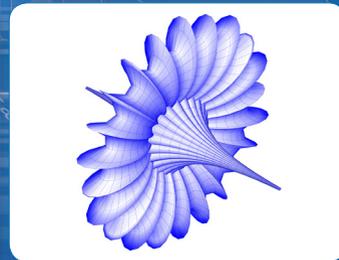
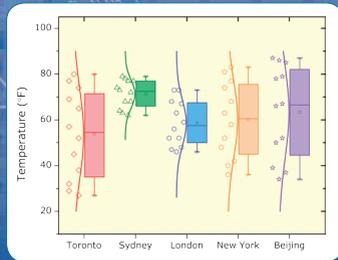
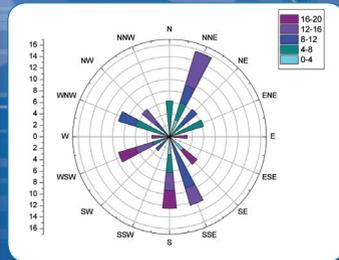
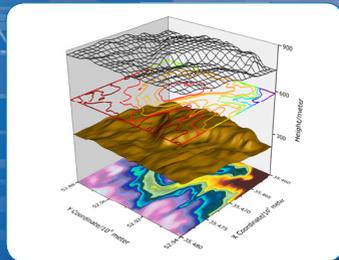
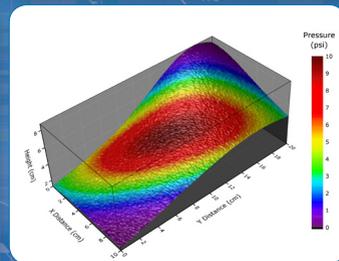
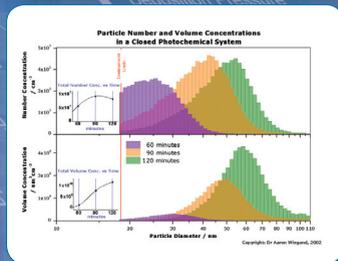
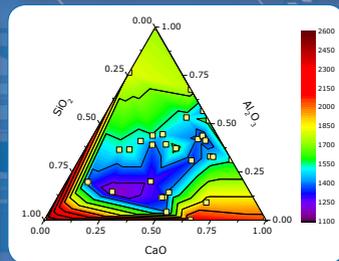
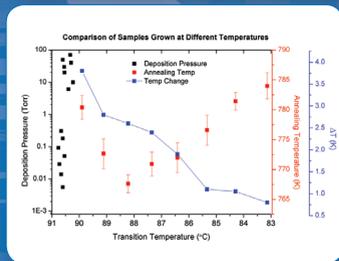
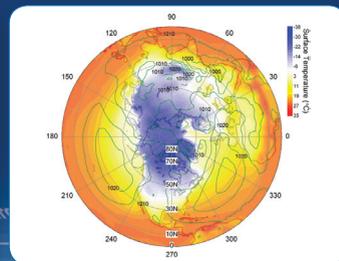
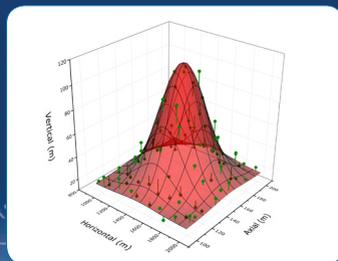
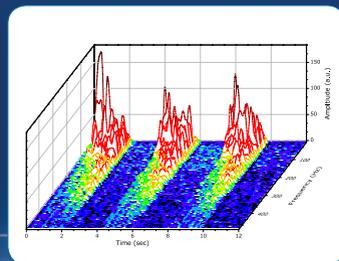
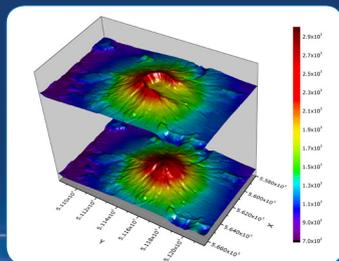


# ORIGIN<sup>®</sup> 9

Data Analysis and Graphing Software



OriginLab<sup>®</sup>

[www.originlab.com](http://www.originlab.com)

Twenty years serving the scientific and engineering community



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# Introduction to Origin & OriginPro

Origin is a user-friendly and easy-to-learn software application that provides powerful data analysis and publication-quality graphing capabilities tailored to the needs of scientists and engineers.

