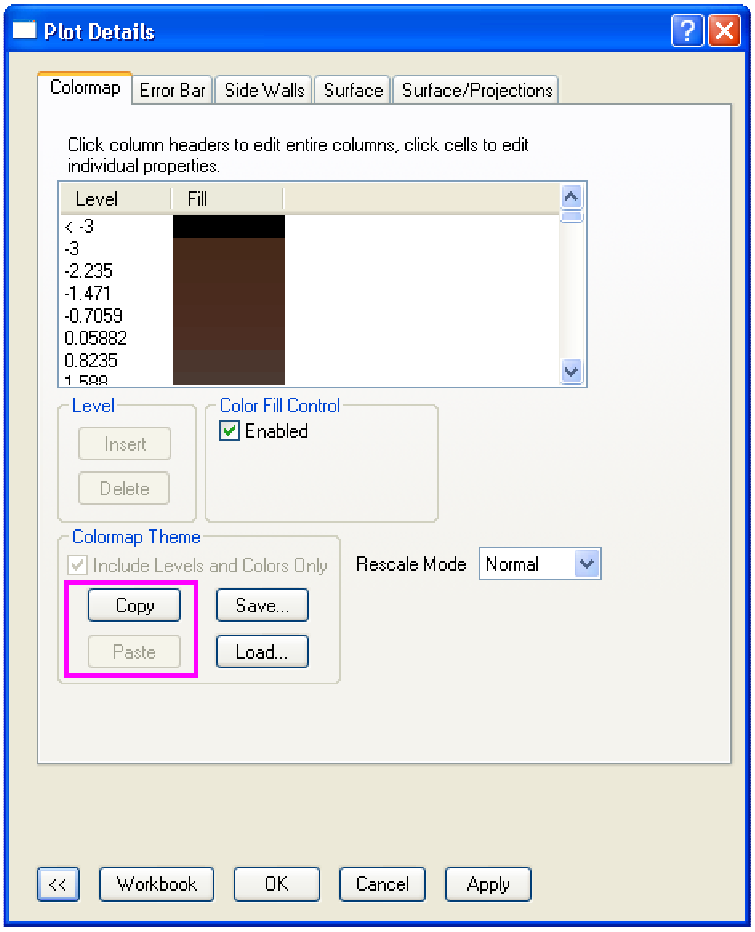
In this section, we will customize the Color Map settings of one plot, and then copy and paste those settings to the other plot.

1. Double-click on the graph to open the **Plot Details** dialog. On the left panel, expand the **Layer1** node and select **VSurface 1**. Then switch to the **Color Map** tab and set **Level** and **Fill** as below:

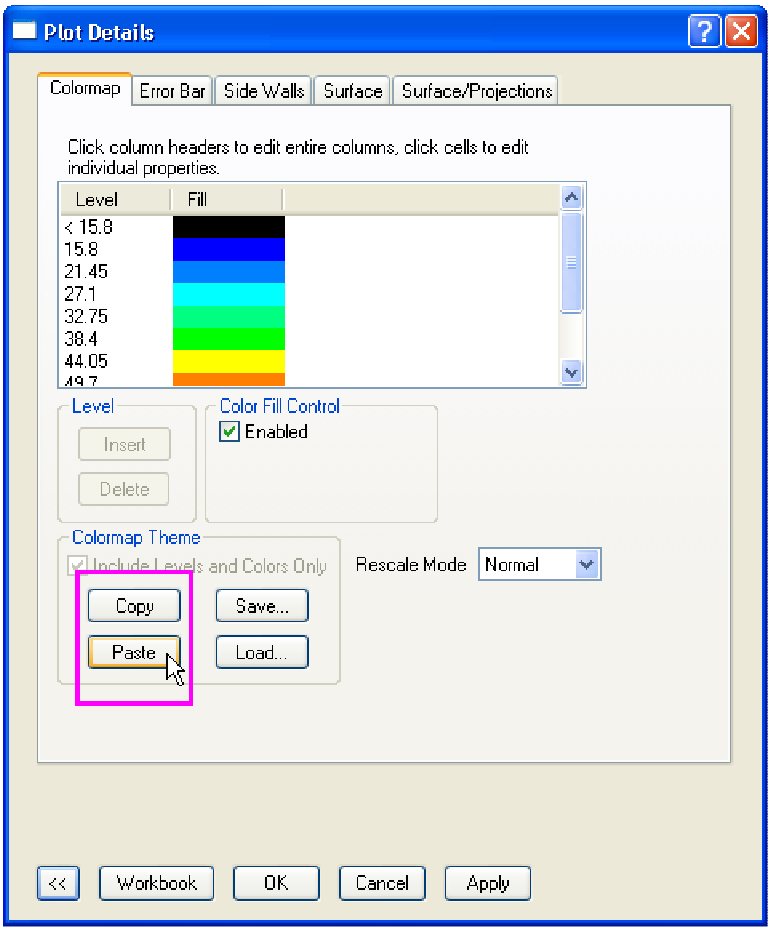




2. Now press the **Copy** button under the **Color Map Theme** group on this tab to copy the level and color settings to the clipboard.



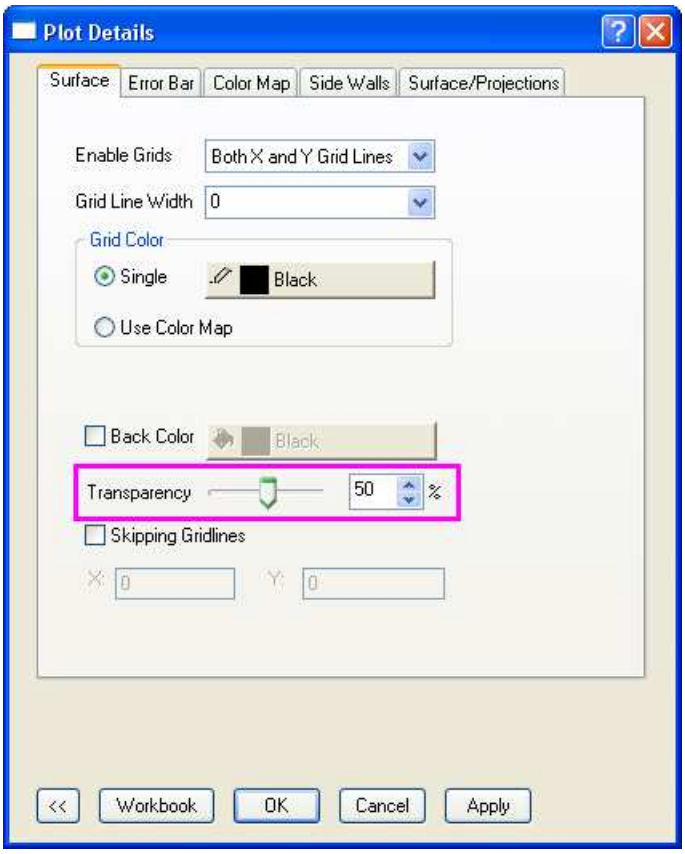
3. Switch to the **VSurface 2** plot in the left panel of Plot Details, and on the right panel, select the corresponding Color Map tab. Then press the **Paste** button to paste the settings from the clipboard to the second plot.



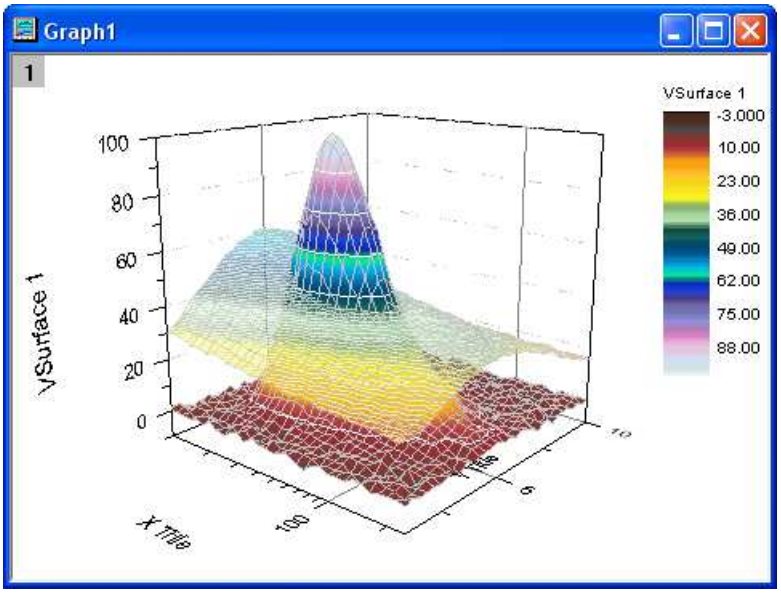
5.5.5 Set Surface Transparency

We will now set the transparency of the second surface so that parts of the first surface are visible in this intersection plot.

1. Switch to the **Surface** tab and move the **Transparency** slider to 50%.



The final graph should look like the following image.


Graph1
1
VSurface 1
-3.000
10.00
23.00
36.00
49.00
62.00
75.00
88.00
100
80
60
40
20
0
VSurface 1
X Title
Y Title
10
5
0

5.6 Customizing a Graph

5.6.1 Summary

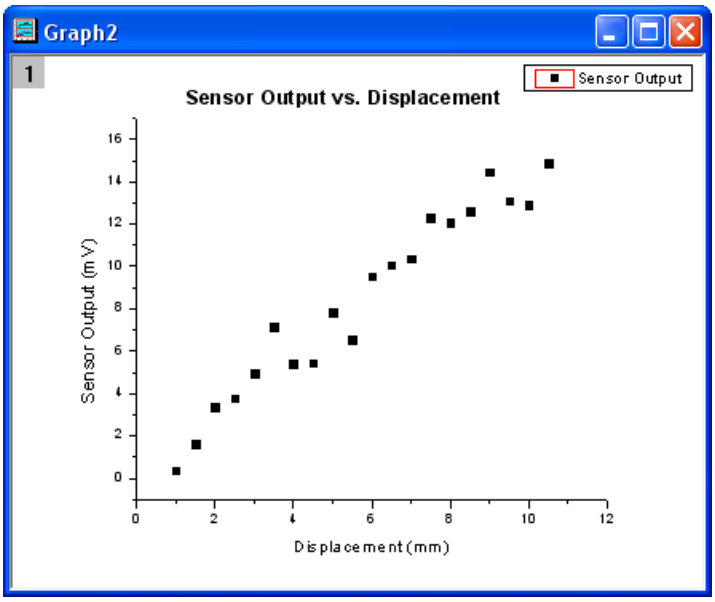
Editing your Origin graph is very easy. Any graph element can be selected and with its associated dialog, the properties can be modified. In fact, you can customize your graph right down to a single data point.

This tutorial will show you how to:

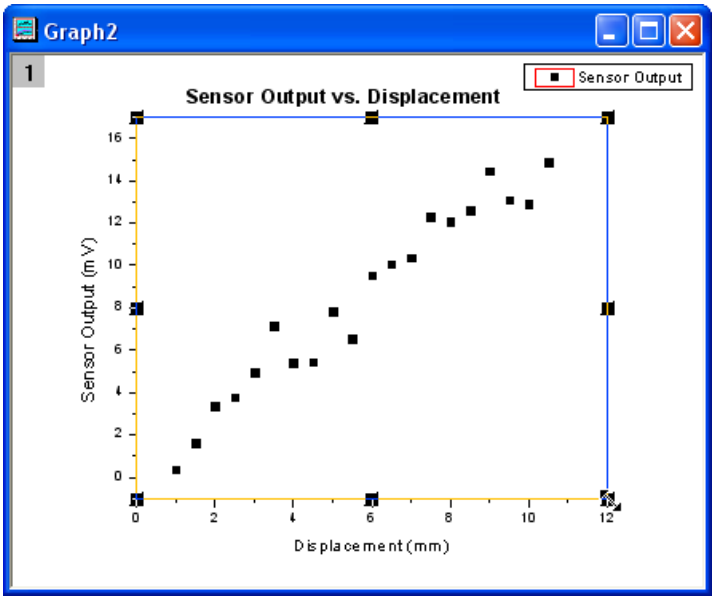
- Resize a Layer
- Add a Layer Title
- Customize and Save a Template
- Customize Axes
- Apply a Graph Theme
- Change Plotting Order in a Layer
- Customize a Point
- Customize a Grouped Plot
- Create a Color-mapped Waterfall Plot

5.6.2 Resize Layer

1. Open **Customizing Graphs.OPJ** from the **\Samples\Graphing** folder and select the **Resize Graph and Customize Symbol** folder from the **Project Explorer** window.
2. Make **Graph2** active and right-click inside the layer, above the data points to select **Add/Modify Layer Title** from the context menu that opens. Add a title, as the following graph shows.

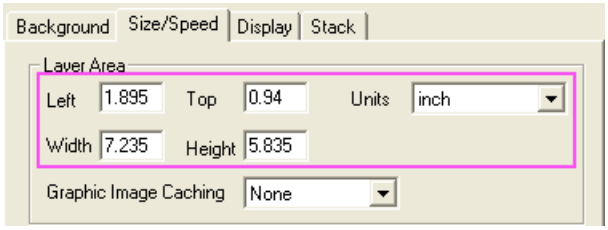


3. The layer can easily be resized graphically by dragging the sizing handles. To resize it, single click inside the layer, but not on a data point. You can left-click in the same space you right-clicked when adding the Layer Title. The layer will become selected as seen below, and then you can drag one of the 8 anchor points to resize the layer. Note: If you hold the Ctrl key down while dragging, the aspect ratio will be maintained.



4. You can also use the **Plot Details** dialog to input the size of the layer, in order to resize it precisely. Double-click inside the layer (in the same spot you left-clicked above) to open the

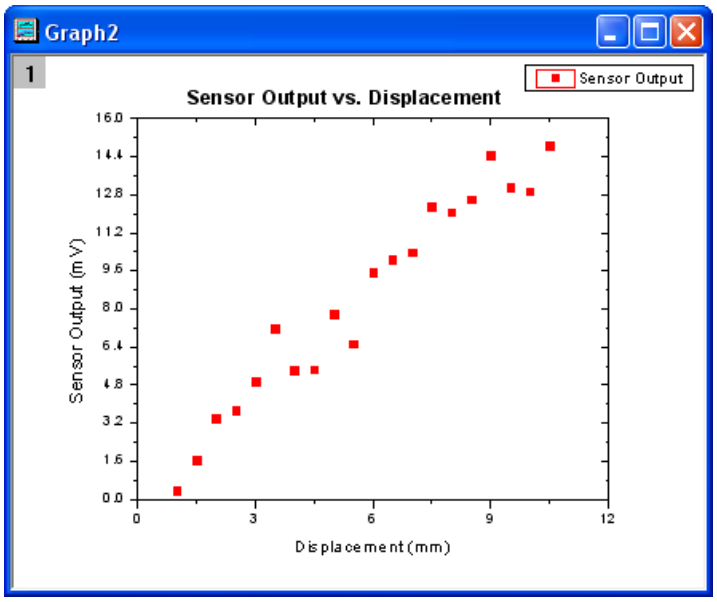
Plot Details dialog. Go to the **Size/Speed** tab, and set the layer area to the values shown in the image below:



5.6.3 Customize Data Plot and Axes

In this section, we will show you how to change the color of a data plot, and how to change the properties of the axes.

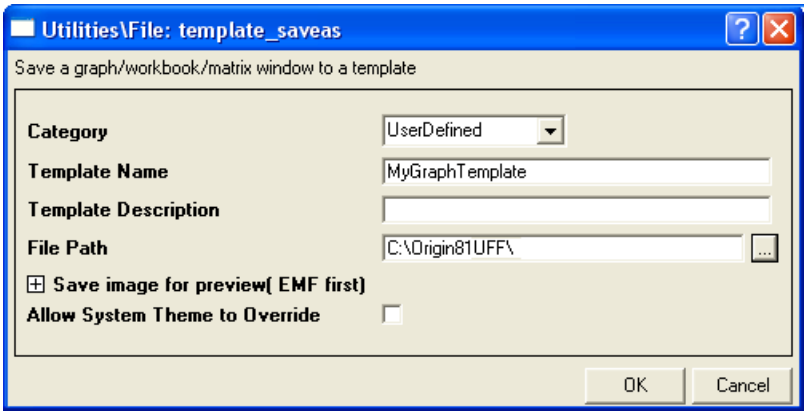
1. Click on one of the data points of **Graph2** to select the entire data plot, and then change the color of the data points to **red** by using the **Line/Border Color** button  in the **Style** toolbar.
2. Next we will use the **Axis** dialog to customize the axes. Double-click on the X-axis to open the dialog and set the controls as follows:
    - On the **Scale** tab, choose the **# Major Ticks** radio button and input **5** into it. Then select **Vertical** from the **Selection** list box. The name of the dialog changes to **Y Axis** when you do this. Input **0**, **16** and **11** into the **From**,**To** and **# Major Ticks** edit boxes, respectively.
    - On the **Title&Format** tab, select **Top** from the **Selection** list and check the **Show Axis&Ticks** check box to add the top X-axis. Then select **Right** from the **Selection** list and again check the **Show Axis&Ticks** check box to add the right Y-axis. Now the graph should look like:



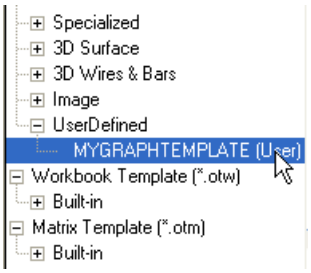
5.6.4 Save and Reuse a Template

In this section, we will show you how to save the graph above as a template and reuse it.

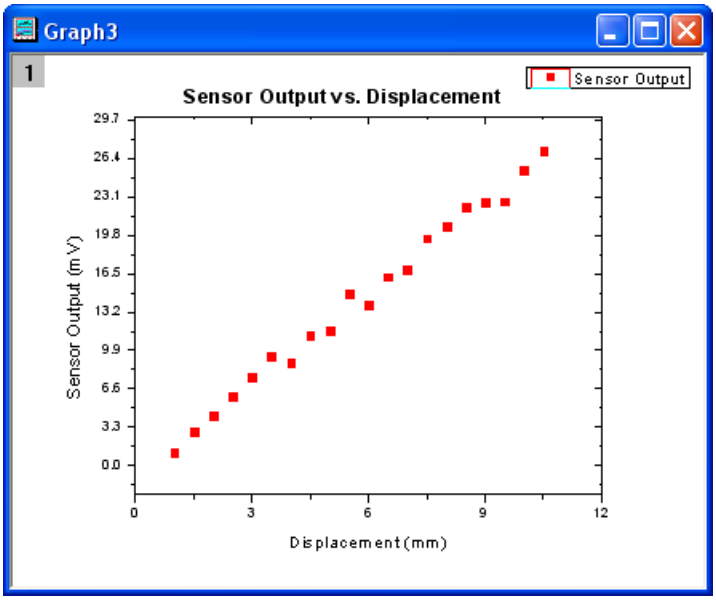
1. In the menu, select **File: Save Template As** (alternatively, right-click on the graph window title and choose **Save Template As** from the context menu) and rename the template as **MyGraphTemplate**. Then click the **OK** button to save it.



2. Create a new workbook and import the data file **\Samples\Curve Fitting\Sensor2.dat**, by using **File: Import: Single ASCII**. Highlight column B and select **Plot: Template Library**. Then select **MyGraphTemplate** and click the **Plot** button to create a graph.



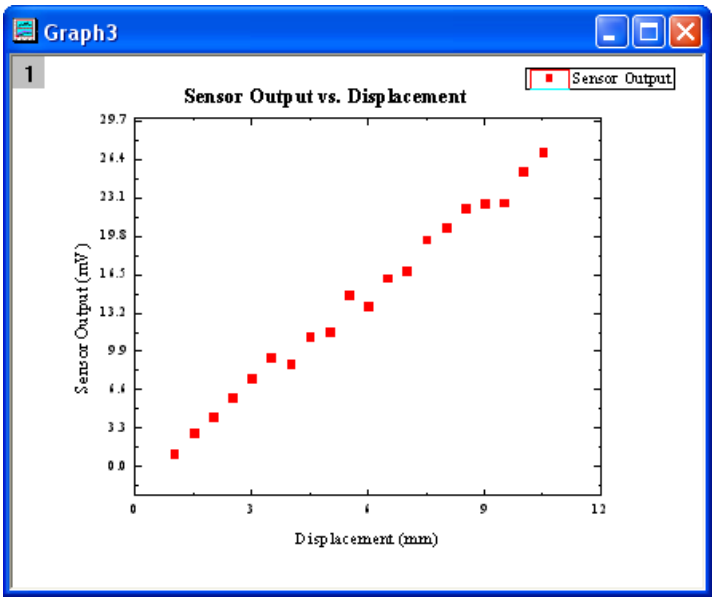
The graph should look like:



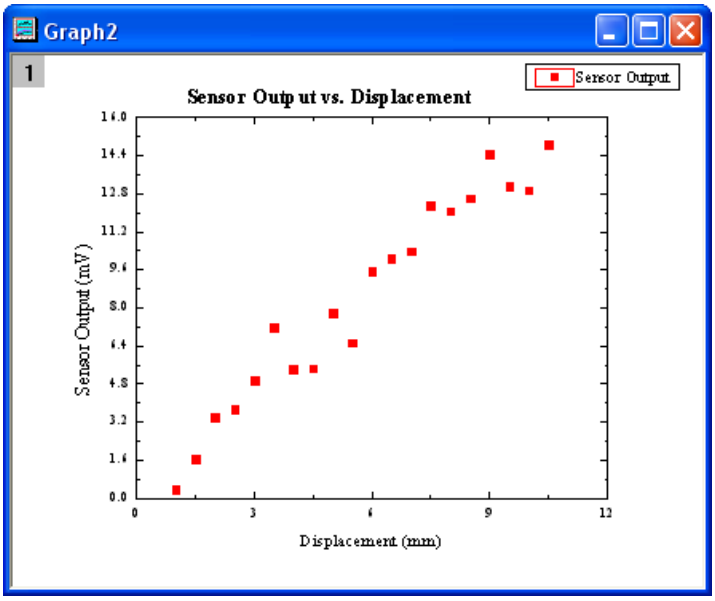
5.6.5 Changing Graph using Theme

Origin stores the properties of a graph in a theme file. In this section we will show you how to customize a graph by using a theme.

1. With **Graph3** active, select **Tools: Theme Organizer** to open a dialog. Apply the themes **Ticks All In** and **Times New Roman Font**. Then click the **Close** button to close the dialog. The graph should look like:



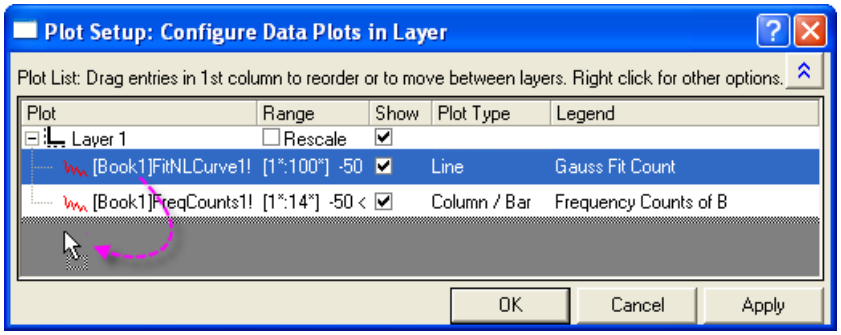
2. Then we will copy the formatting of the current graph and paste it to **Graph2**. Right-click to the right of the layer, anywhere on an empty white space, or even on the gray area, and select **Copy Format: All Style Formats**. Then activate **Graph2**, right-click in a similar spot and select **Paste Format**. Then **Graph2** should look like the image below:



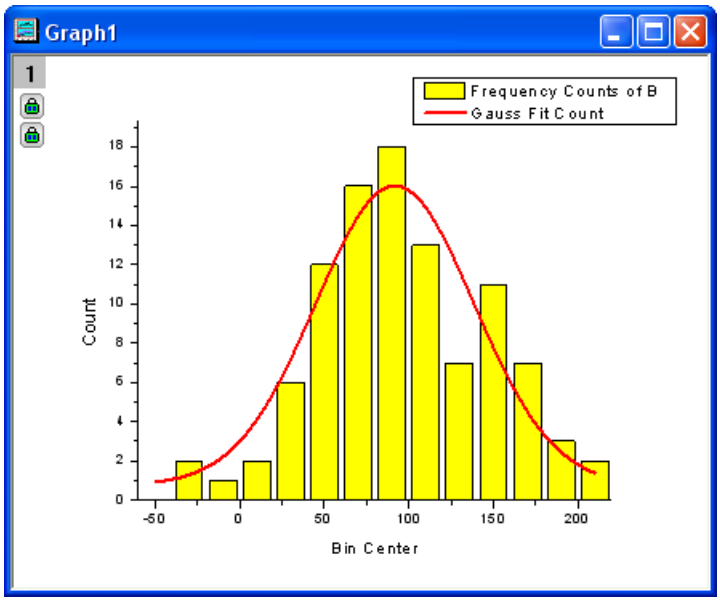
5.6.6 Plotting Order

In this section, we will show you how to change the plotting order by using the **Plot Setup** dialog.

1. Go to the **Plotting Order** folder and activate **Graph 1**. Select **Graph: Plot Setup** from the main menu to open the **Plot Setup** dialog. (Alternatively, double-click on the layer 1 icon in the upper left-hand corner of the graph, which also will open the **Plot Setup** dialog.)
2. In the **Plot List** panel, drag the line plot and drop it beneath Column/Bar Plot Type.



3. Click the **OK** button and you will see that the red curve is now drawn on top. Notice the legend reflects the new plotting order as well.