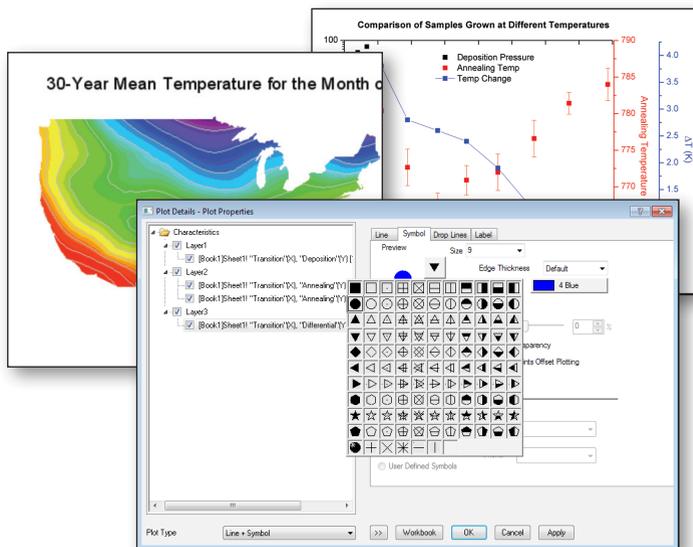
OriginPro offers all of the features of Origin plus extended analysis tools for Peak Fitting, Surface Fitting, Statistics, Signal Processing, and Image Handling. OriginPro is the software of choice for those who want a single data analysis and graphing solution.

See pages 30 - 31 for a table comparing Origin and OriginPro.

## 2D, 3D & Contour Graphing

With over 70 graph templates, Origin makes it easy to create and customize publication-quality graphs.

- Create a graph in two easy steps: simply select the data and then click the desired graph icon
- Origin provides the flexibility to plot multiple datasets in one graph, even when the datasets reside in different workbooks or matrices
- Origin offers customization options for all elements of your graph
- Format settings can be saved as a theme and applied to other graphs
- A customized graph can be saved as a template for creating similar graphs in the future



## Curve Fitting

Origin provides two tools to perform linear and non-linear curve fitting: the Quick Fit Gadget, with a region of interest (ROI) that can be moved and resized, and the NLFit curve fitting tool. With either tool, fitting proceeds in four easy steps:

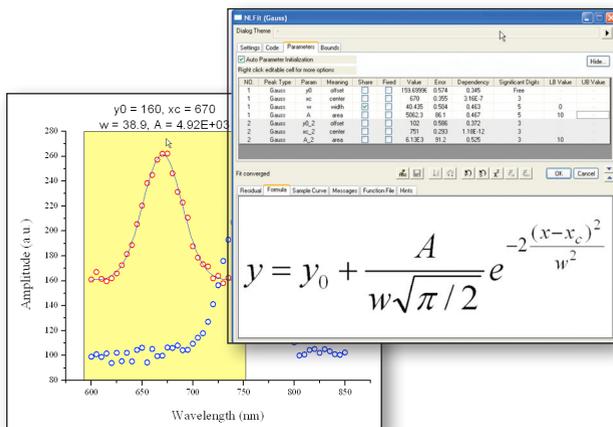
- (1) Select the data
- (2) Open the tool
- (3) Choose the function
- (4) Fit the data and produce a report

Origin supports over 150 built-in fitting functions and provides a wizard to help you create your own. Fitting with implicit functions is also supported.

Place bounds and constraints on your fitting parameters. Fit multiple datasets individually or globally with shared parameters. Fit replicate data with the Concatenate Fit option.

## Programming

Origin includes two built-in programming languages: Origin C and a scripting language called LabTalk. Origin can also be used as an Automation Server for users of VB, C++, C# and LabVIEW.



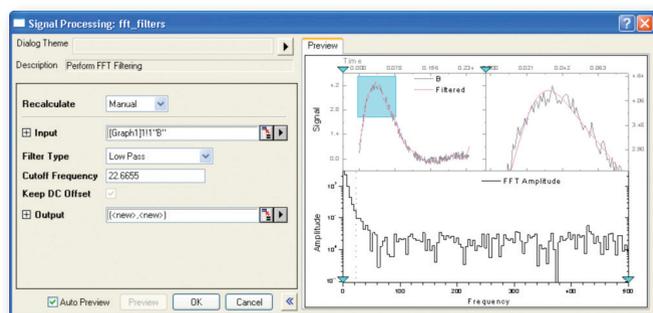
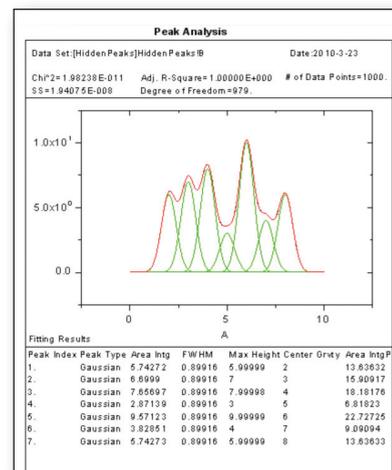
```
void plot_xyz_contour(  
{  
    int npts = 30;  
    Worksheet wks;  
    wks.Create();  
    wks.SetSize(-1,3);  
    wks.SetColDesignations("XYZZ");  
  
    Dataset dsX(wks, 0);  
}
```

## Peak Analysis

Origin provides two tools for analyzing peak data. The Quick Peaks Gadget can perform peak analysis of plotted data within a region of interest. The Peak Analyzer wizard guides you through baseline creation and subtraction, peak finding, and peak integration. OriginPro provides additional baseline and peak fitting capability.

## Statistics

Origin provides tools for Descriptive Statistics, Correlation Coefficient\*, Discrete Frequency\*, Parametric Hypothesis Tests (including Student's t-tests and ANOVA), Repeated Measures ANOVA\*, Nonparametric Tests\* (including Two Sample Kolmogorov-Smirnov Test and Wilcoxon Signed Rank Test), Power and Sample Size\*, Multivariate Analysis\*, Survival Analysis\*, and ROC Curves\*.



## Signal Processing

Origin provides a wide array of tools for signal processing, including FFT, convolution, deconvolution, smoothing, decimation\*, Envelope detection\*, wavelet transforms\*, and IIR filter design\*.