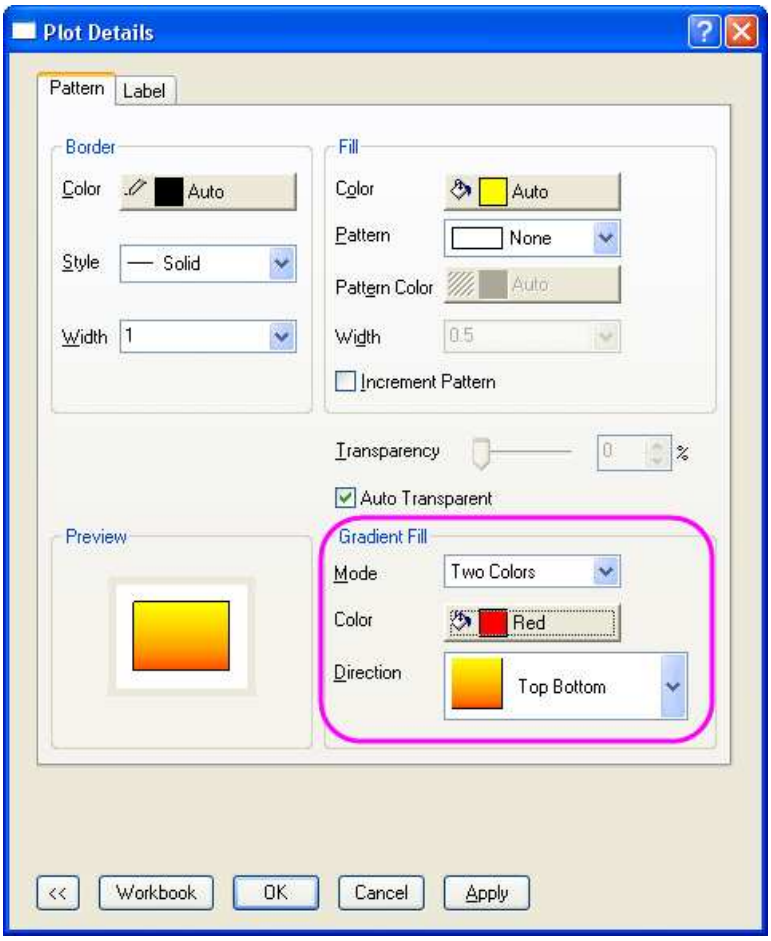
5.6.7 Customize Points

In this section, we will show you how to customize a single data point.

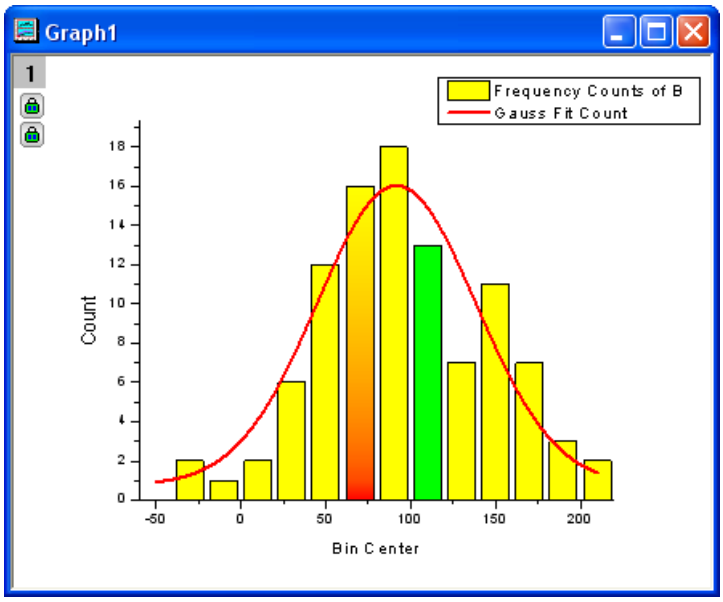
1. Continue viewing the contents of the **Plotting Order** folder and make sure **Graph 1** is active. Click to select one of the columns and all columns become selected. Click again on one of the

columns to select just that one column. Then change the color to **green** by using the **Fill Color** button  on the **Style** toolbar.

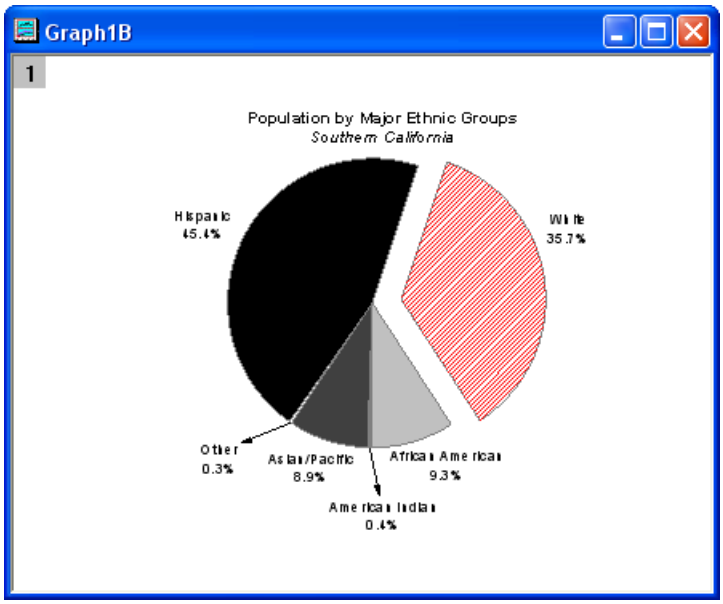
2. You can also use the **Plot Details** dialog to customize a single column. Hold down the Ctrl key while double-clicking on one of the columns to open the **Plot Details** dialog. You'll be editing the properties of just that single data point. Notice the index number for that point in the Plot Details dialog. Set the **Gradient Fill** group as follows to change the column color from yellow to red, gradually.



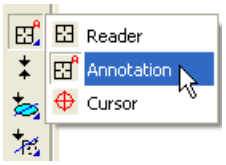
Then the graph should look like the following:



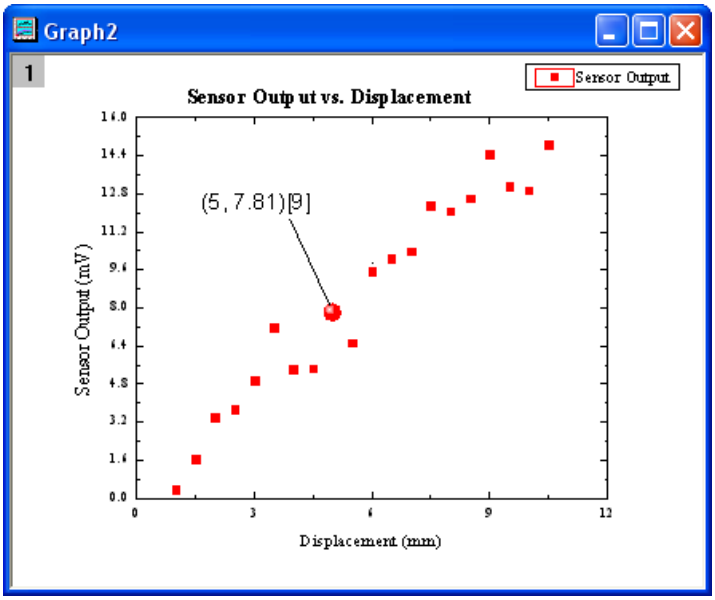
3. You can customize a slice of a pie graph in the same way. Go to the **Edit Single Data Point** folder and activate the pie graph. Hold down the Ctrl key and double-click on one of the slices to open the **Plot Details** dialog. Under the **Pattern** tab, set the **Fill Pattern** to **Dense**, from the drop-down list, and set the **Pattern Color** to **Red**. (Alternatively, you could have clicked once and then clicked again on a slice to select just that one point, and then used the Style toolbar to customize that point.) The graph should look like:



4. You can customize a single data point and add an annotation to it. Go back to the **Resize Graph and Customize Symbol** folder. Hold down the Ctrl key and double-click on one of the scatter points to open the **Plot Details** dialog. Under the **Symbol** tab, click the triangular **Preview** button to open the symbol gallery, and then select **Sphere** for the symbol. Increase the **Size** to **18**, and click the **Ok** button to close the dialog.
5. Now you can use the annotation tool to add the X and Y values that correspond to your customized data point. Select the **Annotation** button from the **Tools** toolbar.



Then move the annotation cursor to your customized data point and double-click on it. Origin will automatically add a text object. Hit the ESC key or click on the Pointer button to stop annotating. You can customize the text label by double-clicking on it to enter Edit mode. You can also change its position by clicking and dragging - a line will automatically be drawn connecting the point and the label.

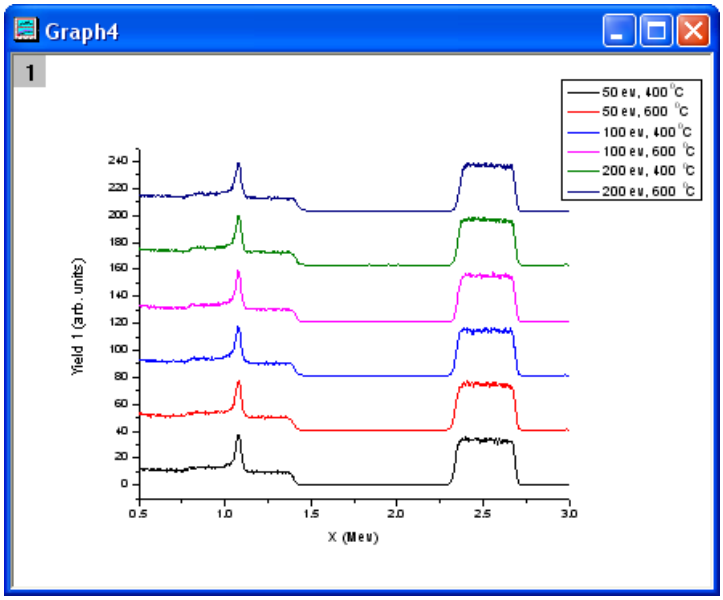


5.6.8 Group Plots

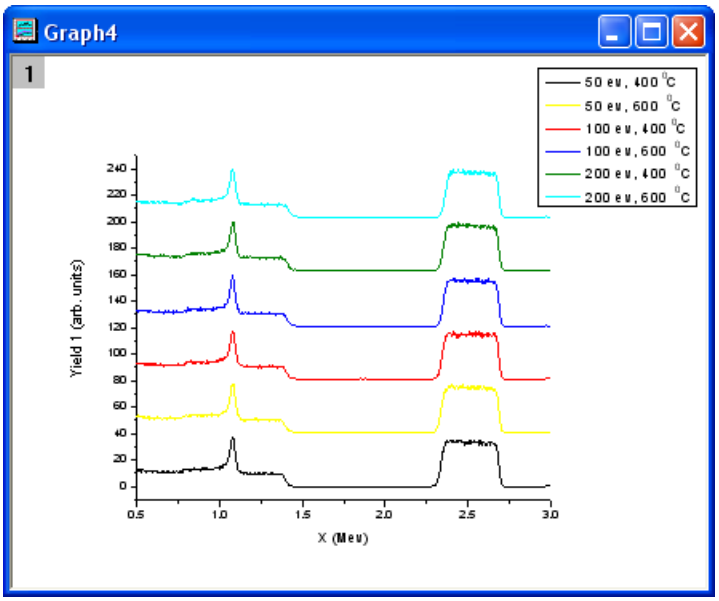
In this section, we will show you how to customize a grouped data plot.

1. Select the **Grouped Data** folder. **Book3** will be active. Highlight the entire worksheet and click the line button  on the **2D Graphs** toolbar to create a line graph.
2. Double-click on the X-axis to open the **Axis** dialog. Input **0.5** into the **From** edit box and **3.0** into the **To** edit box. Select **Manual** from the **Rescale** drop-down list (you will need to scroll up in the list). This prevents the **From** and **To** values from changing while rescaling. Click **OK** to apply these settings.

3. Double-click somewhere inside the layer, on a blank place above the line plots, to open the **Plot Details** dialog. On the **Stack** tab, select **Auto** in the **Offset** group. Click **OK** to close the dialog.
4. Select **Graph: Rescale to Show All**. The Y scale of the graph automatically rescales, while the X scale doesn't change because the option was set to manual. Resize the layer and move the legend as you see fit.

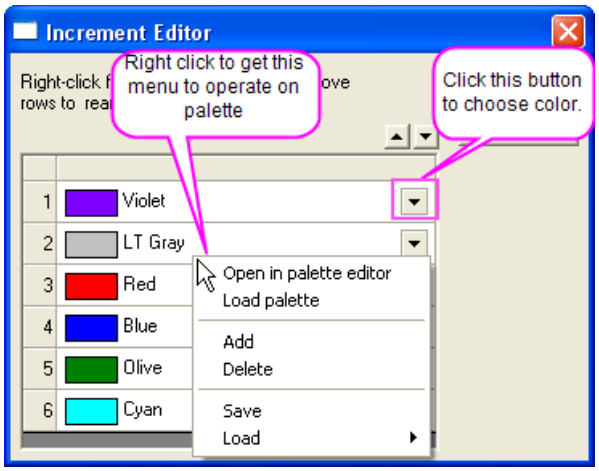


5. Click on one of the data plots to select the entire group, and then use the **Line/Border Color** button on the **Style** toolbar to change the colors. In **Incr. List**, you can select the second-to-last increment list. The graph should look like:

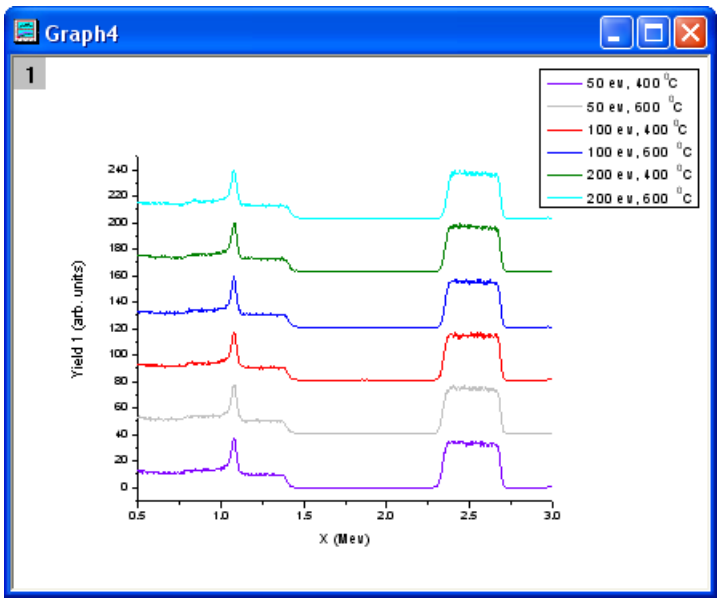


6. Though these data plots have been grouped, you can also customize each of them individually by clicking on the data plot twice. For example, you can click the yellow data plot twice (click once, pause and click again) and then click the **Line/Border Color** button  on the **Style** toolbar to change the color to another color, such as **Olive**.
7. You can also customize the graph by double-clicking on one of the data plots to open the **Plot Details** dialog. Under the **Group** tab, you can click the browser button

to open the **Increment Editor** dialog. In this dialog, customize the graph as shown in the following image. Please note that you can also drag the index of a row and move it to change the order of the color list.



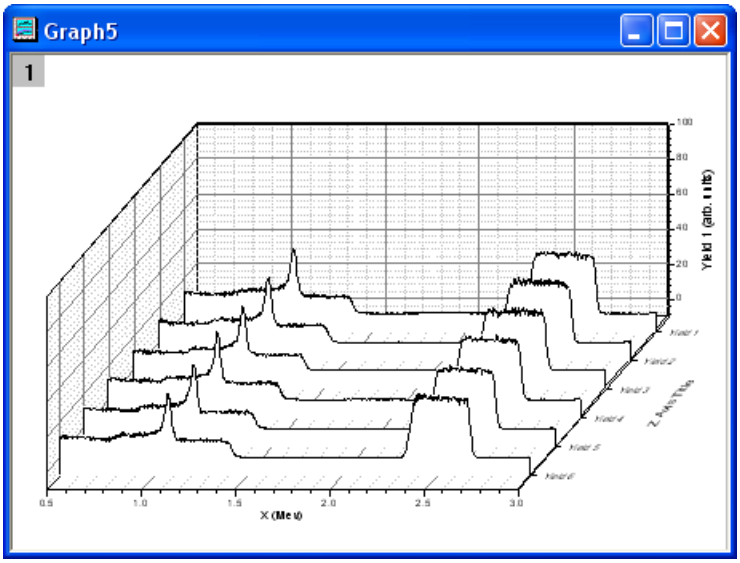
The graph should look like:



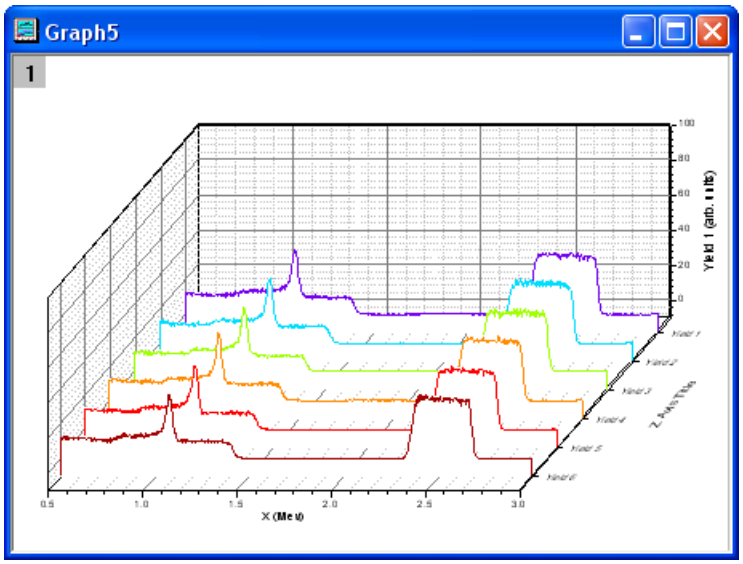
8. Right-click on the inner position of this dialog and select **Save** to save it as **MyPalette** for future use. Then you can right-click to get the context menu and select the **Load** option. You will find that **MyPalette** appears as the first entry in the fly-out menu, as the following image shows.

In the following section, we will show you how to use **Palettes** to set colors for a group of data plots.

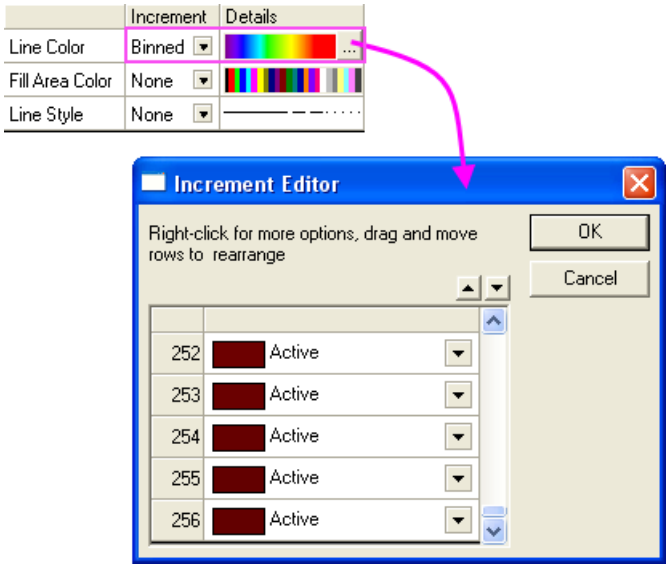
1. Activate **Book3** and highlight all the columns. Select **Plot: Multi-Curve: Waterfall** to create a graph. Double-click on the X-axis to open the **Axis** dialog, and set **From** as **0.5** and **To** as **3**. Select **Vertical** from the **Selection** list, and set the **From**, **To**, and **Increment** edit boxes to **-10**, **100** and **20**, respectively.



2. Click on one of the data plots and then use the **Line/Border Color** button  on the **Style** toolbar to change the colors. You can select the **Rainbow** palette  under **Palettes**. The graph should look like:



3. You can double-click on one of the plots to get the color list, as the following image shows:

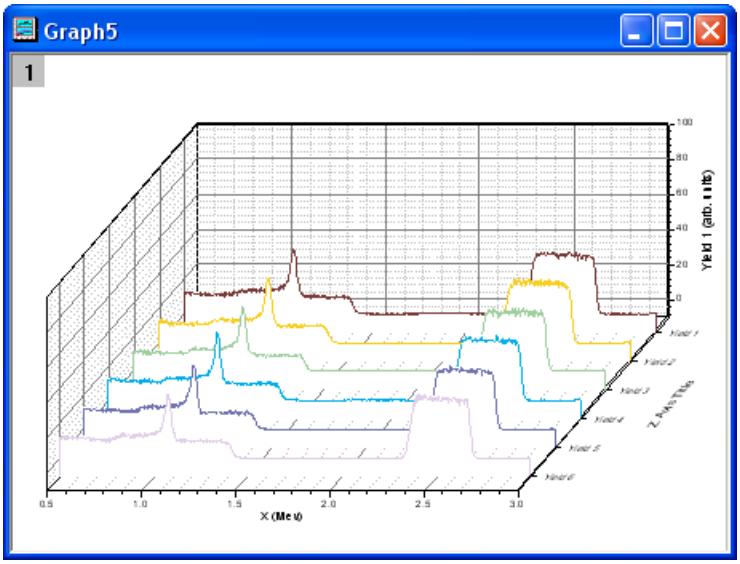


You can find that the **Increment** has been set to **Binned**, so colors are picked from the 256 available in the **Rainbow** palette.

4. We will change the palette to **Reef** by clicking on the **Browser** button to open the **Increment Editor** dialog. Then right-click on the inner position of this dialog and select **Load: Reef.PAL**. The color list in the **Plot Details** dialog should be:

	Increment	Details
Line Color	Binned	
Fill Area Color	None	
Line Style	None	

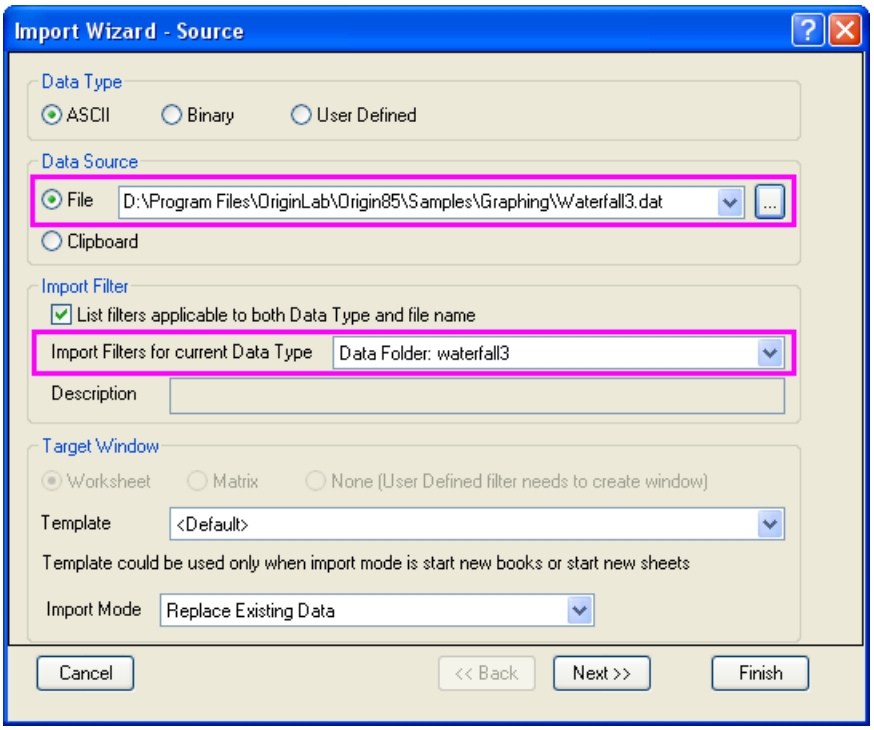
And the graph should look like:



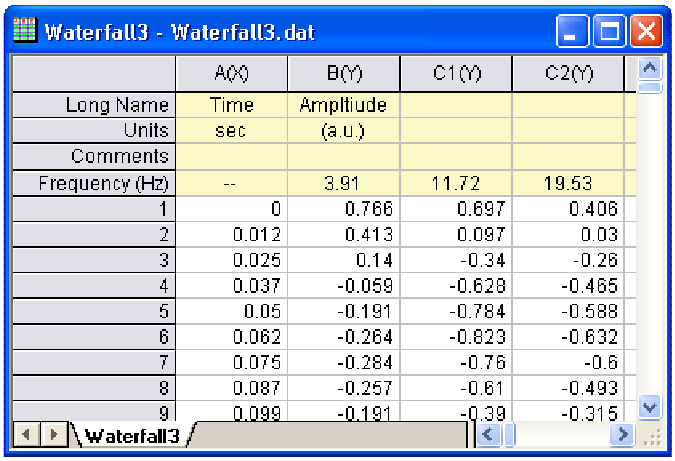
5.6.9 Plot a Color-mapped Waterfall

In this section, we will show you how to create a color-mapped waterfall and use the desired column label row as the Z-axis.

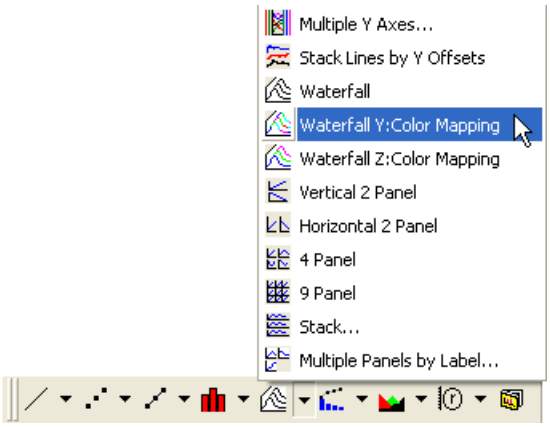
1. Click the **New Workbook** button on the **Standard** toolbar to create a new workbook.
2. Click the **Import Wizard** button on the **Standard** toolbar. This opens the **Import Wizard** dialog. Click the browser button to the right of **File** and select *Waterfall3.dat* from the */Samples/Graphing* folder. Make sure *Waterfall3.oif* is picked up automatically for **Import Filters for current Data Type**.



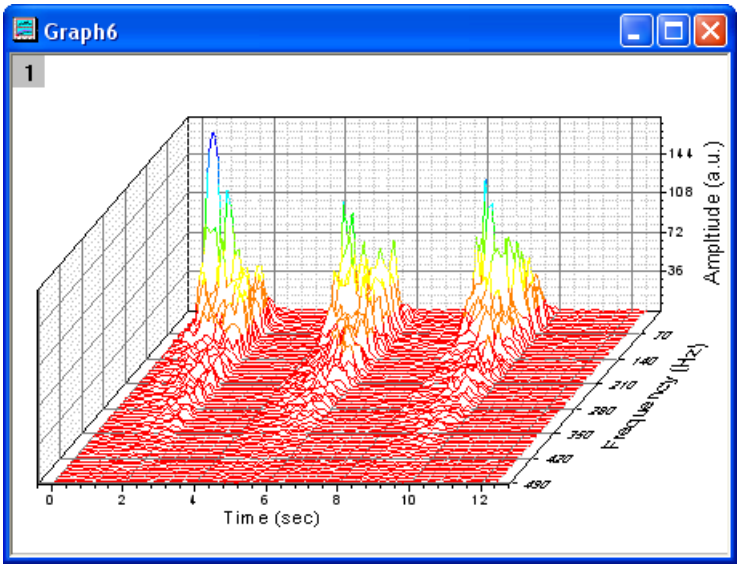
Click **Finish** to import the *Waterfall3.dat* file.



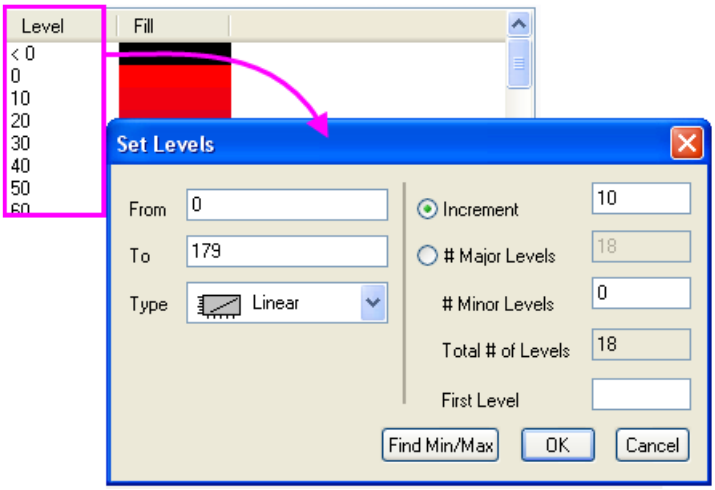
3. To plot a waterfall color-mapped using each line's Y value, highlight the whole worksheet and select **Waterfall Y: Color Mapping** from the **2D Graphs** toolbar (Alternatively, Select **Plot: Multi-Curve: Waterfall Y:Color Mapping** from the main menu).



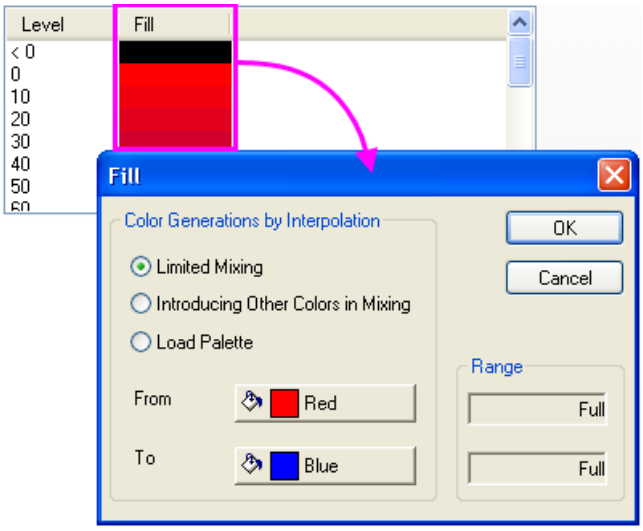
The graph should look like the picture below:



4. Double-click on the waterfall plot to open the **Plot Details** dialog. Go to the **Color Map** tab. On this tab, you can:
    - Click on the **Level** column header to change the color levels

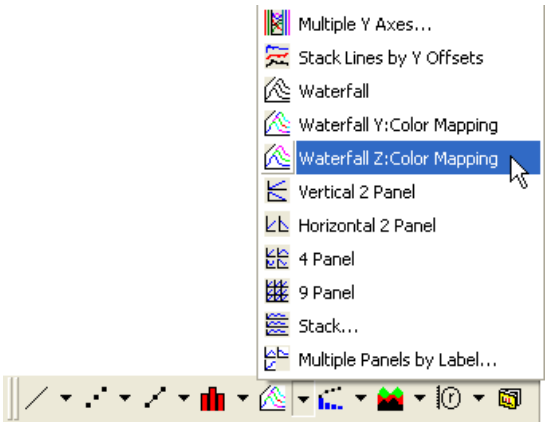


- Click on the **Fill** column header to load a color palette or change the filled color list:

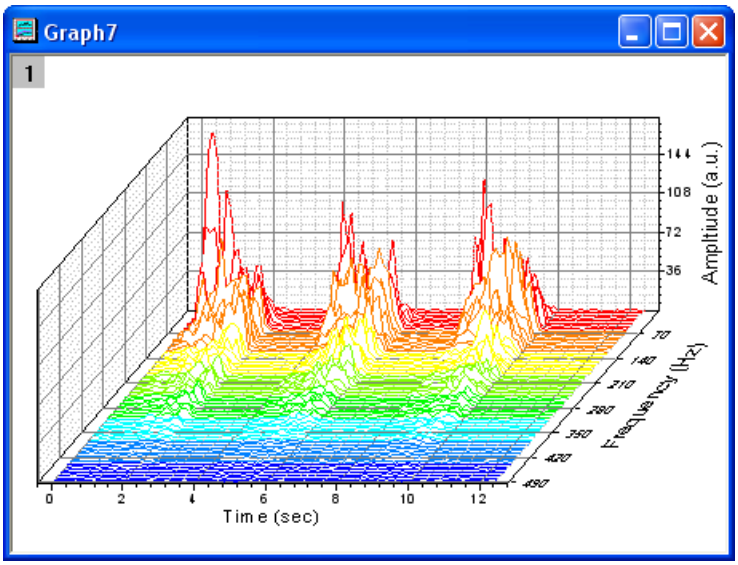


Please note that you can also click inside one single cell to change that level individually.

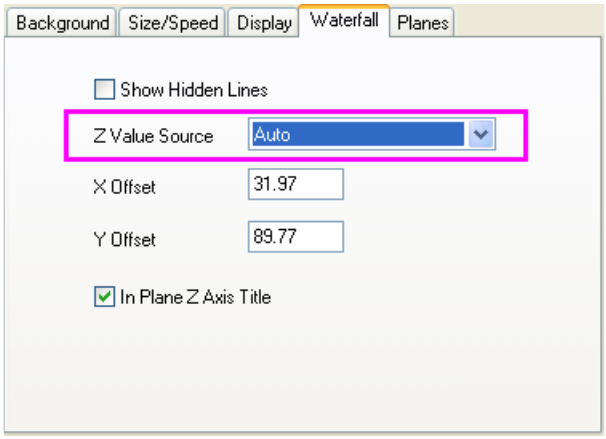
5. To plot a waterfall color-mapped with Z values, highlight the **waterfall** worksheet in **Book 2** and select **Waterfall Z: Color Mapping** from the **2D Graphs** toolbar (Alternatively, Select **Plot: Multi-Curve: Waterfall Z:Color Mapping** from the main menu).



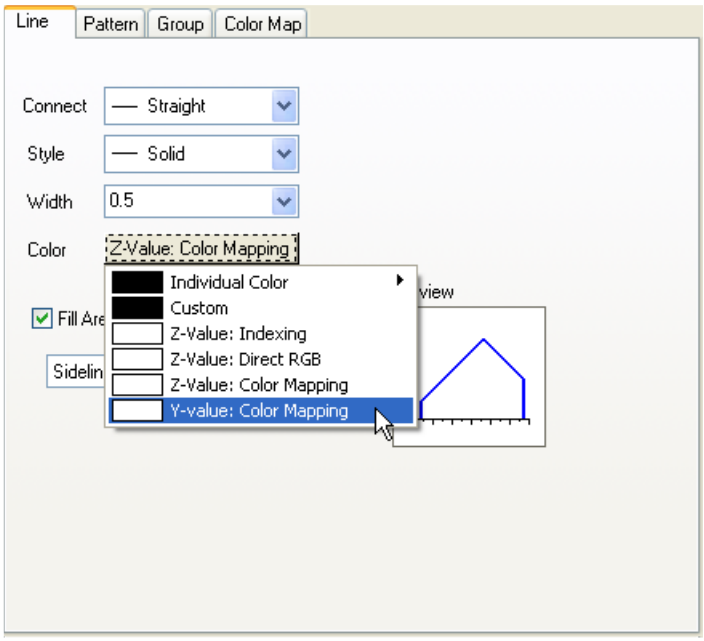
The graph should look like the picture below:



6. Note that the user-defined parameter "Frequency (Hz)" is used as the Z axis automatically. To use another column label as the Z axis, Short Name for example, double-click inside the layer and away from the waterfall lines to open the **Plot Details** dialog at the **Layer** level. Go to the **Waterfall** tab, and select **Auto** from the **Z Value Source** drop-down list.



7. To switch between Y and Z color mapping, select the first plot on the left panel of the **Plot Details** dialog and activate the **Line** tab. Select **Y-value: Color Mapping** from the **Color** drop-down list, to switch to Y color mapping. You can also select **Z-Value: Indexing** or **Z-Value: Direct RGB** from this drop-down list.



5.7 Contour Plots and Color Mapping

5.7.1 Summary

Origin offers rectangular, polar, and ternary contour plots. For **rectangular contour plots**, the data can be either in a matrix or in a worksheet in XYZ format. **Polar contour plots** can be generated from three columns of data in a worksheet, organized either as R Θ Z or Θ R Z. **Ternary contour plots** can be generated from worksheet data organized in X Y Z Z format where the 2nd Z-column contains the 4th parameter which is the height value at a given XYZ point in the ternary space.

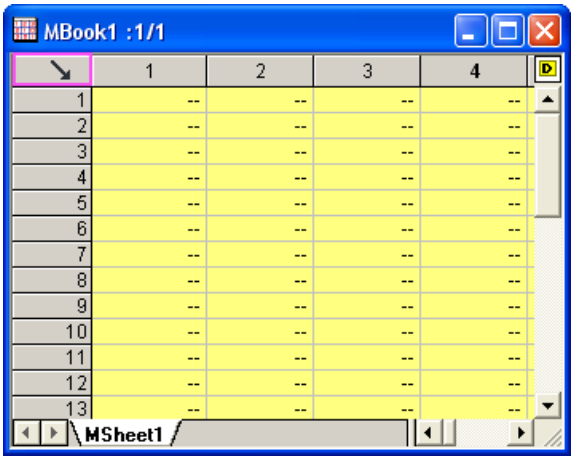
Many options are available for customizing contour plots, such as setting different major and minor contour levels, displaying contour lines only at major levels, applying color palettes, and there is also a control for a custom boundary in the case of contour plots created directly from the worksheet.

This tutorial will show you how to:

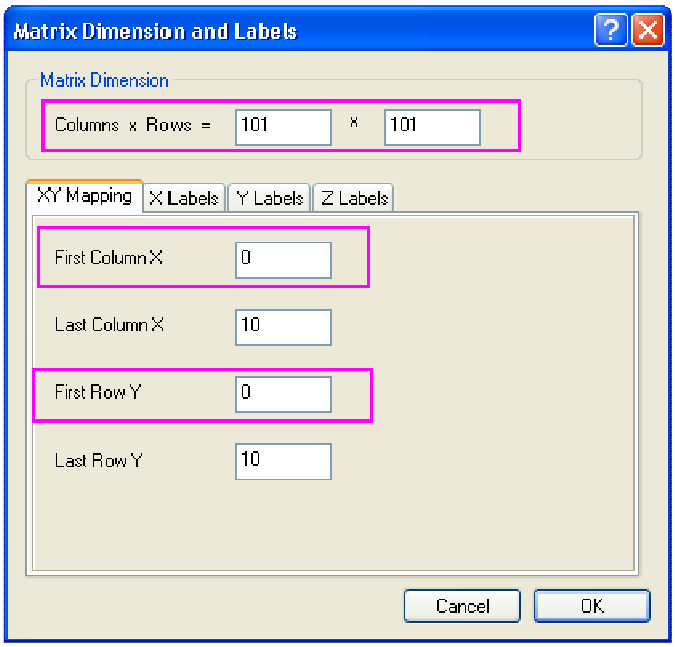
- Set values in a Matrix and create a Contour Plot
- Customize levels, lines, and color mapping
- Extract data from contour lines
- Create a Contour Plot directly from XYZ data
- Use a Custom Boundary

5.7.2 Create Contour Plot from Matrix

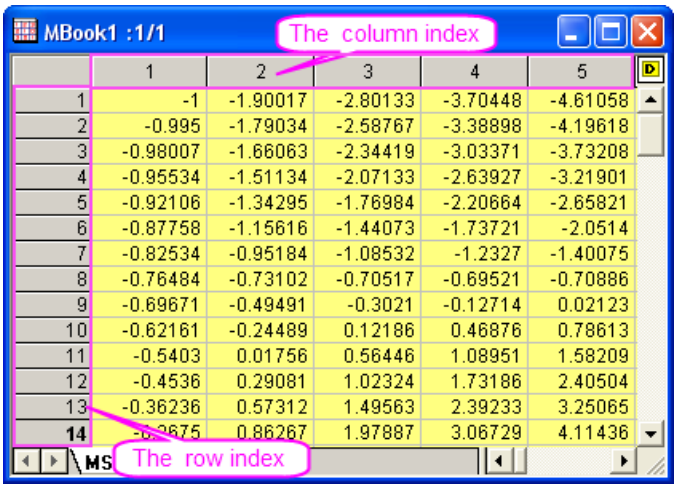
1. First, create a new matrix and set the dimensions for it. Click the **New Matrix button**  to create a new matrix. Then move the mouse to the upper left corner of the matrix until the shape of the pointer has been changed, as the following image shows, and click it to select the entire matrix.



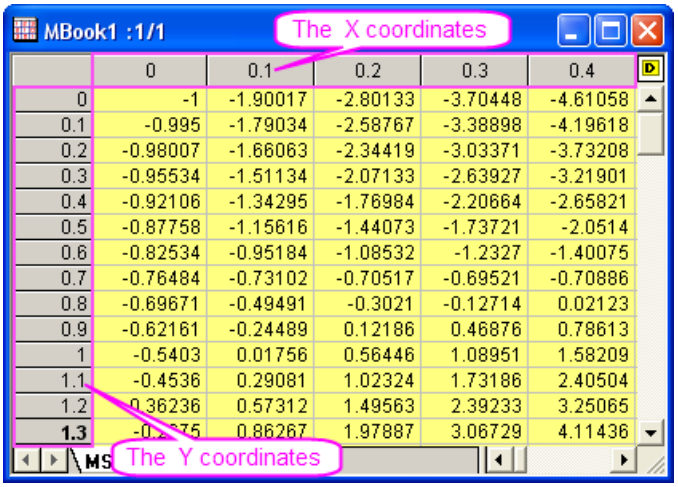
Select **Set Matrix Dimensions/Labels** and set the dialog as shown in the following image:



2. Input data into the matrix by using the **Set Values** dialog. Highlight the matrix and right-click on it. Select **Set Matrix Values** to open the **Set Values** dialog. Input **i*sin(x) - j*cos(y)** in the **Formula** edit box and click **OK** to generate data. The matrix should look like this:

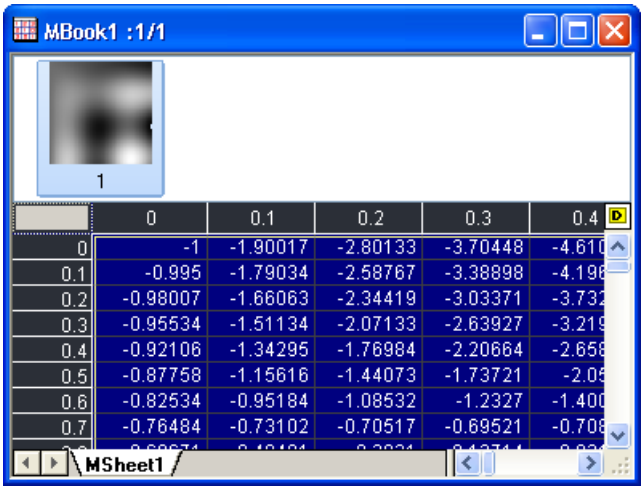


3. Each data point in the matrix corresponds to two different kinds of indices. One is the column and row indices. The other is the X and Y coordinates. You can select **View: Show X/Y** to see the X, Y coordinates.



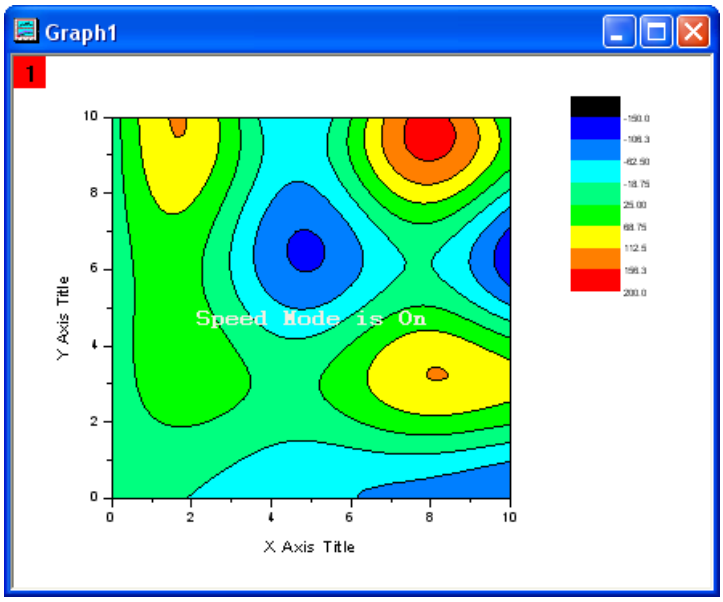
	0	0.1	0.2	0.3	0.4
0	-1	-1.90017	-2.80133	-3.70448	-4.61058
0.1	-0.995	-1.79034	-2.58767	-3.38898	-4.19618
0.2	-0.98007	-1.66063	-2.34419	-3.03371	-3.73208
0.3	-0.95534	-1.51134	-2.07133	-2.63927	-3.21901
0.4	-0.92106	-1.34295	-1.76984	-2.20664	-2.65821
0.5	-0.87758	-1.15616	-1.44073	-1.73721	-2.0514
0.6	-0.82534	-0.95184	-1.08532	-1.2327	-1.40075
0.7	-0.76484	-0.73102	-0.70517	-0.69521	-0.70886
0.8	-0.69671	-0.49491	-0.3021	-0.12714	0.02123
0.9	-0.62161	-0.24489	0.12186	0.46876	0.78613
1	-0.5403	0.01756	0.56446	1.08951	1.58209
1.1	-0.4536	0.29081	1.02324	1.73186	2.40504
1.2	0.36236	0.57312	1.49563	2.39233	3.25065
1.3	-0.[illegible]75	0.86267	1.97887	3.06729	4.11436

4. Select **View: Show Matrix Thumbnails** to turn on thumbnails.



	0	0.1	0.2	0.3	0.4
0	-1	-1.90017	-2.80133	-3.70448	-4.610
0.1	-0.995	-1.79034	-2.58767	-3.38898	-4.196
0.2	-0.98007	-1.66063	-2.34419	-3.03371	-3.732
0.3	-0.95534	-1.51134	-2.07133	-2.63927	-3.219
0.4	-0.92106	-1.34295	-1.76984	-2.20664	-2.658
0.5	-0.87758	-1.15616	-1.44073	-1.73721	-2.05
0.6	-0.82534	-0.95184	-1.08532	-1.2327	-1.400
0.7	-0.76484	-0.73102	-0.70517	-0.69521	-0.708

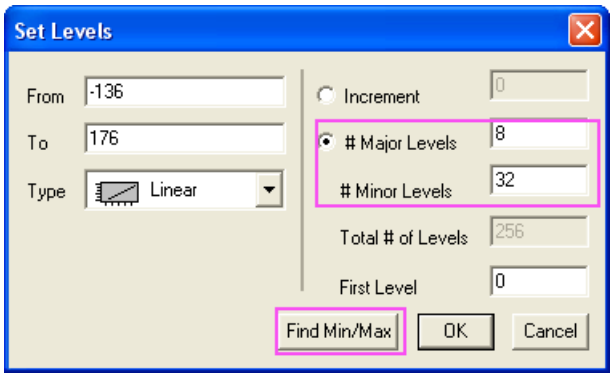
5. Now, create a contour plot. Activate the matrix and select **Plot: Contour: Contour - Color Fill** to create a contour. Right-click on the contour and select **Display Caching: None**. The graph should look like this:



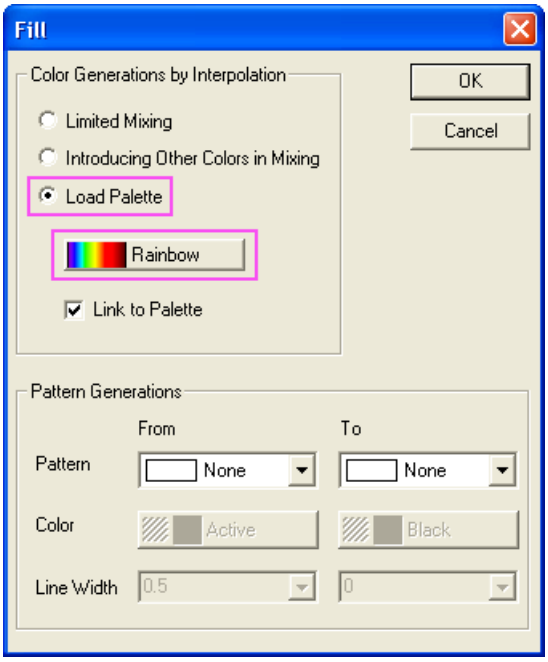
5.7.3 Customize Levels, Lines and Color Map

Origin makes it easy to customize a contour plot, including changing the color scale and adding labels. The following steps show you how.

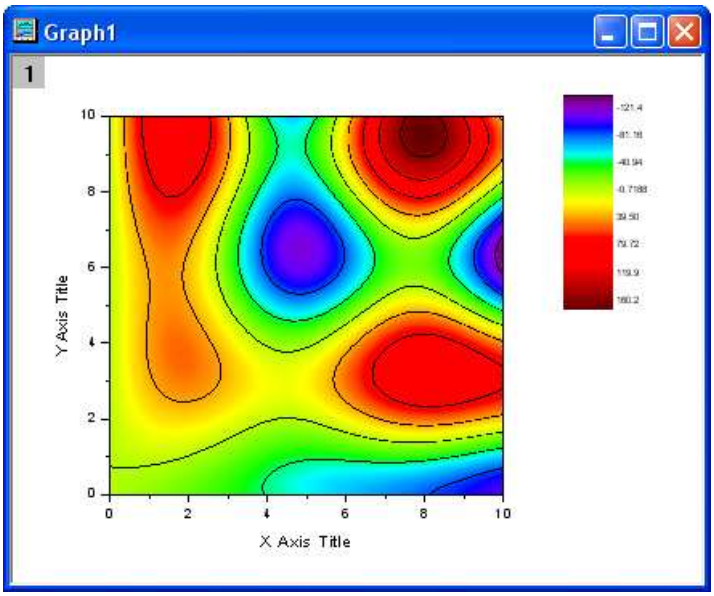
1. Double-click on the contour plot to open the **Plot Details** dialog. Click on the word **Layer1** in the left panel (leave the check box checked, and click on the word itself), and then select the **Size/Speed** tab in the right panel, and disable **Matrix data, maximum points per dimension** to turn off Speed Mode.
2. Then select **[MBook1]MSheet1!1(Z)(1:10201)** to go to the matrix level. Click on the **Level** heading in the right panel to open the **Set Levels** dialog. Click **Find Min/Max** button and then set **Major Levels** to **8** and **Minor Levels** to **32**, and then click OK to close it.



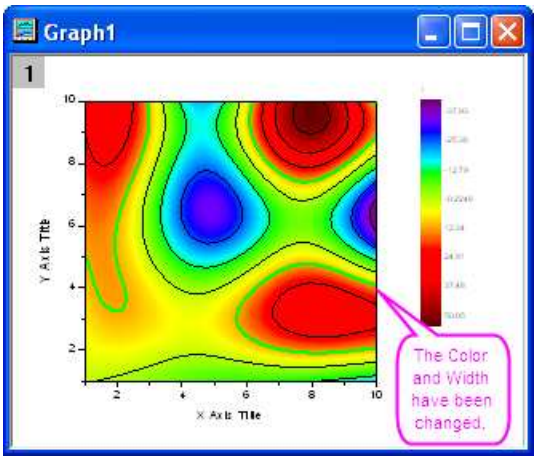
3. Now load a palette for the contour. Click on the **Fill** heading to open the **Fill** dialog, select the **Load Palette** radio box and then click the **Select Palette** button to select the **Rainbow** palette. Click Ok to close the dialog.