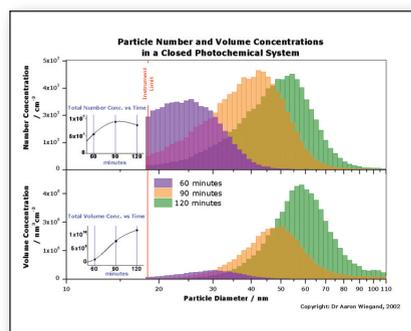
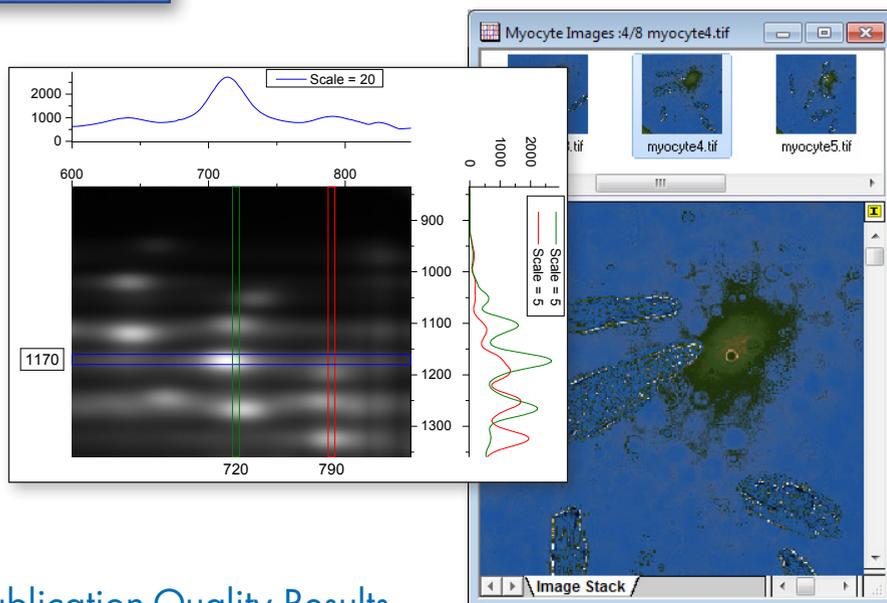
Most tools provide a preview window including options such as zooming into an image, and interactive controls such as moving a vertical line to set cutoff frequencies for filtering.

## Image Handling

Import multiple images into a matrix window, and quickly view and rearrange images using the thumbnail panel.

Perform arithmetic transforms\*, geometric transforms, and image conversion.

The image profile tool allows viewing and comparing multiple horizontal and vertical profiles.



## Publication-Quality Results

Add your Origin graphs, worksheets, and reports to technical publications, posters, and lab reports. Create custom reports and slide shows inside of Origin. Batch export your graphs to Microsoft PowerPoint or save them in a wide variety of popular formats including EPS, PDF, PNG, TIFF, and JPEG.

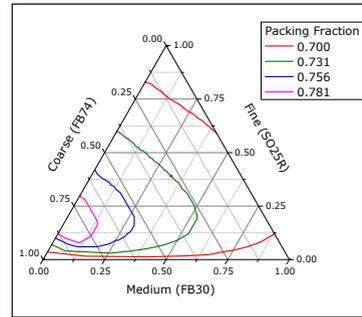
Watch our video tutorials to learn more about Origin and OriginPro: [originlab.com/VideoTutorials](http://originlab.com/VideoTutorials)

# 2D Graphing

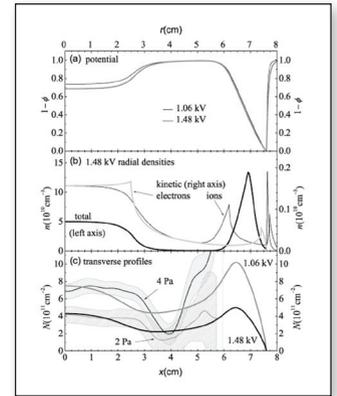
Origin provides many 2D graph templates including line, symbol, column, bar, pie, stock, statistical, contour and area. Specialized plot types include ternary, polar, vector, windrose, and waterfall.

Origin graphs can contain multiple XY axis pairs (layers) that can be arranged arbitrarily, including support for linking axes across layers. Multiple X and/or Y axes with offsets are supported. All graph elements can be easily and extensively customized, including color transparency and gradients.

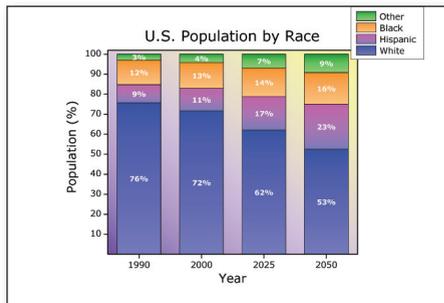
Graph customization can be saved to a template or as a theme for repeated use.