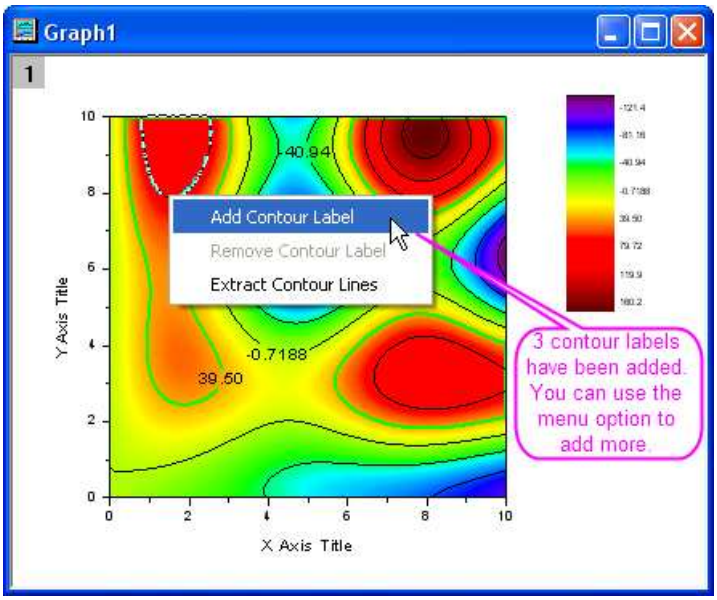
4. Click the **Line** heading to open the **Contour Lines** dialog. Then select **Show on Major Levels only** and click OK to close the dialog. Then click OK to close the Plot Details dialog.
5. Set the properties for the color scale. Right-click on the color scale and select **Properties** to open the **Color Scales Control** dialog. Select the **Show on Major Levels** check box and click OK to apply it to the color scale. Then the contour should look like



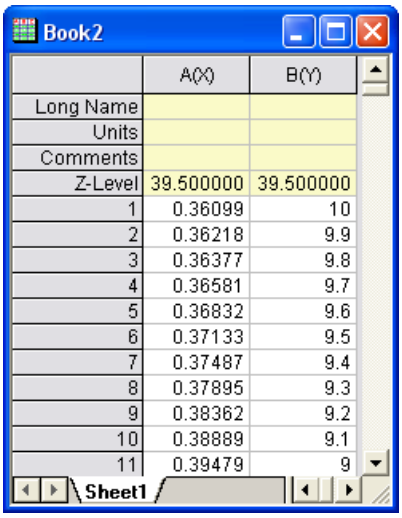
6. Click twice on a contour line (two single clicks, the first click selects the layer denoted by a red square at the plot center, the second click selects the contour line; if you mistakenly double-click, the Plot Details dialog will open) and then click again (a third time) to select all lines at that level. Change the color to **Green** by using the Line/Border Color button in the **Font** toolbar. Also change the width to **3** by using the **Line/Border Width** button in the same toolbar.



Right-click on the selected contour line and select **Add Contour Label** to add a label.



7. Click twice on a contour line to select it, then right-click and select **Extract Contour Lines**. Origin will extract the data for that contour line to a worksheet. The following image shows part of the data in the worksheet.



Book2

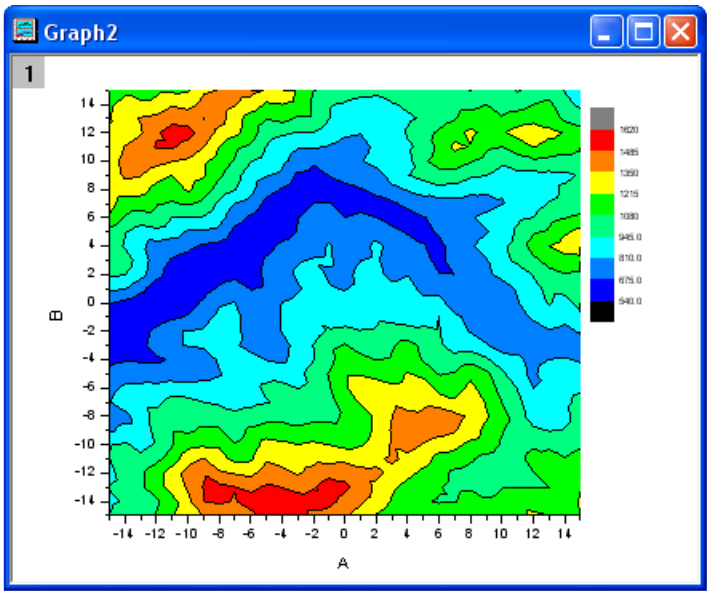
	A(X)	B(Y)
Long Name		
Units		
Comments		
Z-Level	39.500000	39.500000
1	0.36099	10
2	0.36218	9.9
3	0.36377	9.8
4	0.36581	9.7
5	0.36832	9.6
6	0.37133	9.5
7	0.37487	9.4
8	0.37895	9.3
9	0.38362	9.2
10	0.38889	9.1
11	0.39479	9

Sheet1

5.7.4 Create a Contour Plot from XYZ Data

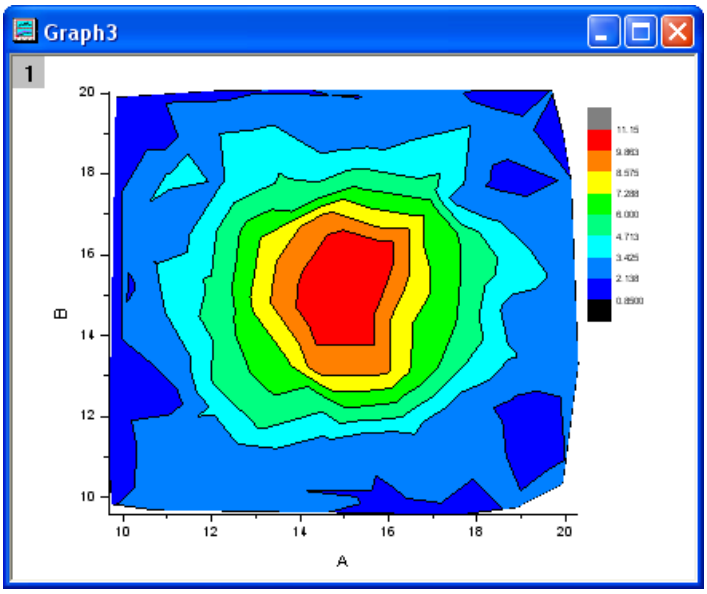
Origin can create contour plots directly from XYZ data in a worksheet without the need for an intermediate matrix. Delaunay Triangulation is used to compute and draw the contour lines.

1. Create a new worksheet and import the **3D XYZ.dat** from the **\Samples\Matrix Conversion and Gridding** folder by using the **Import Single ASCII** button  .
2. Highlight the third column and right-click on it to select **Set As: Z**. Then select **Plot: Contour: Color Fill** to create a graph, as the following image shows.

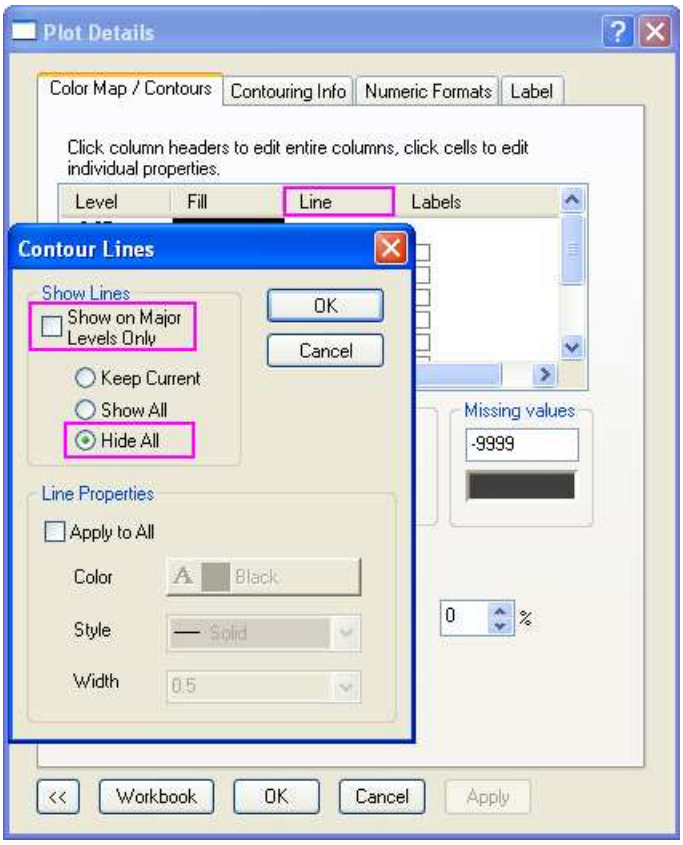


5.7.5 Show the Triangulation Grid

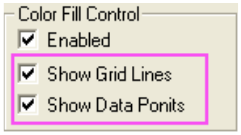
1. Show the triangulation grid that is used to create a contour plot from the data. The individual data points are located at the nodes or vertices of the grid. First, create a new worksheet and import the **XYZ Random Gaussian.dat** file from the **\Samples\Matrix Conversion and Gridding** folder by using the **Import Single ASCII** button  .
2. Highlight the third column and right-click on it to select **Set As: Z**. Then select **Plot: Contour: Color Fill** to create a graph.



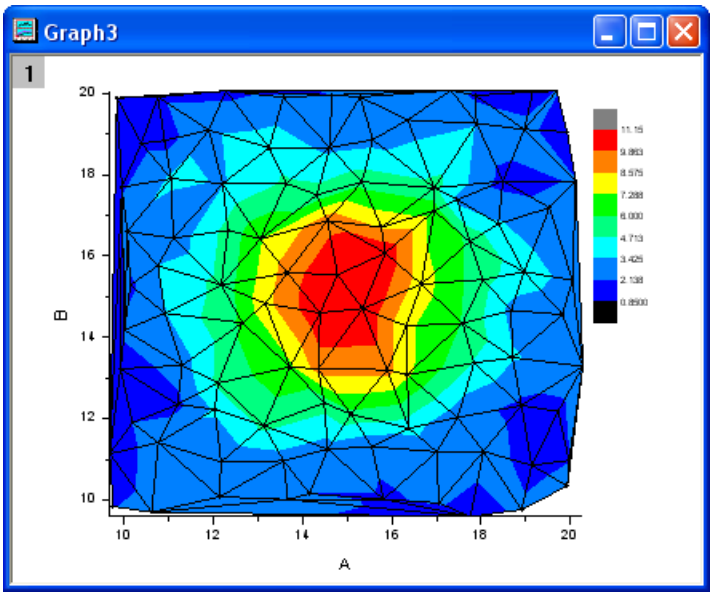
3. Double-click on the contour plot to open the **Plot Details** dialog. Go to the **Color Map/Contour** tab, click on the **Line** heading to open the **Contour Lines** dialog, and select **Hide All** to hide all the contour lines. Click OK to close this dialog.



4. Then select the **Show Grid Lines** and **Show Data Points** check boxes in the **Color Map/Contours** tab. Click OK to close the Plot Details dialog.



The contour plot with its superimposed grid should look like this:



5.7.6 Apply Custom Boundary

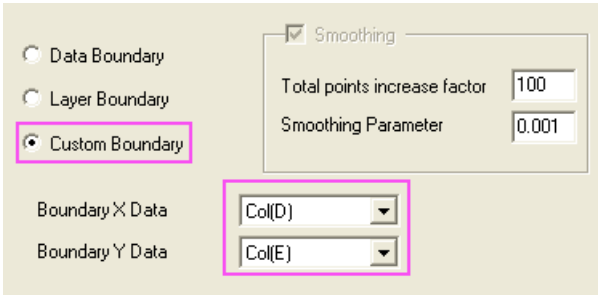
A custom boundary can be applied to contour plots created directly from XYZ data, where the user provides the data points for the boundary in additional columns on the same worksheet. This feature is useful when you have specific boundary data that defines the outline of an object, such as, say, the profile of an engine, and the contour shows engine temperature.

1. We will continue to use the worksheet and the contour plot created with **XYZ Random Gaussian.dat** in the previous example.

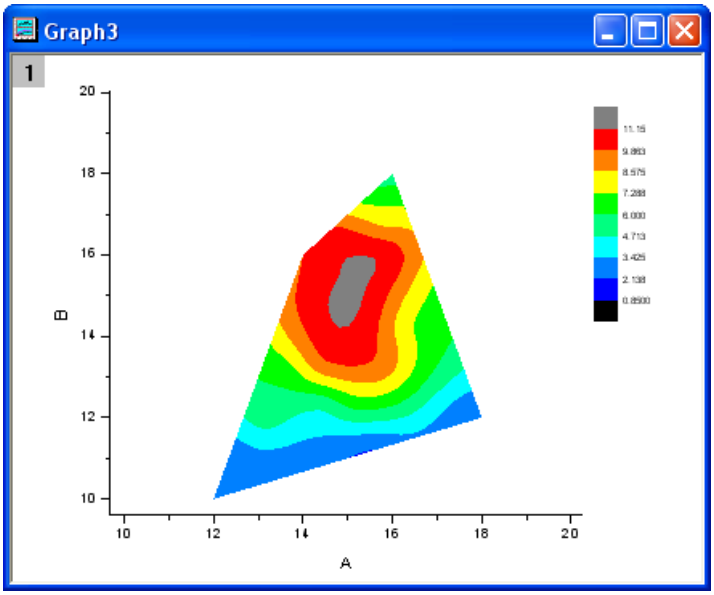
2. Go to the **XYZRandomGaus** workbook and click the **Add New Columns** button  twice to add two columns. Highlight the two columns and right-click to select **Set As: XY XY**. Enter four rows of data, like you see below:

12	10
18	12
16	18
14	16

3. Double-click on the contour plot to open the **Plot Details** dialog. Select the **Contour Info** tab in the right panel, and set the dialog like the following image shows, to customize the boundary of the contour plot. Remember to uncheck the **Show Grid Lines** and **Show Data Points** check boxes in the **Color Map/Contours** tab. Click OK to close the Plot Details dialog.



The graph should look like:



5.8 Merging and Arranging Graphs

5.8.1 Summary

The **Merge Graph Windows** dialog allows you to select which graphs you wish to combine, choosing from any graph in the project. It also has controls to specify how you want the individual graphs arranged on the new page.

The **Object Edit** toolbar allows you to quickly align and size multiple layers.

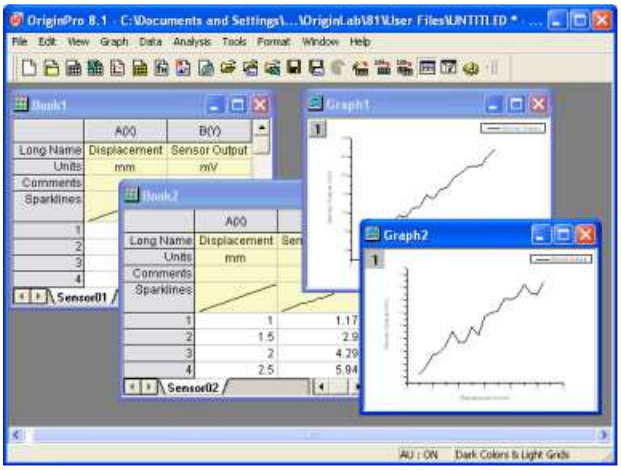
The **Layer Management** dialog lets you add, arrange and link layers on a single graph page.

This tutorial will show you how to:

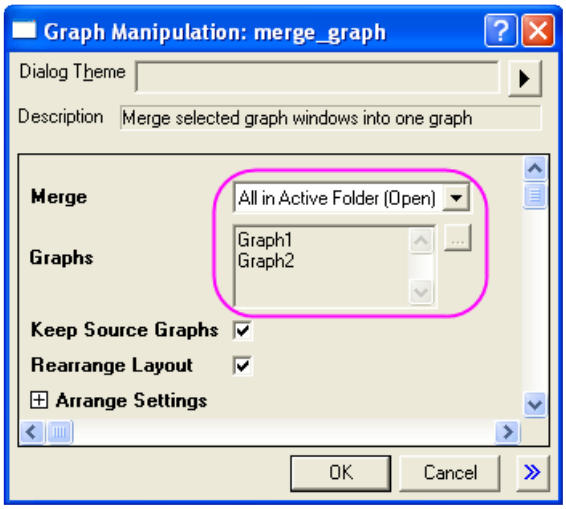
- Merge multiple graphs into one graph
- Resize and align layers quickly
- Add a second axis using a nonlinear relationship with the primary axis
- Use Layer Management for more complex layer positioning and linking

5.8.2 Creating a Merged Graph from Multiple Graphs

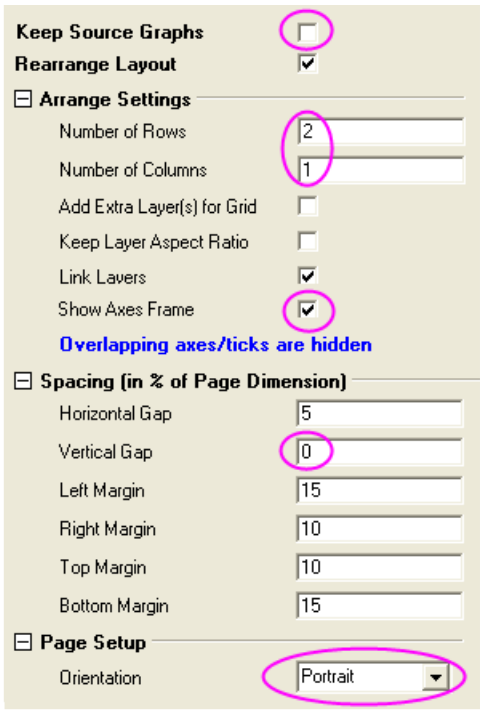
1. Import the two files **sensor01.dat** and **sensor02.dat** from ***\Samples\Curve Fitting***, as separate sheets in separate books, using the file names as the sheet names. (Please read the Importing Data tutorial for how to import files.)
2. Select the Y column of one sheet and create a line plot. Repeat with the Y column of the other sheet and create a second line plot. You will have two separate graph windows at this point.



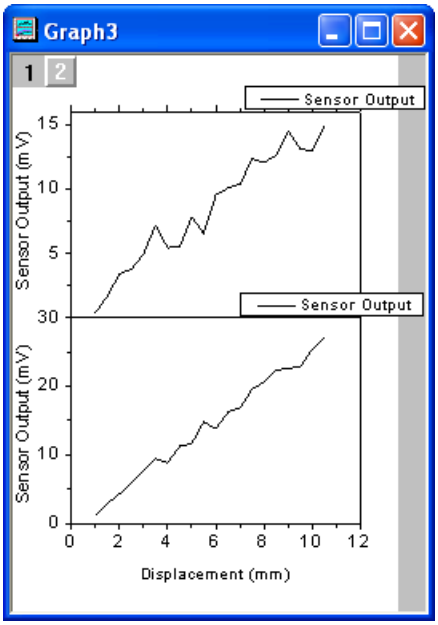
3. Now, to merge the two graphs into one page, bring up the merge graphs dialog from **Graph: Merge Graph Windows**. In this dialog, the default setting for merging graphs is **All in Active Folder (Open)**, so the two graph windows are already listed in the **Graphs** box.



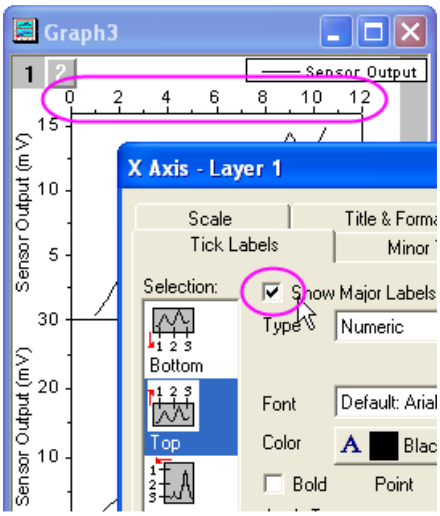
4. Specify the following settings to merge the two graphs: 1), Uncheck **Keep Source Graphs**. This will remove source graphs after merging. 2) Arrange the layers as one column and two rows. 3) Check **Show Axes Frame**. In this example, the two layers share the same X axis range, so we can hide the overlapped X axis. 4) Set the **Vertical Gap** to 0 for the two layers. 5) Change page orientation to **Portrait**. Then the source plots will be added as layers in the new graph page.



5. Click **OK** to close the dialog, and a new merged graph page is created:

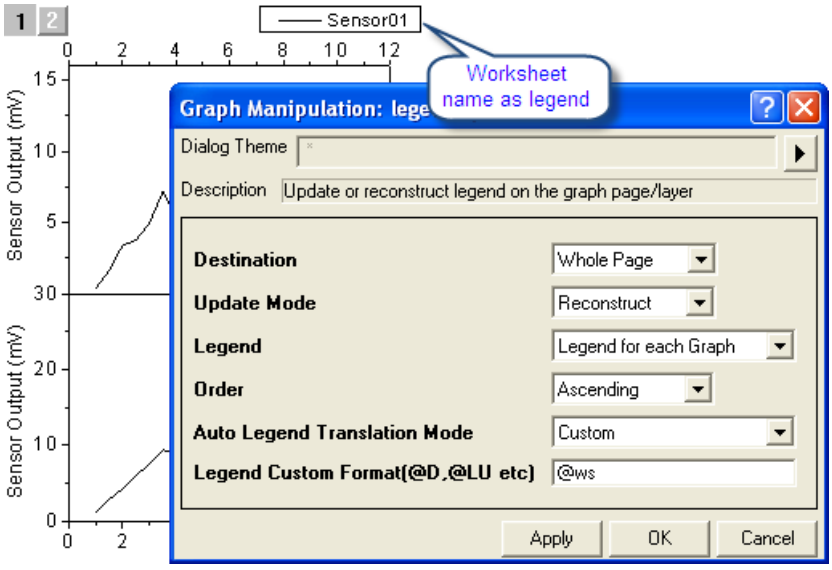


6. Double-click the top X-axis and add tick labels as below:



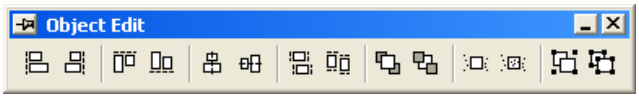
7. The two graph legends are the same in the output page. For the graph legend, Origin uses the worksheet column's **Comments** label row, or if that's empty it will use the **Long Name** if there is one, and if not, the Column name. To modify the legends, select **Graph: Update Legend** from the menu to open the legend update dialog. You will change the legends for the **Whole Page**, and **Reconstruct** them. Select **Custom** from **Auto Legend Translation Mode**

and enter **@ws** in the **Legend Custom Format** edit box. Here, @ws means Origin will use the worksheet name as the graph legend.



5.8.3 Aligning Layers using the Object Edit Toolbar

1. Select **File:Open** and open the OPJ ***\Samples\Graphing\Layer Management.opj*** and go to the subfolder ***Arranging Layers***. (If you don't see the subfolders, click **View: Project Explorer** to open the Origin Project Explorer window.)
2. Now we want to use the **Object Edit** tools to rearrange the graph. Make sure you already opened this toolbar, or you can open it from the **View: Toolbars** dialog.



3. On the graph, hold the **Shift** key down and click on all four layers to select them as a group.

   Then press the **Uniform Width**  and **Uniform Height**  buttons on the **Object Edit** toolbar to make them the same height and width.
4. Click and select the bottom two layers and click the **Bottom**  button in the Object Edit toolbar to align them. Do the same thing for the top two layers.
5. Now click and select the top and bottom on the left column, and do **Left** align  , then repeat for the other two in the right side column.

The object edit toolbar provides a quick way to align and set the size of layers. The first layer you select is the reference layer and all others will adjust according to that one. The **Layer Management** tool provides many more options, such as reordering and linking

layers, in addition to setting size and alignment.

6. Do not save changes to your project, as the same project is used later to demonstrate Layer Management.

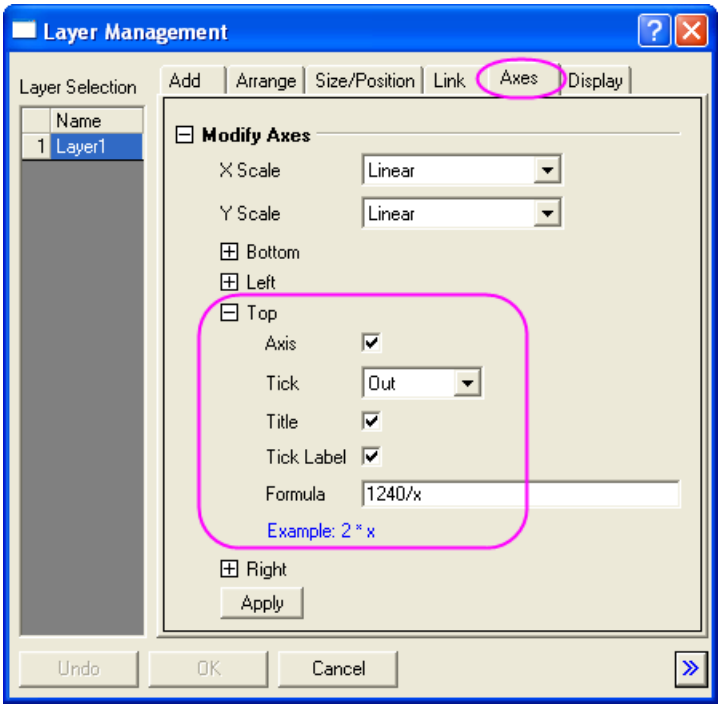
5.8.4 Displaying Opposite Axes with a Nonlinear Formula

An Origin 2D graph layer is a set of X, Y axes, and opposite axes can be turned on for both X and Y. In addition, the opposite axes can also display labels using any user-specified nonlinear formula with respect to the primary axis.

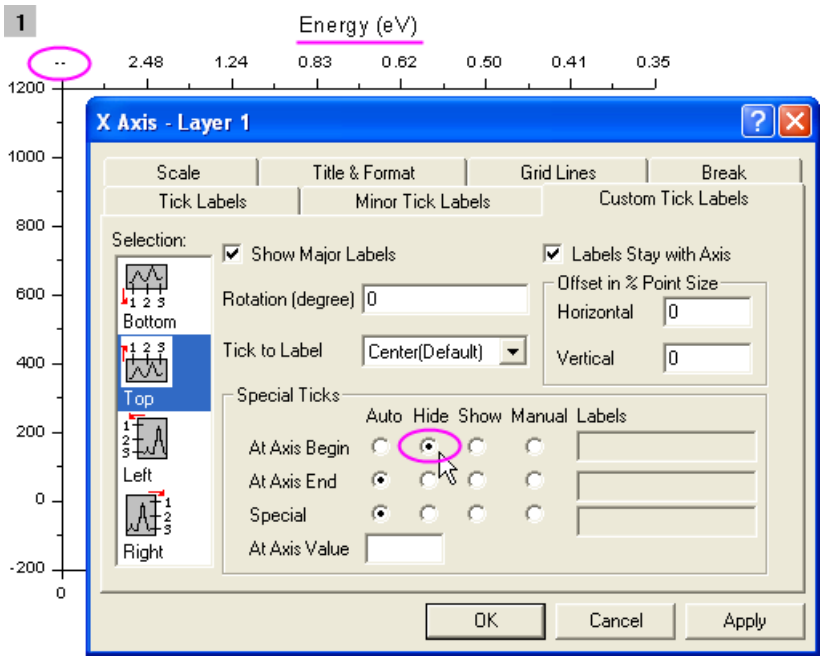
1. Using the Project Explorer window, switch to the subfolder named **Nonlinear Axis**.
2. With the graph active, bring up the Layer Management tool by selecting **Graph: Layer Management**.
3. Switch to the **Axes** tab and expand the **Top** branch and check the **Axis**, **Title**, and **Tick Label** check boxes.
4. We want to display the labels on the top axis in units of Energy and the relationship between wavelength and energy is:

   Energy (eV) = 1240/Wavelength (nm)

   So in the **Formula** box, enter: 1240/x and click **Apply**, then click **OK** to close the dialog.



5. Double-click and edit the top X-axis title and change it to: Energy (eV)
6. Double-click the top axis labels or axis, to open the X-Axis dialog. Switch to the Custom Tick Labels tab, and then click Hide radio for At Axis Begin, to hide the missing value label for energy that corresponds to zero wavelength.

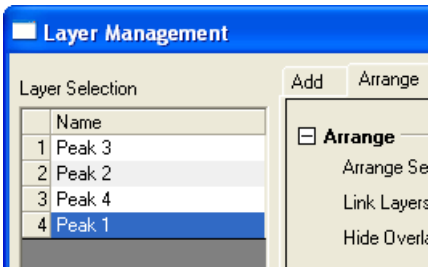


If you are setting up a nonlinear relationship for the right Y-axis, in the **Formula** you still need to use **x** instead of **y**.

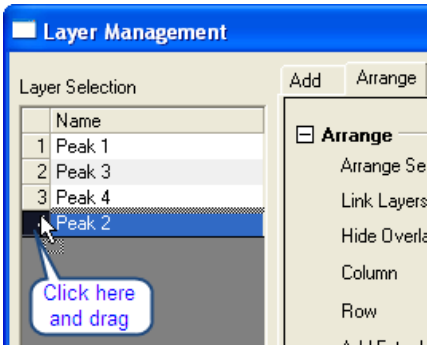
5.8.5 Using Layer Management to Link and Position Layers

The Layer Management tool can be used to position, resize, swap, and link layers in order to establish the desired relationship between layers, as demonstrated in the following steps:

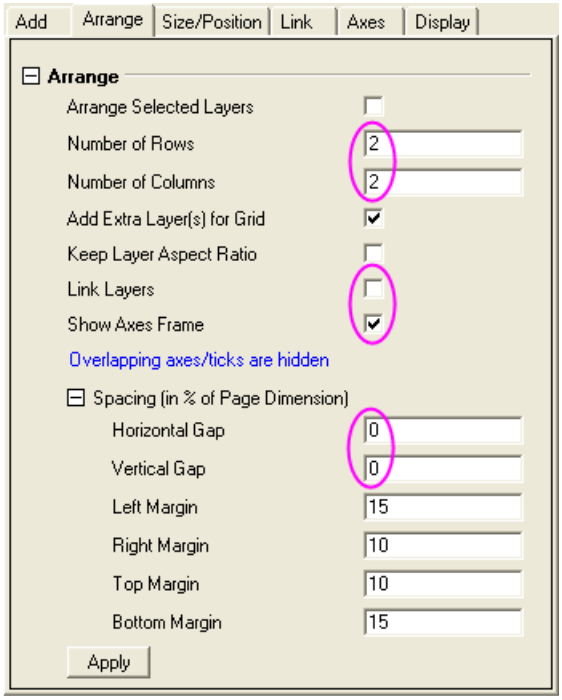
1. Reopen the project ***\Samples\Graphing\Layer Management.opj*** and then switch to the subfolder named ***Arranging Layers***. You can reopen the project by selecting **File: Recent Projects: Layer Management.opj**. Do not save changes to the project.
2. Bring up the Layer Management tool from **Graph: Layer Management**. Then go to left panel and rename the layers so that they are, top to bottom: Peak 3, Peak 2, Peak 4, Peak 1. The layer names now correspond to the legend for each layer. Note: to rename a layer, double-click on the name, as the hint text in the dialog says.



3. Now drag and arrange the list on the left so that they are ordered Peak 1, Peak 2, Peak 3, Peak 4. The layer number and names now match.

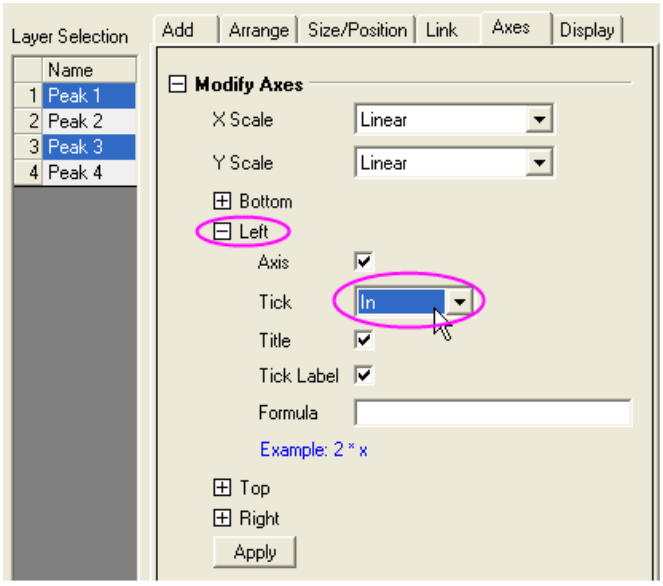


4. Now switch to the **Arrange** tab and do the following steps: 1) Uncheck the **Link Layers** check box. 2) Check **Show Axes Frame**. 3) Leave the **Number of Columns** and **Number of Rows** edit boxes as 2 by 2. 4) Set **Horizontal Gap** and **Vertical Gap** to 0.

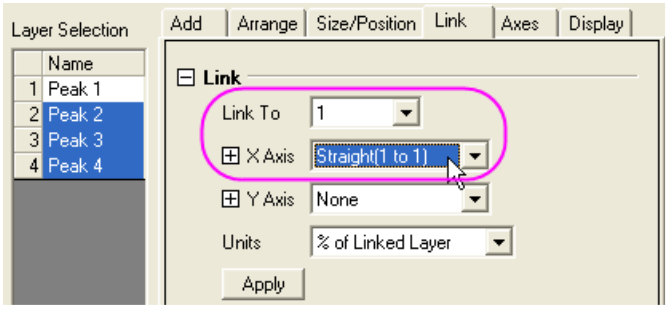


Click **Apply**. This resizes and repositions the layers so they are aligned, and hides ticks and labels where layers overlap.

5. Now go to the Axes tab, hold down the **Ctrl** key and select Peak 1 and 3 on left list, then expand the **Left** branch and set tick direction to **In**, and click **Apply**.

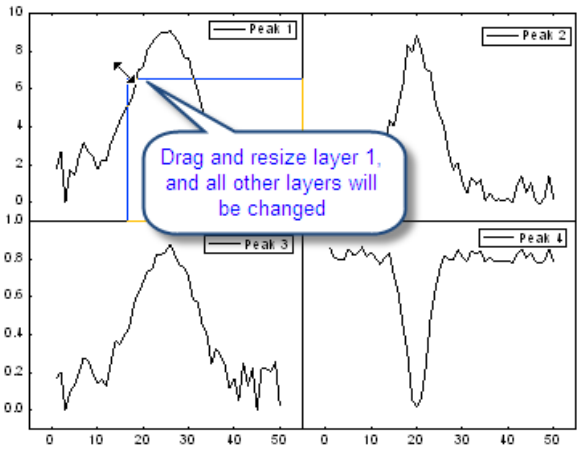


6. Now select Peaks 3 and 4, set the **Bottom** tick direction to **In** and click **Apply**. Then select Peaks 1 and 2, set the **Top** ticks to **In** and click **Apply**.
7. Now go to the Link tab and select Peaks 2, 3, and 4 in the left list and link them to layer 1, making sure you have the X-Axes linked **Straight(1 to 1)**, and click **Apply**.

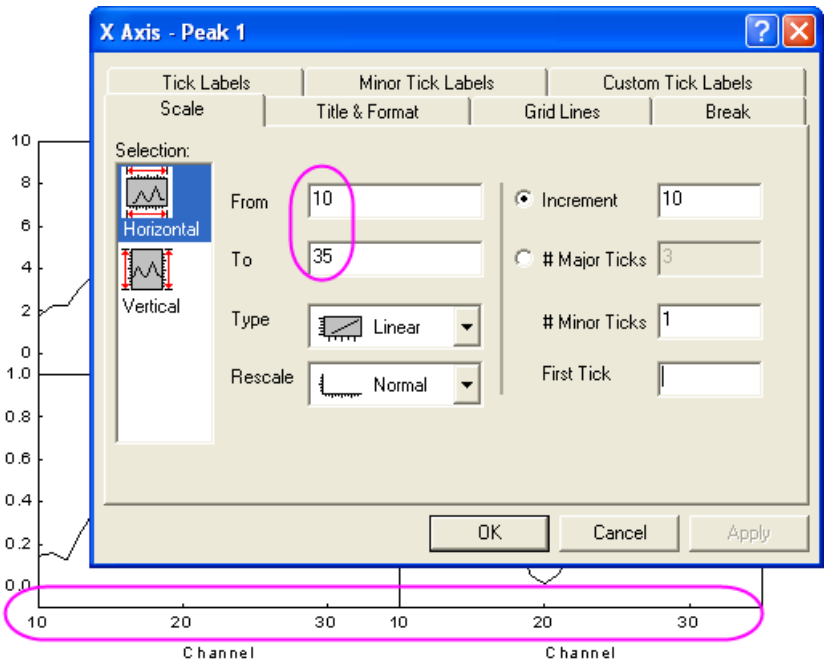


Then click **OK** to close the dialog.

8. Click and select the top left layer, layer 1, then drag and resize the layer and move the layer. Note that the other layers resize and move too, since they are linked by dimension to layer 1.



9. Go to the top left layer (layer 1), and double-click the top X-axis. In the X-Axis dialog, change the X-Axis scale From 10 To 35, and click **OK**. You'll see that all the other layers now show the same new x range, as they are all linked in X.



When arranging linked layers, they are treated as one unit, so you should first unlink them if you need to rearrange and then you can link them again after arranging.

5.9 Working with Excel

5.9.1 Summary

Origin provides flexible ways to interact with Excel. You can either import Excel data into an Origin workbook, or open an Excel book inside Origin. If you require full access to all of Origin's graphing and analysis features, you will probably want to import your Excel data files into Origin. If it is important to maintain a separate Excel workbook file—perhaps so that other colleagues who do not work with Origin have access to that file—you will probably want to open your Excel data files directly. We give a brief introduction to working with Excel in this tutorial.

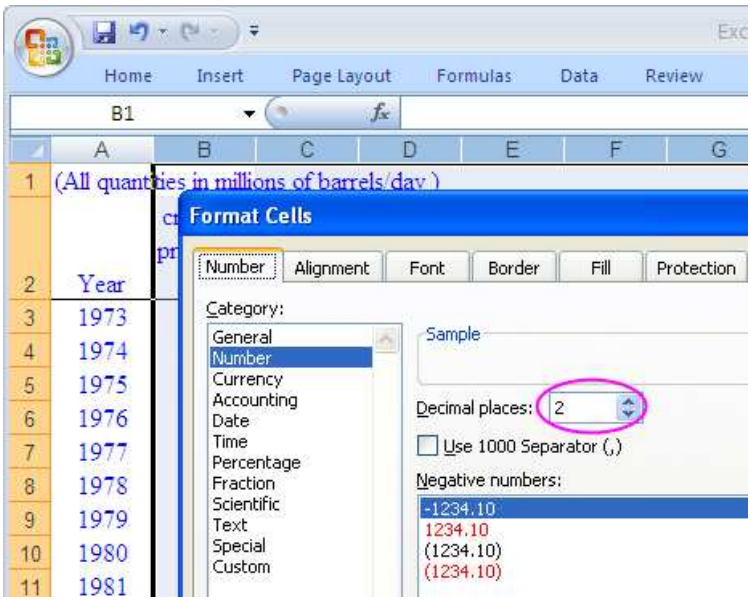
This tutorial will show you how to:

1. Copy and paste data from Excel with full precision
2. Import an Excel file into an Origin workbook
3. Open an Excel file in Origin
4. Save an Excel file with path relative to the Origin Project file

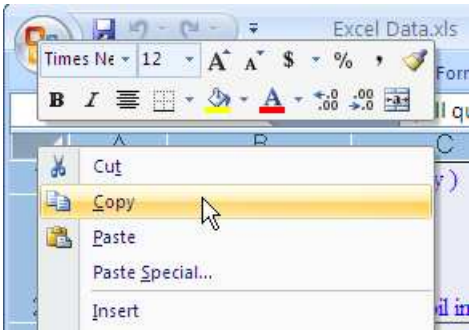
5.9.2 Copying and Pasting Data from Excel

It may be desirable at times to simply copy and paste data from Excel to Origin instead of importing or opening Excel. These steps show that such a copy/paste operation can bring in data with full precision.

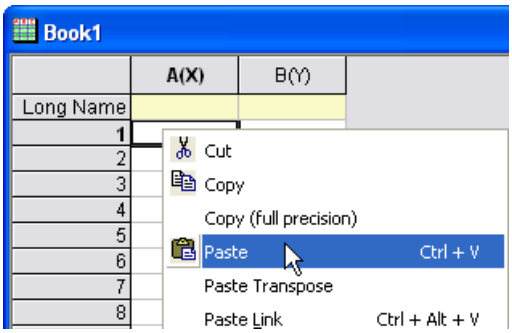
1. Launch Excel and Origin separately.
2. Open the file **<Origin Installation Folder>\Samples\Graphing\ExcelData.XLS** in Excel.
3. Select columns B through L, then right-click and bring up the **Format Cells** dialog, and set the number of decimal places to 2. So now Excel shows fewer decimal places.



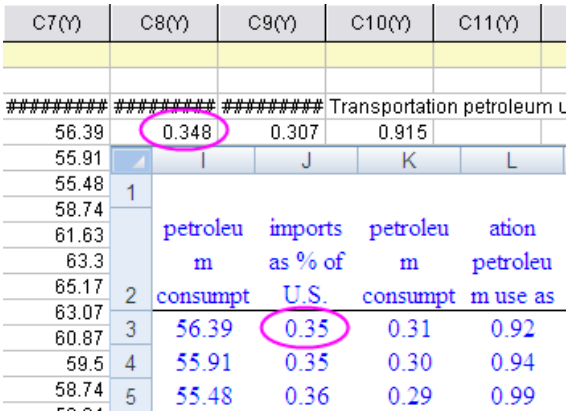
4. Click on the top left cell in the Excel sheet to select the entire sheet and right-click and select **Copy**, or use the keyboard shortcut **Ctrl**+**C** to copy.



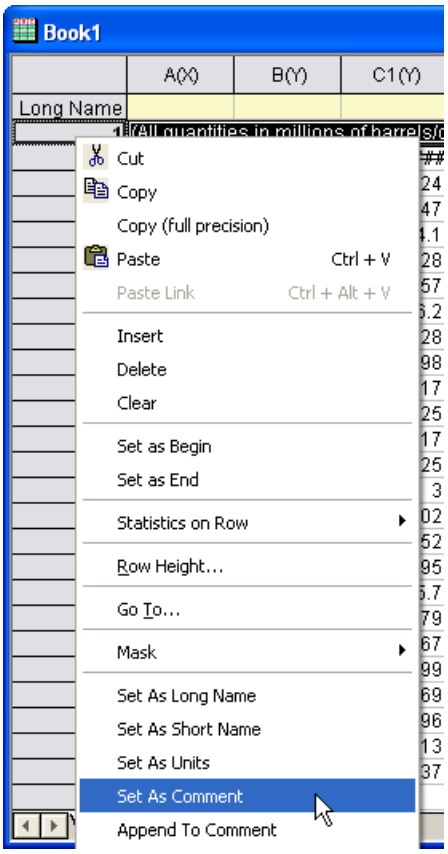
5. Go to a new book in Origin, place the cursor in row 1 of column 1 and do **Ctrl**+**V** or right-click and **Paste**.



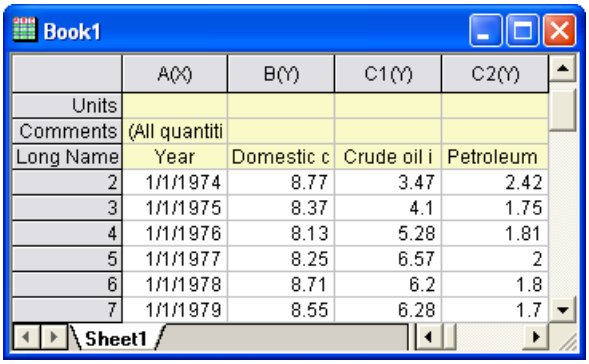
6. Note that the numbers come into Origin with full precision, not the number of displayed digits (2) in Excel.



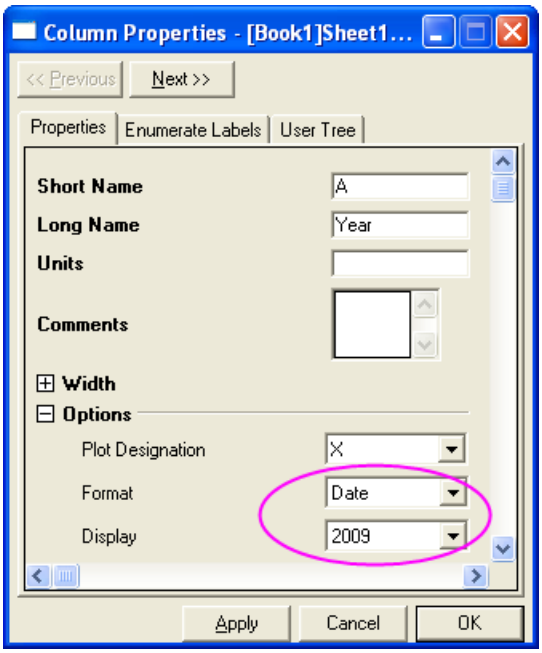
7. In Origin, right-click on the row 1 header and select **Set as Comment** to make this row an Origin column comment.



8. Right-click on row 1 again and select **Set as Long Name**. Then rows 1 and 2 in Excel become the worksheet header in Origin:



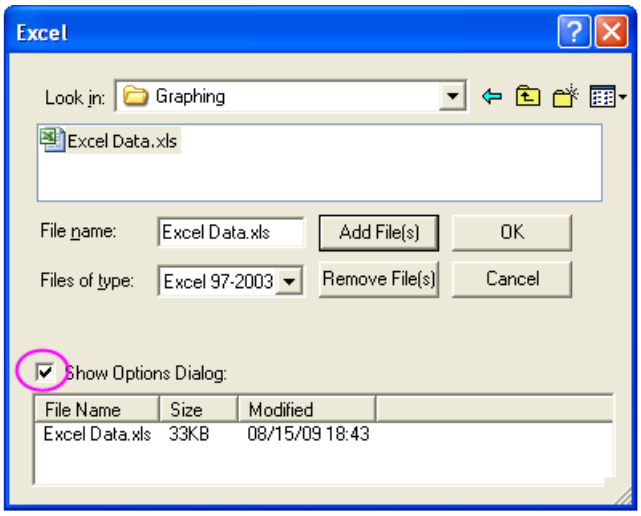
9. You can now double-click column 1 and set it as **Date** and then plot the data.



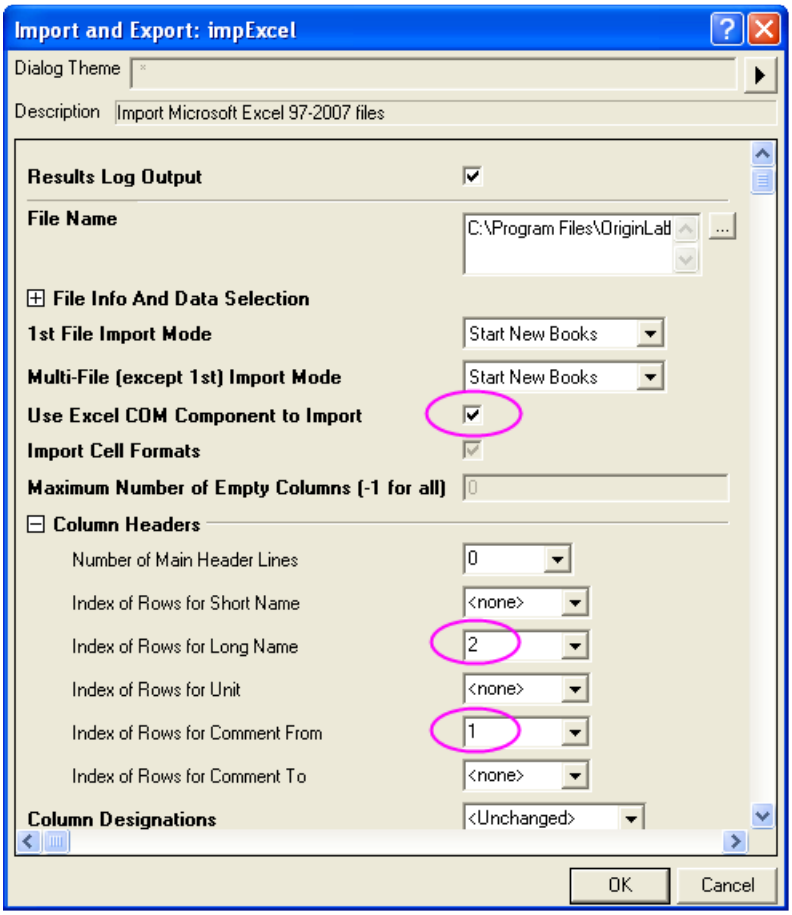
5.9.3 Importing Excel Files

Origin supports importing Excel files directly into Origin workbooks. Multiple sheets are supported and controls are available for setting specific rows in the Excel sheet to be brought into an Origin worksheet as header information, including Long Name and Comments. If you want to perform analysis or data manipulation operations on your Excel data, we recommend importing your data into Origin.

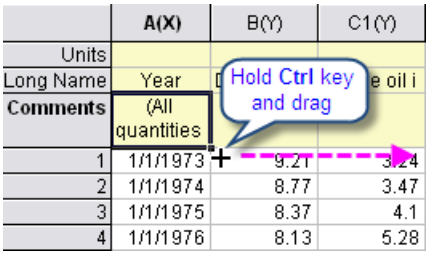
1. With a new book active in Origin, use the menu to select **File: Import: Excel (XLS, XLSX)**.
2. Select the file **\samples\graphing\Excel Data.xls**, and make sure **Show Options Dialog** is checked.



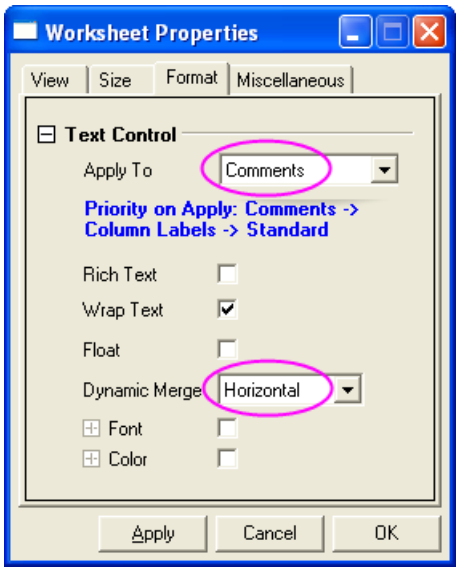
3. In the dialog that comes up, leave the **Use Excel COM Component to Import** check box checked.
4. Set the **Index of Rows for Comments** to 1.
5. Set the **Index of Rows for Long Name** drop-down to 2 and click **OK** to Import.



6. Click and select the **Comments** cell under column 1, hold down the **Ctrl** key and drag the bottom right point of the selected cell to stretch across all columns with data, copying the same comments to all columns.



7. Press **F4** to bring up the format dialog, switch to the **Format** tab, change the **Apply To** drop-down to **Comments** and set **Dynamic Merge** to **Horizontal**, then click **OK**.



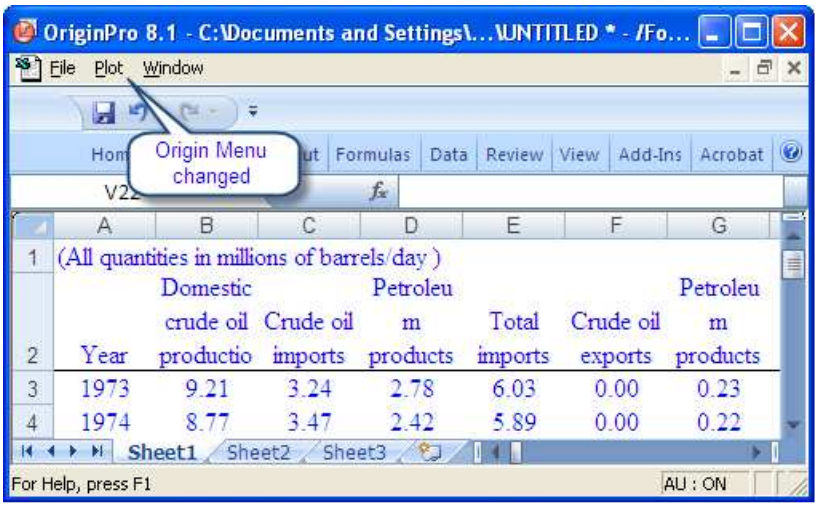
This sets the comments cells to be merged and to show in the center of all data columns.