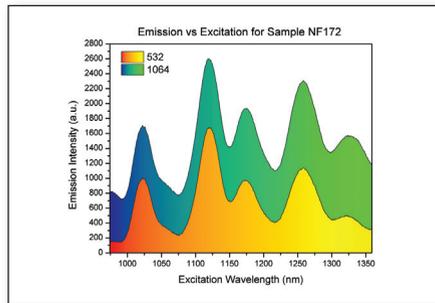
Ternary plot



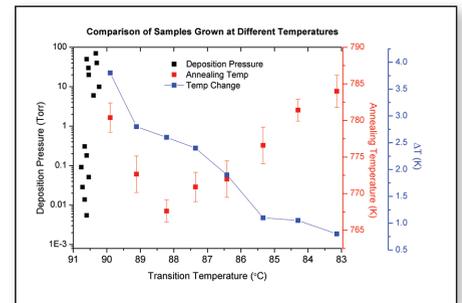
Line plot with linked x-axes



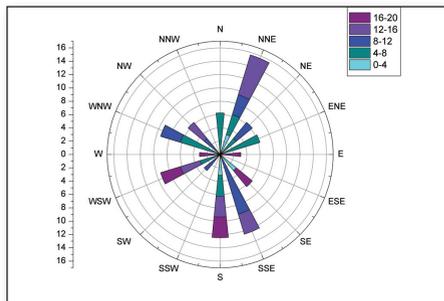
Stacked column plot with gradient color fill



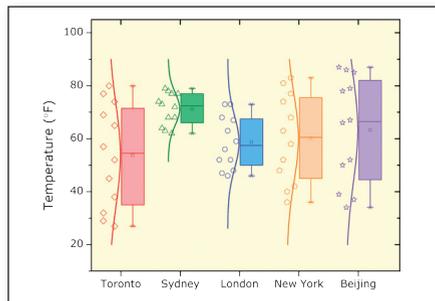
Area plot with gradient color fill



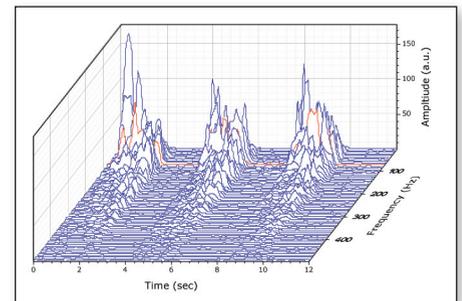
Line and scatter plot with multiple y-axes



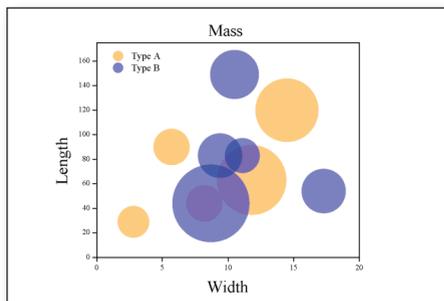
Windrose plot with applied color palette