C3(Y)	C4(Y)	C5(Y)	C6(Y)
Total impor	Crude oil e	Petroleum	U.S. petrole
(All quantities in millions of barrels/day)			
6.03	0	0.23	17.31
5.89	0	0.22	16.65
5.85	0	0.2	16.32
7.09	0	0.22	17.46
8.57	0.05	0.19	18.43

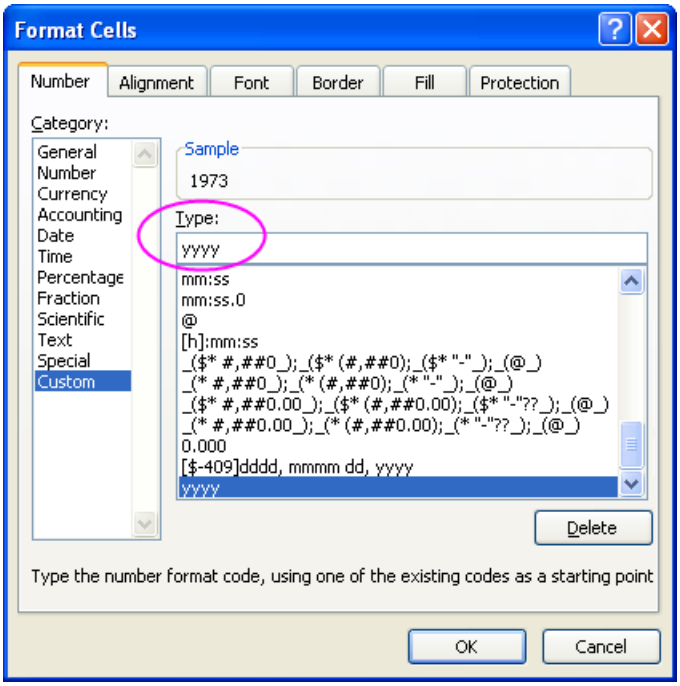
5.9.4 Open Excel File in Origin

At times it may be desirable to keep the data in an external XLS file and simply open the file inside Origin as an Excel window, and then work with the data. When you open Excel (.XLS or .XLSX) files as Excel workbooks in Origin, an OLE instance of Microsoft Excel is launched. You can plot directly using Excel workbook data, but many analysis features, as well as 3D plotting, will be inaccessible.

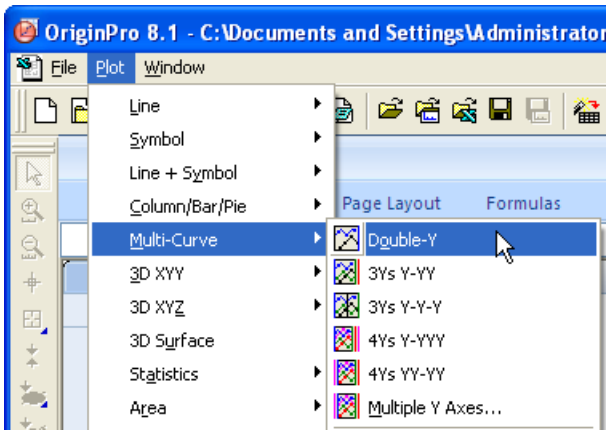
1. Select **File: Open Excel** and select the file **\Samples\Graphing\Excel Data.xls**.
2. A new Excel window opens inside the Origin workspace. When this window is active, the Origin main menu has different entries, some of which are specific to Excel, and the Excel toolbars are available.



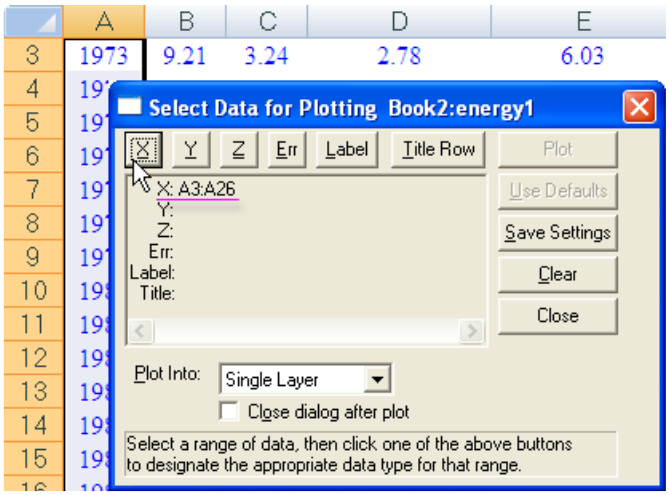
3. Highlight the Excel data range **A3:A26** and right-click, then select **Format Cells** to make sure that the data is in **Date** format.



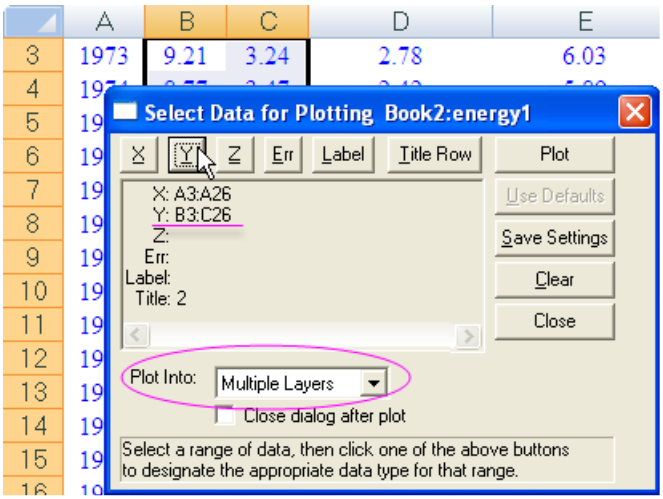
4. Now select the **Plot** menu in Origin and select the **Multi-Curve: Double-Y** plot type.



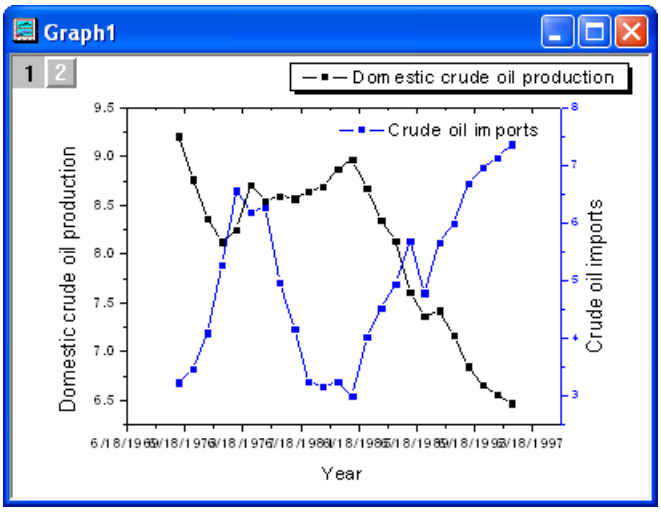
5. Select **A3:A26** in the Excel sheet and click **X** in the **Select Data for Plotting** dialog to assign the X data.



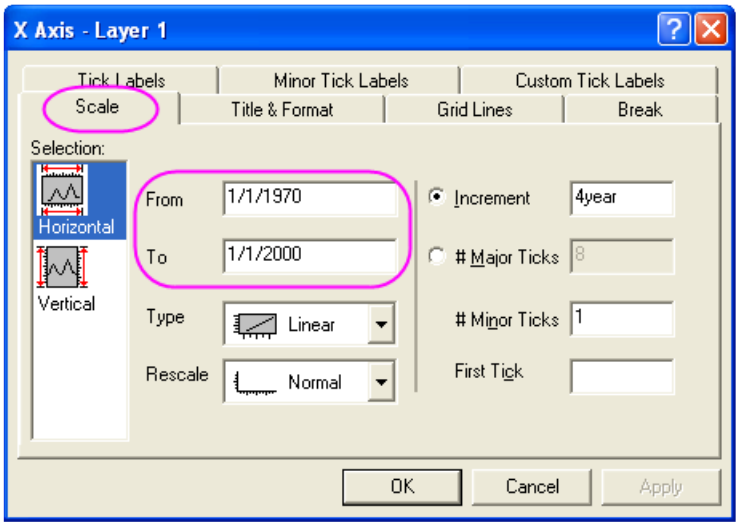
6. Select **B3:C26** in the Excel sheet and click **Y** in the **Select Data for Plotting** dialog to assign the Y data, and then change the **Plot Into** drop-down to be **Multiple Layers**.



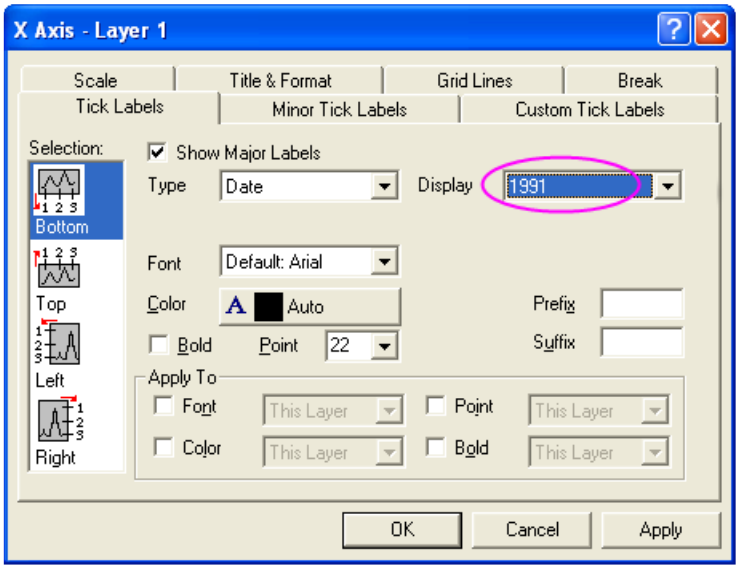
7. Click **Plot** and a double-y plot is created.



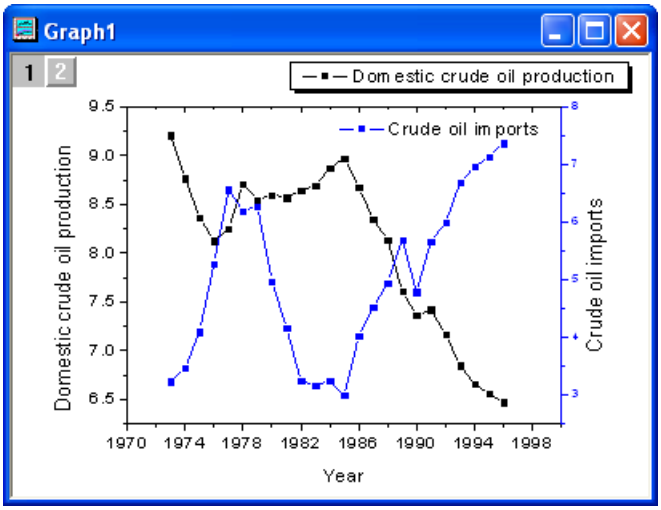
8. By default, Origin displays the tick labels for time on the X-axis in MM/DD/YYYY format. Double-click the X-axis to open an X-Axis Properties dialog box. On the **Scale** tab, change the scale from **1/1/1970** to **1/1/2000**.



On the **Tick Labels** tab, change the **Display** to year only.



Then we get:

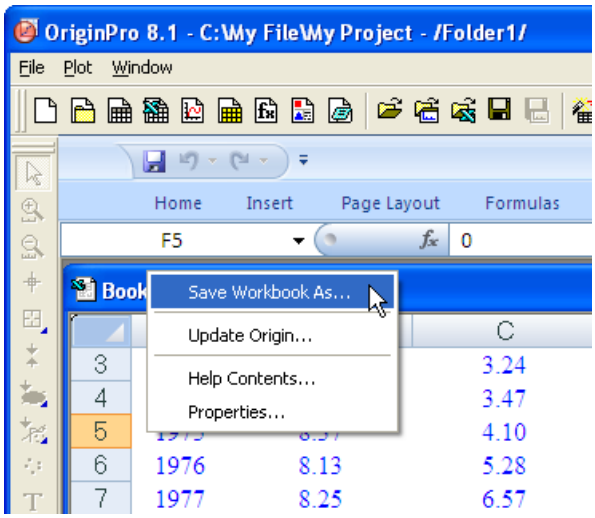


After opening Excel in Origin, if you switch to another Origin window, a toolbar spacer is visible where the Excel menu used to be. Right-click and you can select **Hide Toolbar Spacer** or **Hide Toolbar Spacer Always**.

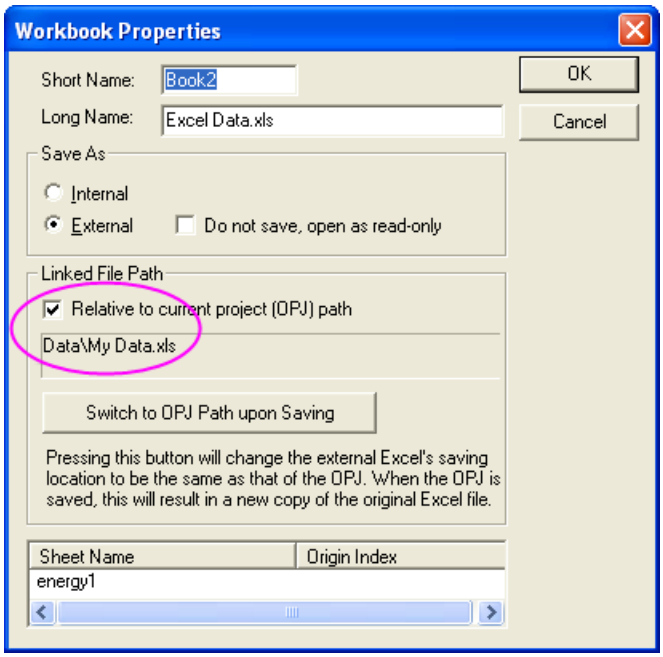
5.9.5 Setting External Excel File Path Relative to OPJ Path

The Origin Project can contain an Excel window which is linked to an external Excel file. It may then be beneficial to save the Excel file in the same folder as the Origin project, or in a subfolder under the Origin project folder, which will then make the two files more portable, as seen in the following steps:

1. Close Excel if it is running.
2. Perform the steps under the **Open Excel File in Origin** section above, and (optionally) create a plot.
3. First save the OPJ to some folder location such as "C:\My Files\My Project.opj".
4. Now right-click on the Excel window and select **Save Workbook As** and save it in a (new) subfolder under the OPJ save location, such as "C:\My Files\Data\My Data.xls".



5. Right-click again on the Excel window title and select **Properties**, and then check the box that says **Relative to current project (opj) path**. Note that the Excel file path in the box below changes to the relative path "Data\My Data.xls".



6. Save the OPJ again. Now you can copy the entire subfolder structure, starting from where the OPJ is saved, and put it on an external memory device (i.e., a memory stick or similar), or zip the entire folder structure. When taken to another computer and opened, Origin will look relative to the OPJ path to find the Excel file.

If your Excel file is in a different location and you want to save it to the same path as the OPJ, you can open the Excel file in Origin, then right-click the title, select **Properties** and click the **Switch to OPJ path upon Saving** button. On saving the OPJ, the Excel file will be copied from its current location to the same path where the OPJ is saved.

5.10 Descriptive Statistics

5.10.1 Summary

Origin provides comprehensive Descriptive Statistics support including basic statistics (mean, median, variance, etc.), frequency counts, and correlation coefficients of data you select. In addition to strong plotting features, Origin's statistical tools help you summarize and analyze your data.

This tutorial will show you how to:

- Use the **Statistics on Column** Dialog to calculate descriptive statistics for grouped data.
- Copy statistical results to a new worksheet for further processing.
- Unstack Columns to a graph.
- Analyze data sets with the **Correlation Coefficient** Tool.

5.10.2 Finding Frequency Information for Groups

Start with some data. We can use the **Discrete Frequency** Tool to quickly obtain frequency information for groups of data.

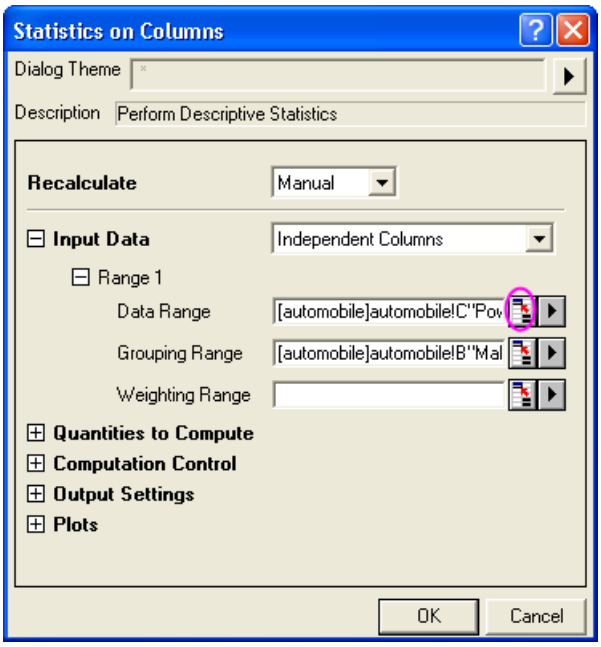
1. Start with a new project or a new workbook. Import the data file *\Samples\Statistics\automobile.dat* by using **Import Single ASCII**  .
2. Highlight the first two columns. Select **Statistics: Descriptive Statistics: Discrete Frequency** to open a dialog. Column A and Column B are automatically picked as Input Data. Click **OK**

Results of discrete frequency are sorted in descending order of **Count**; the most frequently occurring data will appear first. You can rearrange the results by sorting worksheets even though there are locks on the columns.

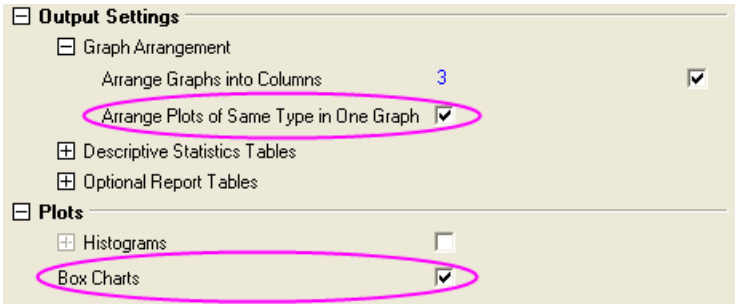
5.10.3 Calculating Descriptive Statistics on Grouped Data

Using the **Statistics on Columns** tool, we can find basic statistics for each group of data.

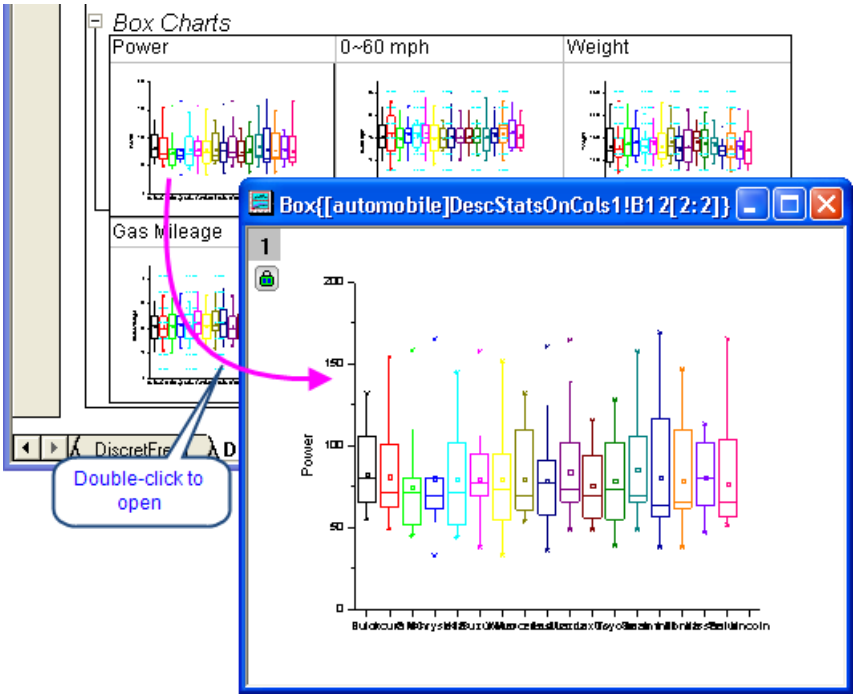
1. Switch back to the first sheet.
2. Select **Statistics: Descriptive Statistics: Statistics on Columns** to open the **Statistics on Columns** dialog.
3. Open the **Range 1** branch and click the **interactive button**  . The dialog will "roll up" and you can set **Data Range** as Column C - Column G by selecting C(Y) and dragging to G(Y) in the Worksheet. Click the button in the rolled up dialog to restore the dialog. To set **Group Range** to **B(Y): Make**, click the **triangle button**  next to **Grouping Range** and select **B(Y) : Make**.



4. Here, we will show how to make a box plot for the grouped data and put all groups in a graph for a quick comparison. Do the following: 1) Expand the **Output Settings** branch and the **Graph Arrangement** sub-branch. Select the **Arrange Plots of Same Type in One Graph** check box. 2) Expand the **Plots** branch, and select the **Box Charts** check box.



5. Click the **OK** button to get the results in a report sheet.



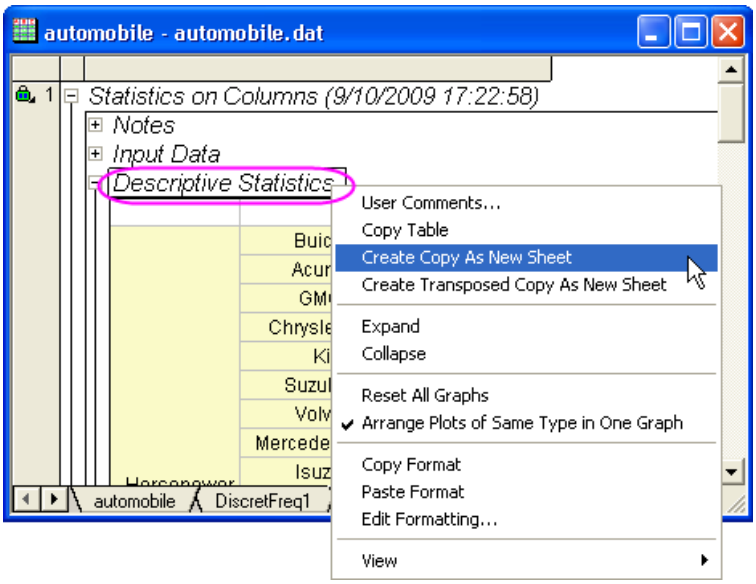
You can double-click to open the graph containing the box plot and customize the graph. Click the **Close** button on the graph to restore the modified graph to the Report Worksheet.

5.10.4 Using Statistical Results for Further Operations

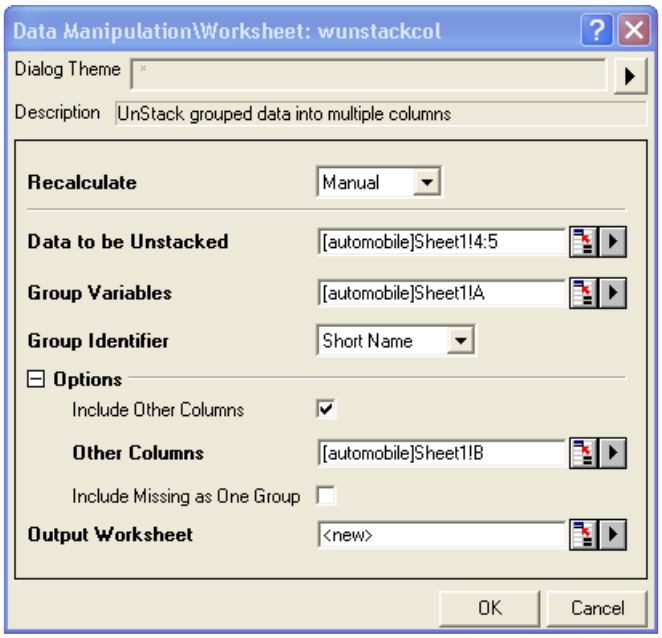
After using the **Statistics on Columns** dialog to produce a report tree, you may wish to do further analysis and plotting on the statistical results.

For example, to get average attribute values (i.e. horsepower, 0-60 mph time, weight, mileage) by vehicle Make from 1992 to 2004, perform the following:

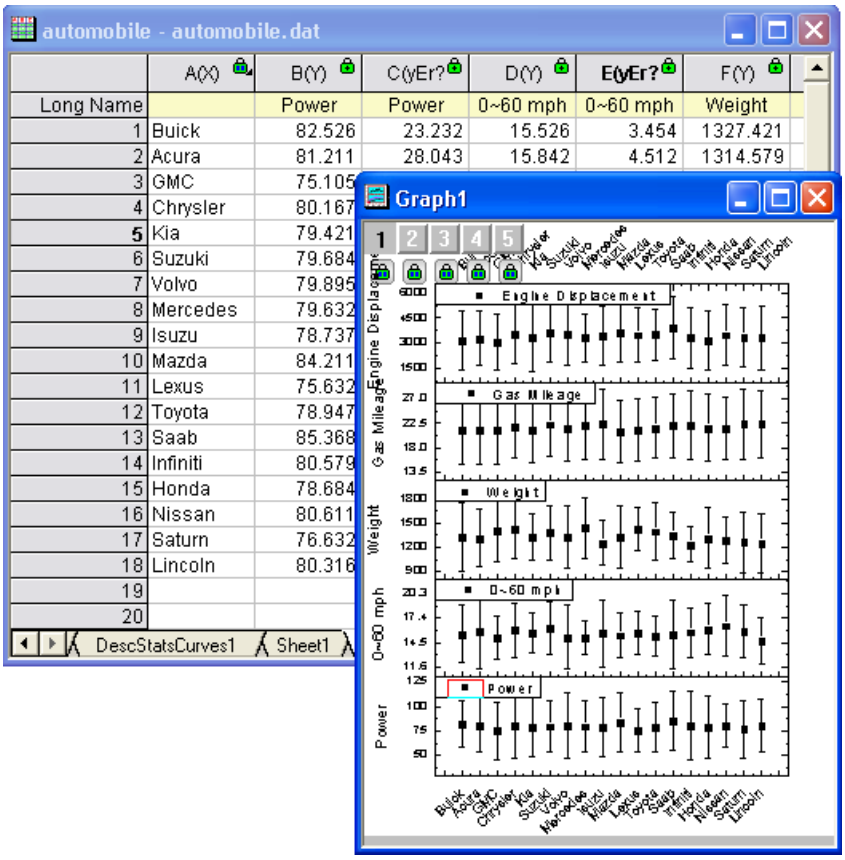
1. In the report sheet, right-click on the title of the Descriptive Statistics table and select **Create Copy as New Sheet** from the short-cut menu.



2. When the new sheet is active, select **Worksheet: Unstack Columns**.
3. In the dialog that comes up, set columns D and E as **Data to be Unstacked**. Since the triangle button fly-out menu supports only one selection, you need to use the interactive button.
4. Set **column A** as **Group Variables**.
5. Set **Group Identifier** to **Short Name**.
6. Select the **Include Other Columns** check box and set **Other Columns** to column B. Click the **OK** button.



7. In the result of **Unstack Columns**, we get the mean and standard deviation of Power, 0~60 mph time, Weight, Gas Mileage and Engine Displacement for the 18 different car makes.
8. To compare these indicators, we can plot a graph of the results. Set user parameter row **A** as **Long Name** by right-clicking on this user parameter row and selecting **Set As Longname** from the context menu.
9. Highlight the whole worksheet. Select **Plot: Multi-Curve: Stack** from the main menu.
10. In the pop-up dialog, all columns in the worksheet are automatically set as **Input**. Set **Plot Type** to **Scatter** and click the **OK** button.



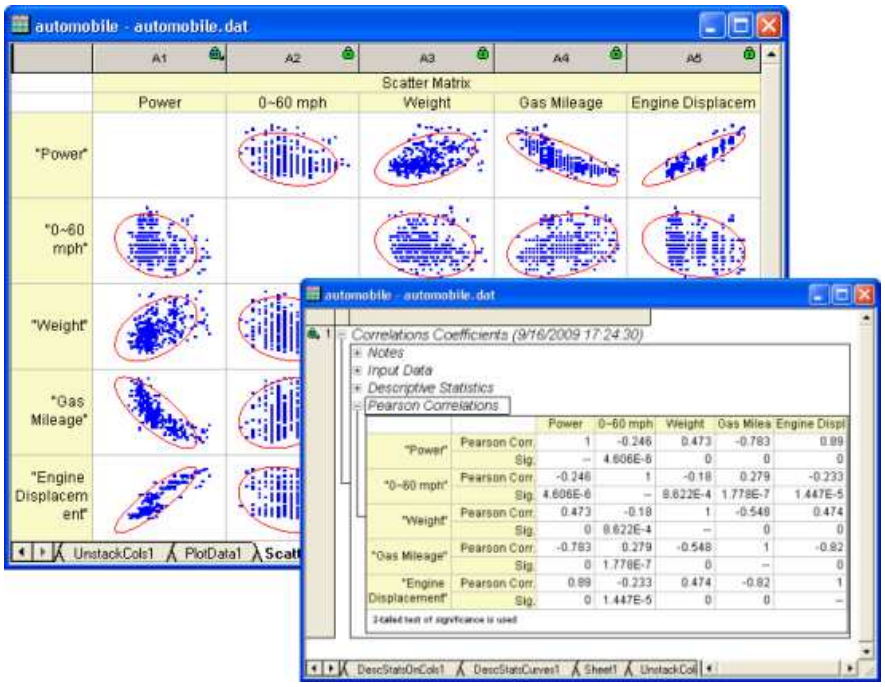
	A(X)	B(Y)	C(yEr?	D(Y)	E(yEr?	F(Y)
Long Name		Power	Power	0~60 mph	0~60 mph	Weight
1	Buick	82.526	23.232	15.526	3.454	1327.421
2	Acura	81.211	28.043	15.842	4.512	1314.579
3	GMC	75.105				
4	Chrysler	80.167				
5	Kia	79.421				
6	Suzuki	79.684				
7	Volvo	79.895				
8	Mercedes	79.632				
9	Isuzu	78.737				
10	Mazda	84.211				
11	Lexus	75.632				
12	Toyota	78.947				
13	Saab	85.368				
14	Infiniti	80.579				
15	Honda	78.684				
16	Nissan	80.611				
17	Saturn	76.632				
18	Lincoln	80.316				
19						
20						

In the above screenshot, the X-Axis Tick Labels have been rotated 45 degrees for clarity. To do this, double-click on the tick labels to open the **X-Axis** dialog. Set the **Rotation** on the **Custom Tick Labels** tab.

5.10.5 Analyzing the Relationship between different Indicators

We can use a correlation coefficient to explore the relationship between columns of our automobile data. In addition, we can plot a scatter matrix with a confidence ellipse to get a graphical representation of the correlation.

1. Go to the original worksheet with the source data. Highlight the last five columns.
2. Select **Statistics: Descriptive Statistics: Correlation Coefficient** from the Origin menu to open the **Correlation Coefficient** tool. Note that **Pearson** is the default selection. This method is suitable for quantitative data.
3. Under the **Plots** branch, select the **Add Confidence Ellipse** check box. The **Scatter Plot** check box should then be automatically selected. This means that the tool will create a scatter matrix with a confidence ellipse added to each scatter plot. Click **OK**.



Note the high positive correlation between **Engine Displacement** and **Power** and the high negative correlation between **Gas Mileage** and **Engine Displacement**.

5.11 Nonlinear Curve Fitting

5.11.1 Summary

The Nonlinear Curve Fitter in Origin provides close to 200 built-in fitting functions, plus the ability to fit with user-defined functions. This tutorial will demonstrate how to use the fitter for a basic fitting task, including flexible selection of data.

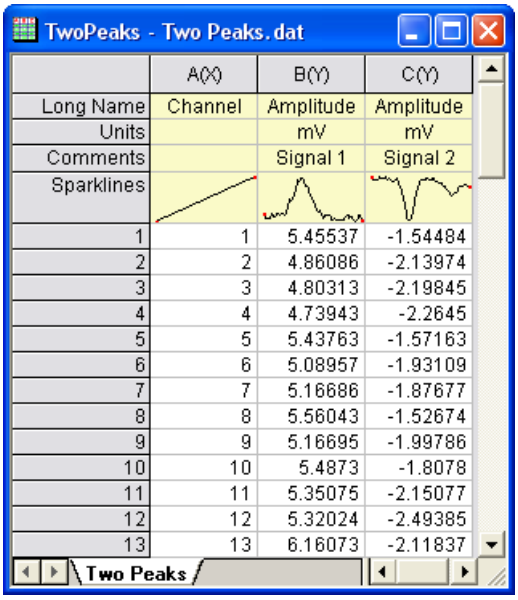
This tutorial will show you how to:

- Use the Regional Data Selector tool to select a specific range of a data plot to fit
- Use the Nonlinear Curve Fitter (NLFit) dialog to perform curve fitting
- Use Change Parameters to modify the data range to be fit

5.11.2 Graphically Selecting the Input Data Range to be Fitted

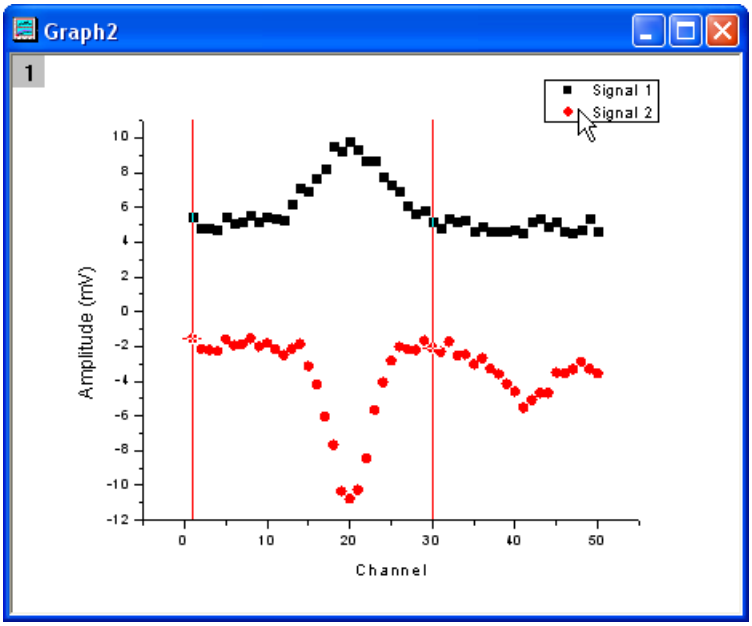
In this section, we will show you how to select a specific range of a dataset and perform curve fitting on it.

1. Start with a new project or create a new workbook and import the data file **\samples\curve fitting\Two Peaks.dat**, using **File: Import: Single ASCII**. Your workbook will look like this:

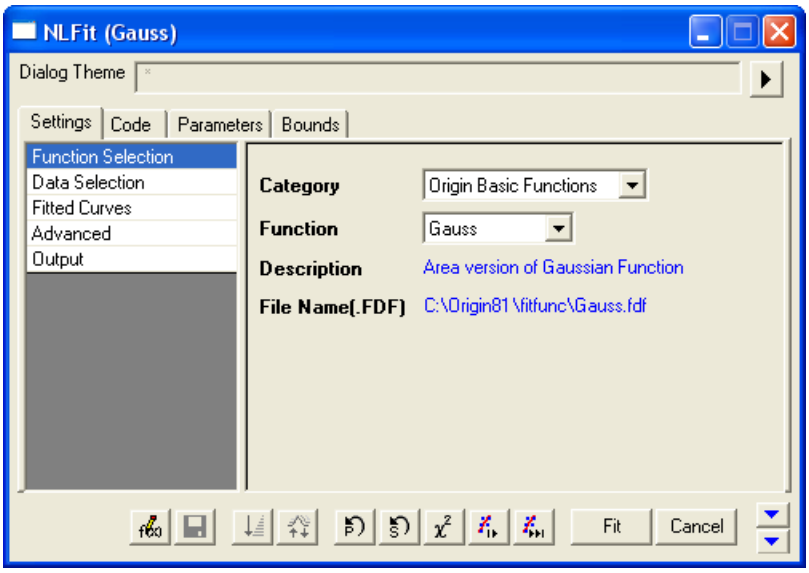


2. Highlight columns **B** and **C** and click the **Scatter** button,  , from the **2D Graphs** toolbar to create a scatter graph. Note: Origin will automatically plot the two Y columns against the associated X column, column A, so there is no need to highlight column A.
3. The graph you just created includes multiple data plots, but only the first data plot, **Signal 1**, is active, meaning automatically picked up as input when an analysis dialog such as the

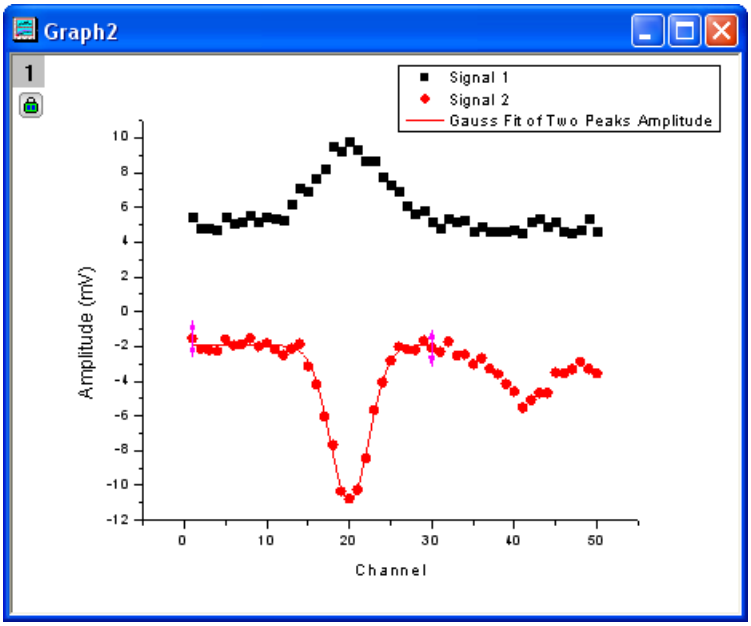
Nonlinear Curve Fitting tool is opened. To fit the large peak on the left side of the second data plot, **Signal 2**, you can graphically select this range as input using the **Regional Data Selector** tool,  , from the **Tools** toolbar to draw a rectangle around the big peak in the lower plot on the graph (you can move the two vertical lines to appropriate positions by dragging). The graph should look like this:



4. Select **Analysis: Fitting: Nonlinear Curve Fit** to open the **Nonlinear Curve Fitting** dialog, and select **Gauss** from the **Function** drop-down list:

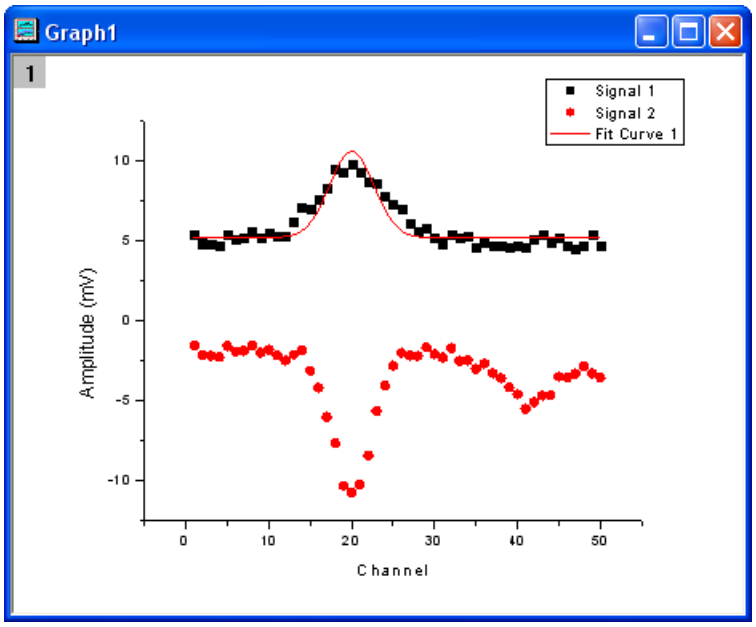


5. The fit line is drawn *only* for the range selected. Note that if you select **Data Selection** on the **Settings** tab, you can view the input data range that the dialog automatically picked up from the graph window.
6. Click **Fit** to finish the fitting. Note the analysis markers on the graph, marking the range that the analysis was performed on. These markers, as well as the green lock that appears, can be used to *Change Parameters* of the fitting. Delete the table on the graph. The graph will look like this:

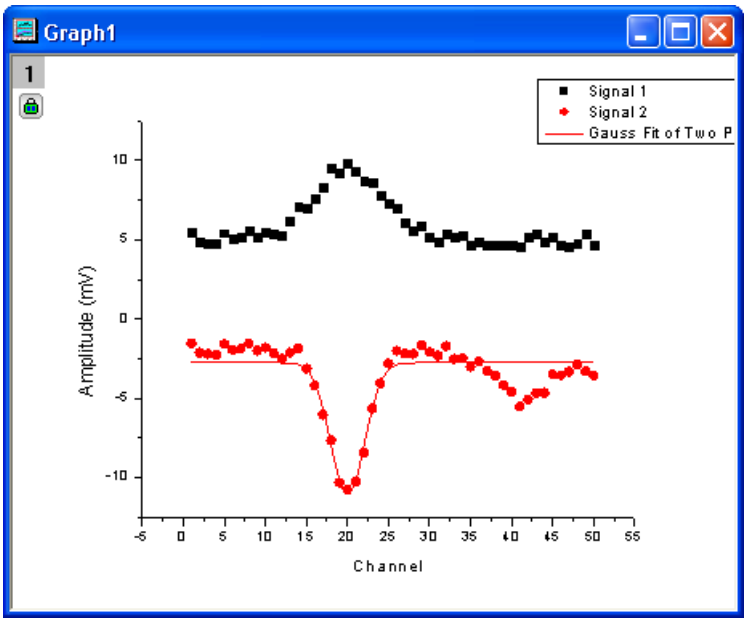


5.11.3 Assigning an Input Data Range Inside the NLFit Dialog

1. Begin by creating a new graph as follows: In the TwoPeaks worksheet, highlight columns **B** and **C** and click the **Scatter** button,  , from the **2D Graphs** toolbar to create a scatter graph.
2. Select **Analysis: Fitting: Nonlinear Curve Fit** to open the **Nonlinear Curve Fitting** dialog, and select **Gauss** from the **Function** drop-down list. Please note that a graph in Origin can include multiple data plots, but only one of them will be active. In the current graph, **Signal 1**, the first data plot, is the active data plot. If you select **Data Selection** on the **Settings** tab, you can see that it has been automatically assigned as the **Input Data** range.



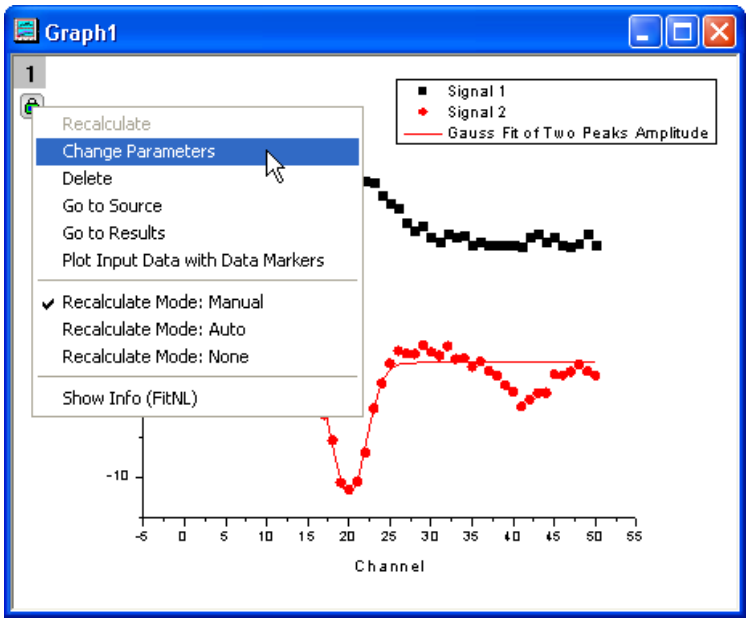
   You can reassign the input from within the dialog, by clicking the triangular button next to **Range 1** and selecting **Signal 2**. The fit line should now be tracking the **Signal 2** data plot.
3. Click the **Fit** button. The tool will automatically fit until convergence. It will also close the dialog and create the fitting report.



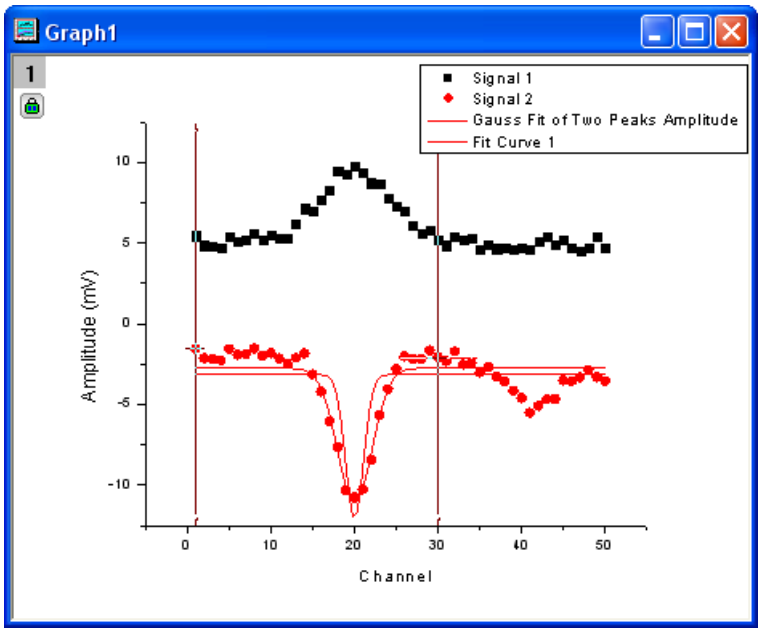
5.11.4 Using Change Parameters, Modify the Data Range to be Fitted

After fitting the entire range of **Signal 2**, you may want to update the fit just to fit a part of the curve. You can see that there are two peaks in **Signal 2** and we only want to fit the larger one on the left hand side of the graph. This section demonstrates how to do this.

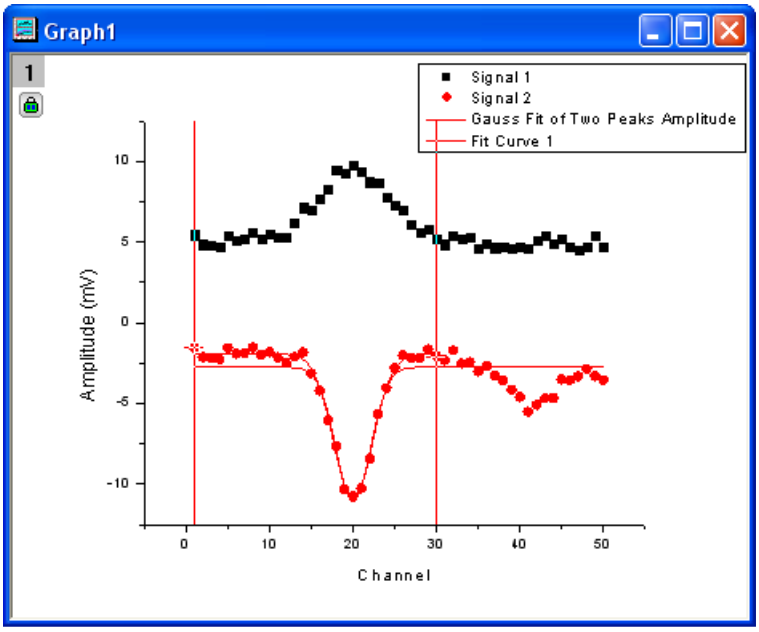
1. First reopen the **Nonlinear Curve Fitting** dialog. You can click on the green lock on the upper left corner of the graph and select **Change Parameters** to open it.



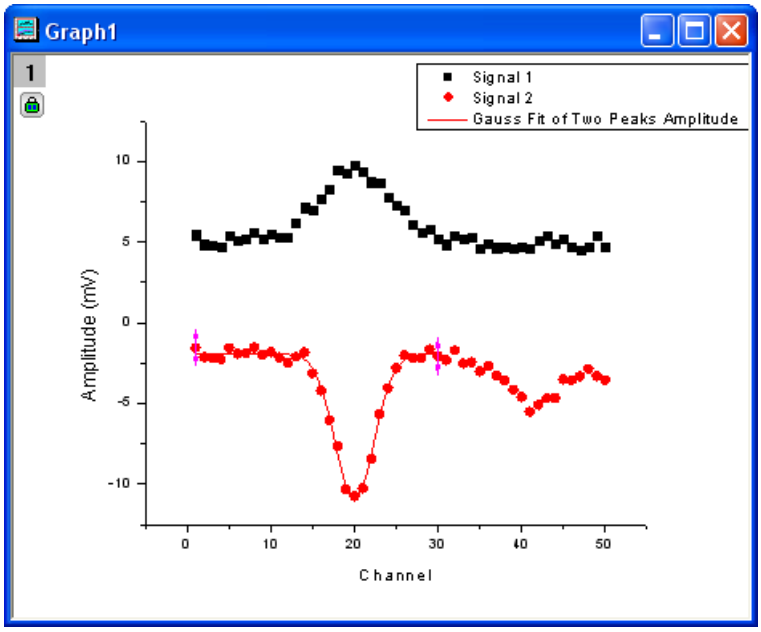
2. Change the fitting range by selecting **Data Selection** in the **Settings** tab, and then clicking the triangular button next to **Range 1** to choose **Select Range from Graph**. The Nonlinear Curve Fitting dialog will automatically be minimized.
3. Drag the vertical line on the *right* side of the graph to leave out the small peak, as shown in the following image.



4. Maximize the **Nonlinear Curve Fitting** tool and click the **Fit Until Converged** button  . As in the image below, you will find that the new fit curve is now only over the selected range, and it fits the baseline better.



5. Click the **OK** button and you will get the following result:



5.12 Analysis Template and Batch Processing

5.12.1 Summary

Origin version 8.5 allows users to easily perform batch processing of multiple files or data sets, using an Analysis Template. This tutorial will show you how to use this new functionality to batch process multiple files.

This tutorial will show you how to:

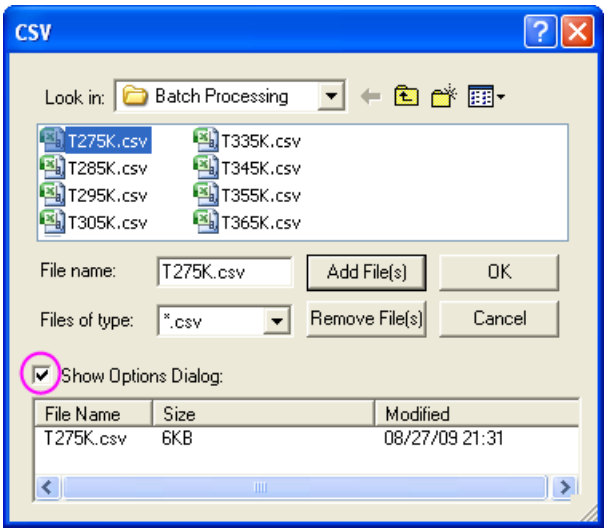
- Create an Analysis Template
- Use the Analysis Template to batch process multiple data files

5.12.2 Creating an Analysis Template

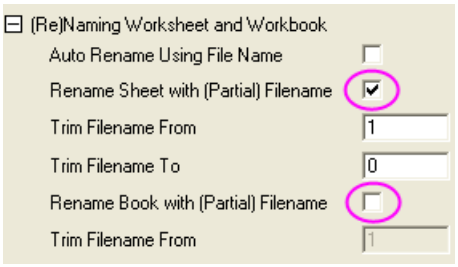
The first task is to create an Analysis Template for processing a single file/data set. Once the Analysis Template has been created, it can be used by the Batch Processing tool to process multiple files/data sets.