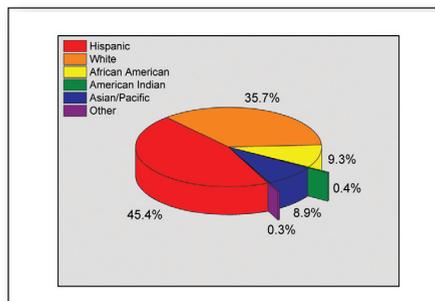
Box chart with data points



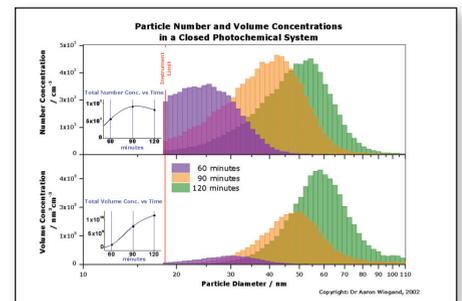
Waterfall plot with highlighted curve



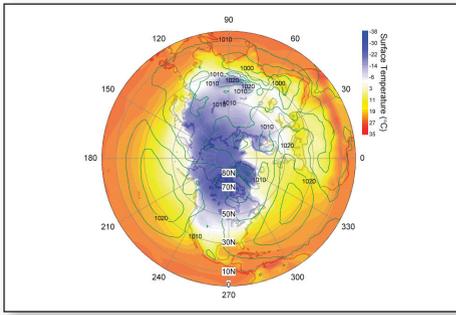
Scatter plot with transparency



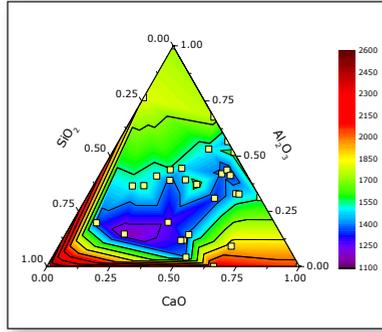
Pie chart with extended wedges



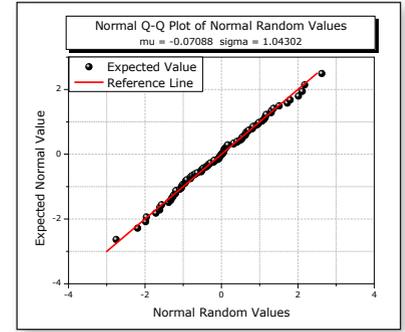
Bar chart with transparency and embedded layers



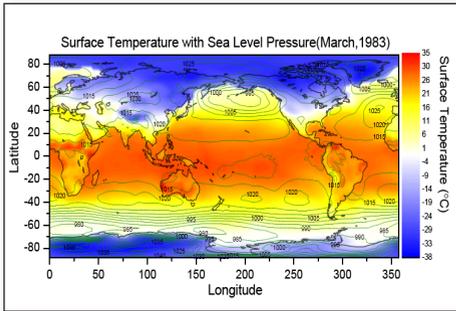
Polar contour with polar plot overlay



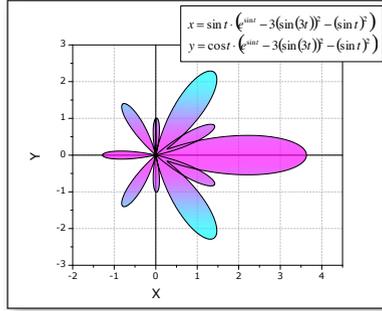
Ternary contour plot with scatter overlay



Q-Q plot



Overlay of two contour plots



Parametric function plot

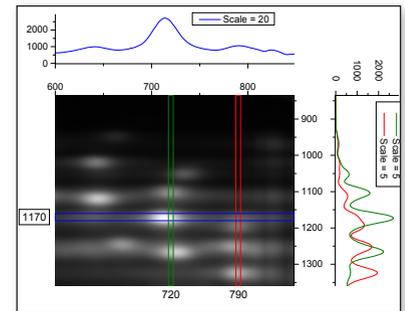
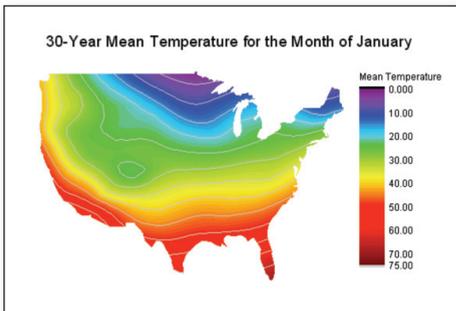
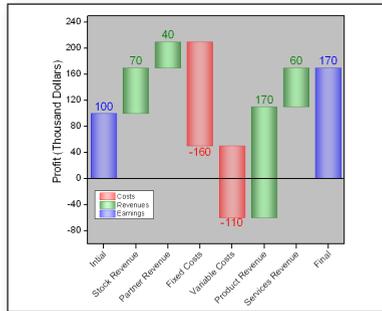