The following steps demonstrate how to create an Analysis Template:

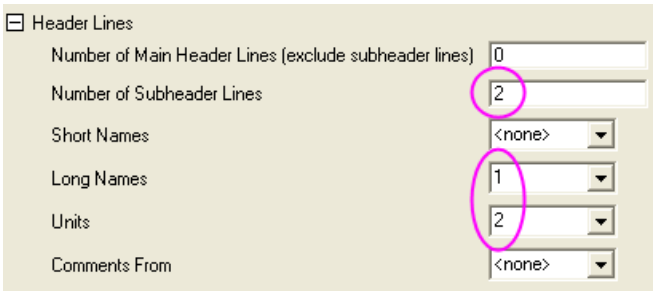
1. Start with a new workbook.
2. Use the **File: Import: Comma Delimited (CSV)** menu item, and in the file dialog that opens, navigate to, and select, the file ***\Samples\Batch Processing\t275k.csv***, and press the **Add File(s)** button. Then check the **Show Options Dialog** check box and press **OK**.



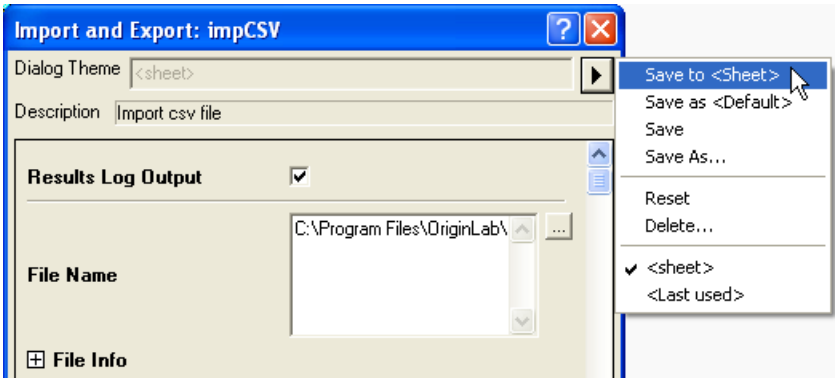
   The **impCSV** dialog now opens, which can be used to specify custom settings for importing the selected file.
3. Expand the **Import Options** node and then the **(Re)Naming Worksheet and Workbook** subnode, and change the settings as below, so that only the sheet gets renamed by file name, not the book.



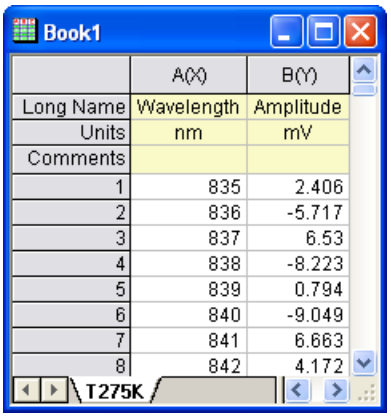
4. Our data file has two sub header lines suitable for Long Name and Units. Expand the **Header Lines** node and set Number of Subheader Lines to 2, and set Long Names as 1 and Units as 2.



5. Go to the Dialog Theme control in the top of the dialog, press the arrow button, and select **Save to <Sheet>** from the pop-up menu. This saves the custom settings right into the worksheet, so that the settings will become part of the Analysis Template and will be used for importing similar files when the template is used later by the Batch Processing tool.



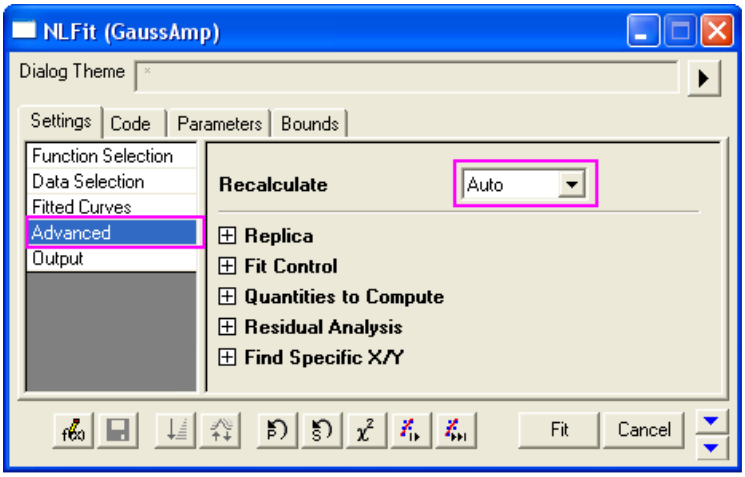
6. Press **OK** and the file gets imported



Import dialogs, such as ASCII import (impASC), CSV Import (impCSV), or any of the third-party imports, including ETAS INCA MDF (impMDF), all allow saving custom settings to the **<sheet>**. If you use the Import Wizard for importing the file, the custom settings can also be saved into the worksheet as a filter, in the Save Filters page of the wizard. Saving the import settings or the import wizard filter into the worksheet allows for all information to be contained in the analysis template itself, making it portable. There is then no need for additional files, in case you are sharing the analysis template with another user.

The next step in creating the Analysis Template is to add desired analysis operations based on the imported data. In our example we will perform curve fitting on the imported data.

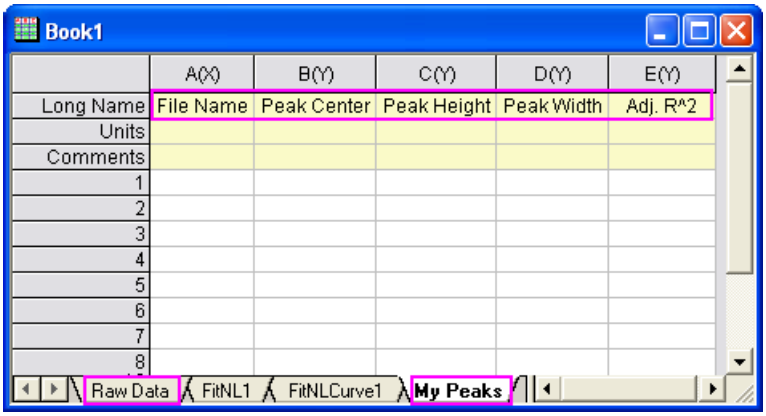
7. Highlight Column **B** and select **Analysis: Fitting: Nonlinear Curve Fit** to bring up the dialog. Select **GaussAmp** from the **Function** drop-down list and then select **Auto** from the **Recalculate** drop-down list, as shown in the following image. Click the **Fit** button to complete the fitting process.



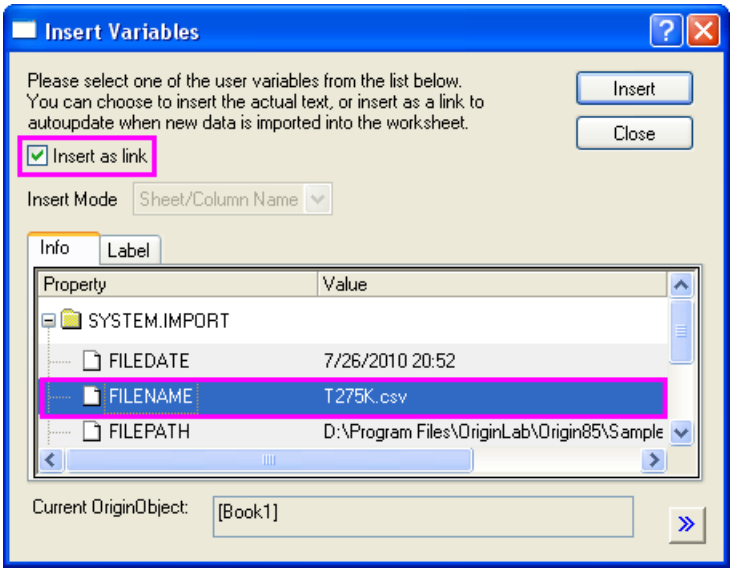
8. Rename the first worksheet **Raw Data**, so that the template has a suitable and recognizable sheet name.

The next important step in creating the Analysis Template is to add a **Result Sheet**, into which you can place desired information from the import and the analysis. This sheet will then be used by the Batch Processing tool to create a summary report from multiple files/data sets. Note that this step is optional; you must add such a sheet only if you need to obtain a summary report at the end of the batch processing operation.

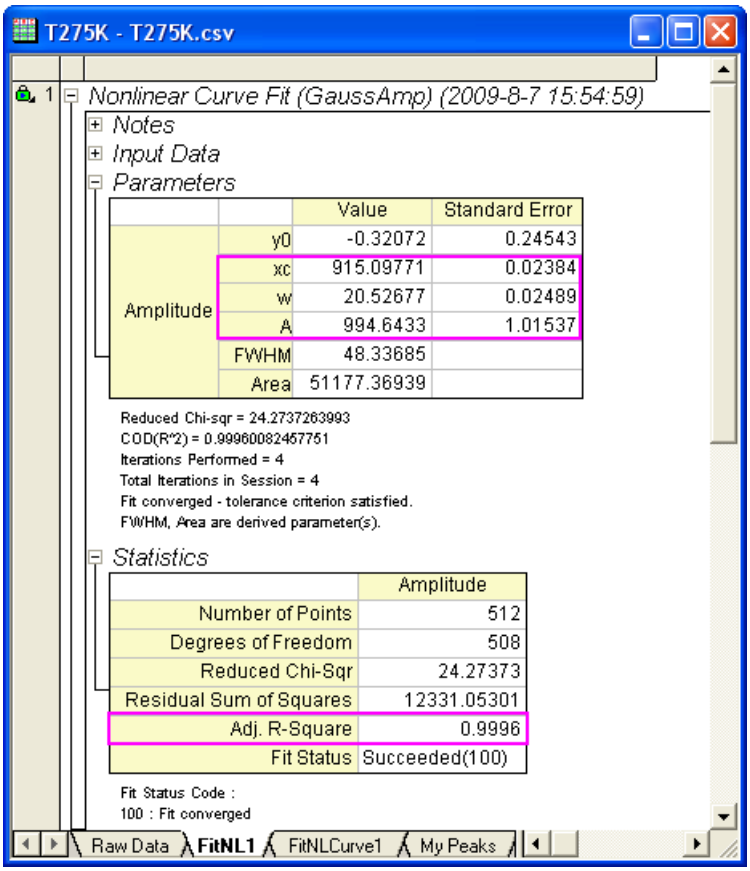
9. Add a new worksheet named **My Peaks** into the current workbook, and add three columns. Set the long names of the columns as shown in the image below. This sheet will be set up by paste-linking desired quantities from the current analysis. The Batch Processing dialog will then create a new report book with this information appended for each data file.



10. Right-click on the **first** cell of Column **A** of the worksheet **My Peaks** and select **Insert Variables**. Select **FILENAME** to insert. Make sure the **Insert as link** check box is checked.



11. Go to the **FitNL1** sheet to copy the values of parameter **xc** and then go to the **My Peaks** worksheet. Right-click on the first cell of Column **B** and select **Paste Link**. Then **Copy** relevant values from the **Parameters** table (parameters **A** and **W**) and from the **Statistics** table (**Adj. R^2**), to **Paste Link** them to Columns **C**, **D** and **E**.



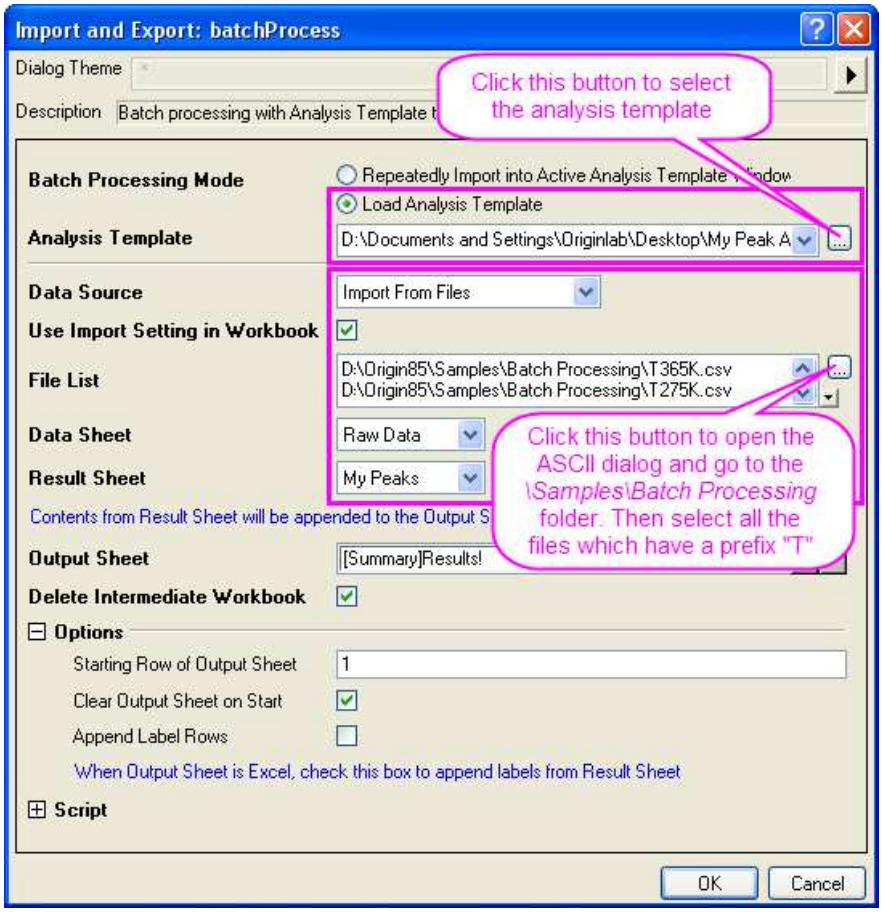
12. Select **File: Save Workbook as Analysis Template** and name it **My Peak Analysis**. The raw data and related results will be cleared and the book will be saved to the disk as an **OGW** file with the specified name.

Analysis Templates can also include custom sheets other than a summary sheet. For instance, the user can create a custom sheet which combines multiple elements such as graphs and result tables in a format suitable for presentation and reporting. A graph can be inserted into a cell and then multiple cells in a sheet can be merged with this cell, to create a larger display of the graph image, for instance. Please view other tutorials available from the Help menu for information on how to create custom reports with merged cells.

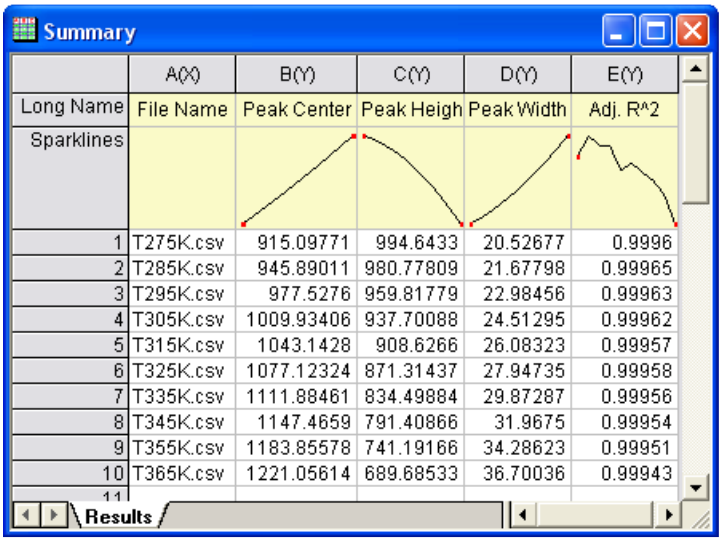
5.12.3 Performing Batch Processing

We will now use the Analysis Template created in the steps above to perform batch processing of data from ten similar data files.

1. Create a new project and select **File: Batch Processing** from the main menu. Set the controls in the dialog as shown in the image below. Please note that the data files are under the ***Origin Installation Folder\Samples\Batch Processing*** folder, and all of them have the same prefix, **T**. Please remember to select **All Files(*.*)** from the **Files of type** drop-down list after you've opened the ASCII dialog by clicking the browser button, which is next to the **File list**.



2. Click **OK** to perform Batch Processing. The summary report should look like the image below. Sparklines were turned on for the data columns to visually compare the fit results from the different data files.



Summary

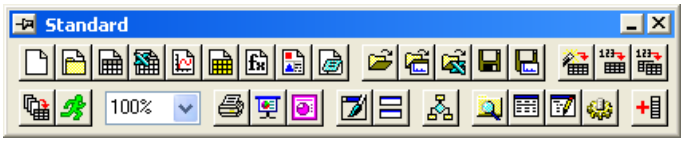
	A(X)	B(Y)	C(Y)	D(Y)	E(Y)
Long Name	File Name	Peak Center	Peak Heigh	Peak Width	Adj. R^2
Sparklines					
1	T275K.csv	915.09771	994.6433	20.52677	0.9996
2	T285K.csv	945.89011	980.77809	21.67798	0.99965
3	T295K.csv	977.5276	959.81779	22.98456	0.99963
4	T305K.csv	1009.93406	937.70088	24.51295	0.99962
5	T315K.csv	1043.1428	908.6266	26.08323	0.99957
6	T325K.csv	1077.12324	871.31437	27.94735	0.99958
7	T335K.csv	1111.88461	834.49884	29.87287	0.99956
8	T345K.csv	1147.4659	791.40866	31.9675	0.99954
9	T355K.csv	1183.85578	741.19166	34.28623	0.99951
10	T365K.csv	1221.05614	689.68533	36.70036	0.99943
11					

Results

6 Origin Toolbars

Presented below is a list of all toolbars and buttons in Origin. Certain toolbar buttons (or entire toolbars) will be inactive (grayed out) if the object they act on is not present in the Origin Project. For instance, the 3D-Rotation Toolbar is only available when a 3D graph is active.

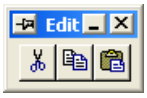
6.1 Standard



Button	Description	Button	Description
	New Project		New Folder
	New Workbook		New Excel Workbook
	New Graph		New Matrix
	New Function		New Layout
	New Notes		Open
	Open Template		Open Excel
	Save Project		Save Template
	Import Wizard		Import Single ASCII
	Import Multiple ASCII		Batch Processing
	Recalculate Manual		Recalculate Auto
100%	Zoom In and Out by Percentage		Print
	Slide Show of Graphs		Send Graphs to PowerPoint
	Refresh		Duplicate

	Custom Routine		Project Explorer
	Results Log		Command Window
	Code Builder		Add New Columns

6.2 Edit



Button	Description	Button	Description
	Cut		Copy
	Paste		

6.3 Graph

Button	Description	Button	Description
	Zoom In		Zoom Out
	Whole Page		Rescale
	Extract to Layers		Extract to Graphs
	Merge		Add Bottom-X Left-Y Layer
	Add Top-X Layer		Add Right-Y Layer
	Add Top-X Right-Y Layer		Add Inset Graph
	Add Inset Graph With Data		Add Color Scale

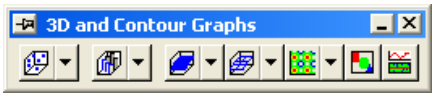
	New Legend		Add XY Scale
	Date & Time		New Link Table

6.4 2D Graph

Button	Description	Button	Description
	Line		Horizontal Step
	Vertical Step		Spline Connected
	Scatter		Scatter Center
	Y Error		X Y Error
	Vertical Drop Line		Bubble
	Color Mapped		Bubble + Color Mapped
	Line + Symbol		Line Series
	2 Point Segment		3 Point Segment
	Column		Column + Label
	Bar		Stack Column
	Stack Bar		Floating Column
	Floating Bar		3D Color Pie Chart
	B&W Pie Chart		Double Y Axis
	3Ys Y-YY		3Ys Y-Y-Y
	4Ys Y-YYY		4Ys YY-YY
	Multiple Y Axes		Stack Lines By Y Offsets

	Waterfall		Waterfall Y: Color Mapping
	Waterfall Z: Color Mapping		Vertical 2 Panel
	Horizontal 2 Panel		4 Panel
	9 Panel		Stack
	Multiple Panels by Label		Box Chart
	Histogram		Histogram + Probabilities
	Stacked Histograms		QC(X-bar R) Chart
	Pareto Chart-Binned Data		Pareto Chart-Raw Data
	Scatter Matrix		Probability Plot
	Q-Q Plot		Area
	Stack Area		Fill Area
	Polar theta(X) r(Y)		Polar r(X) theta(Y)
	Wind Rose-Binned Data		Wind Rose-Raw Data
	Ternary		Smith Chart
	High-Low-Close		Vector XYAM
	Vector XYXY		Zoom
	Japanese Candlestick		OHLC Bar Chart
	OHLC-Volume		Template Library

6.5 3D and Contour Graph



Button	Description	Button	Description
	3D Scatter Plot		3D Trajectory
	3D Error Bar		3D Vector XYZ XYZ
	3D Vector XYZ dXdYdZ		XYY 3D Bars
	3D Ribbons		3D Walls
	3D Color Fill Surface		3D X Constant with Base
	3D Y Constant with Base		3D Color Map Surface
	3D Color Fill Surface with Error Bar		3D Color Map Surface with Error Bar
	Multiple Color Fill Surfaces		Multiple Color Map Surfaces
	3D Wire Frame		3D Wire Surface
	Matrix 3D Bars		Matrix 3D Scatter
	Matrix 3D Error Bar		Contour - Color fill
	Contour - B/W Lines + Labels		Gray Scale Map
	Contour Profiles		Polar Contour theta(X) r(Y)
	Polar Contour r(X) theta(Y)		Ternary Contour
	Image Plot		Image Profiles

6.6 3D Rotation

Button	Description	Button	Description
	Rotate counterclockwise		Rotate clockwise
	Tilt left		Tilt right
	Tilt down		Tilt up
	Increase perspective		Decrease perspective
	Fit frame to layer		Reset rotation

6.7 Worksheet Data

Button	Description	Button	Description
	Statistics on Column(s)		Statistics on Row(s)
	Sort		
Set Column Values			
	One column		All columns
	Row number		Uniform random numbers
	Normal random numbers		

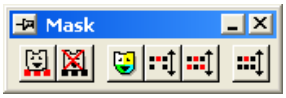
6.8 Column

Button	Description	Button	Description
	Set as X		Set as Y
	Set as Z		Set as Y Error Bars
	Set as Labels		Set as Disregard
	Set as Grouping		Set as Subject
	Move to First		Move Left
	Move Right		Move to Last

6.9 Layout

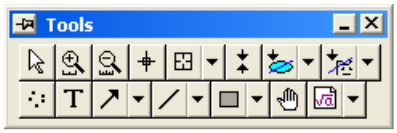
Button	Description	Button	Description
	Add Graph		Add Worksheet

6.10 Mask



Button	Description	Button	Description
	Mask Range		Unmask Range
	Change mask color		Hide/Show masked points
	Swap mask		Disable/Enables masking

6.11 Tools



Button	Description	Button	Description
	Pointer		Scale In
	Scale Out		Screen Reader
	Reader		Annotation
	Cursor		Data Selector
	Selection on Active Plot		Selection on All Plots
	Mask Points on Active Plot		Mask Points on All Plots
	Unmask Points on Active Plot		Unmask Points on All Plots
	Draw Data		Text Tool
	Arrow Tool		Curved Arrow Tool

	Line Tool		Polyline Tool
	Freehand Draw Tool		Rectangle Tool
	Circle Tool		Polygon Tool
	Region Tool		Panning
	Insert Equation		Insert Word Object
	Insert Excel Object		Insert Object

6.12 Object Edit

Button	Description	Button	Description
	Left		Right
	Top		Bottom
	Vertical		Horizontal
	Uniform Width		Uniform Height
	Front		Back
	Front(data)		Back(data)
	Group		Ungroup

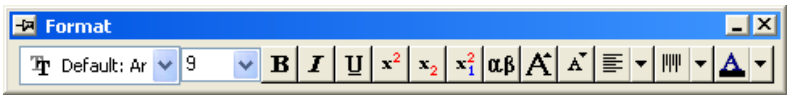
6.13 Arrow

Button	Description	Button	Description
	Horizontal Alignment		Vertical Alignment
	Widen Head		Narrow Head
	Lengthen Head		Shorten Head

6.14 Style

Button	Description	Button	Description
	Fill Color		Line/Border Color
	Pattern Color		Clear Borders
	Left Border		Top Border
	Right Border		Bottom Border
	Frame Borders		Inside Horizontal Borders
	Inside Vertical Border		Inside Horiz and Vert Borders
	All Horizontal Borders		All Vertical Borders
	All Borders		Merge cells

6.15 Format



Button	Description	Button	Description
	Bold (Ctrl+"B")		Italic (Ctrl+"I")
	Underline (Ctrl+"U")		Superscript (Ctrl+"+")
	Subscript (Ctrl+"=")		SuperSubscript (Ctrl+"-")
	Greek (Ctrl+"G")		Increase Font (Ctrl+">")
	Decrease Font (Ctrl+"<")		Left
	Center Horizontal		Right
	Top		Center Vertical
	Bottom		Font Color

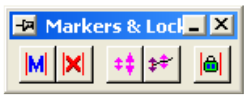
6.16 Auto Update

Button	Description
	Auto Update On

6.17 Database

Button	Description	Button	Description
	Create/Edit SQL		Load ODQ File
	Preview Import		Import data
	Remove SQL		Worksheet Link

6.18 Markers & Locks



Button	Description	Button	Description
	Add Data Markers		Clear Data Markers
	Marker Size		Marker Hide Show
	Lock Positions		