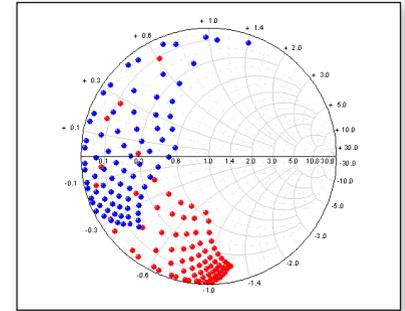
Image profiling



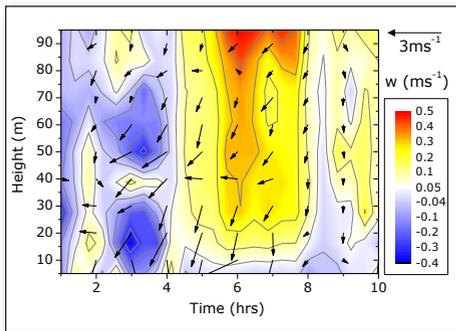
Contour plot with custom boundary



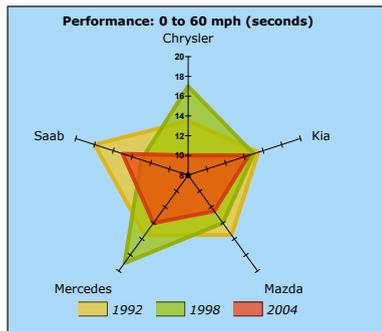
Waterfall chart



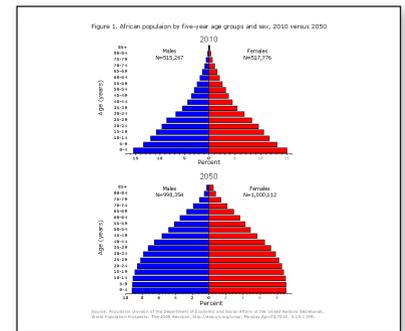
Smith chart



Contour plot with vector overlay



Radar chart

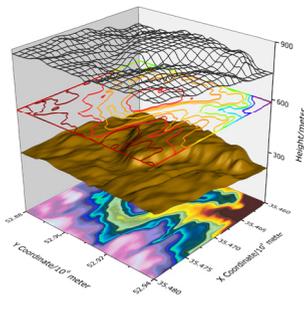


Bar plot

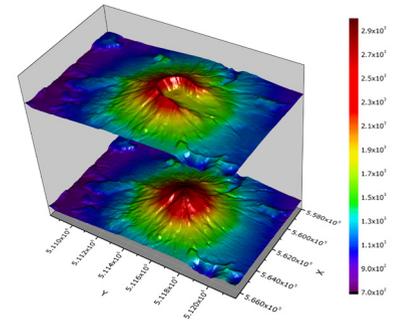
View more graphs at: [originlab.com/GraphGallery](http://originlab.com/GraphGallery)

# 3D Graphing

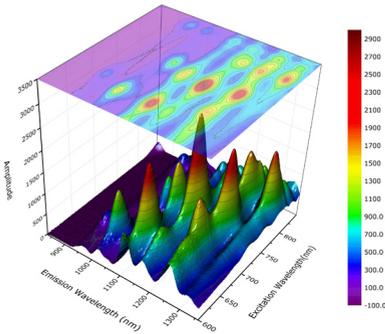
Origin provides high-performance 3D graphs and parametric function plots, created using OpenGL. Many built-in templates such as wireframe, colormap surface with contour projection, scatter, bars, ribbons, and walls are provided. Multiple datasets can be plotted in the same layer, with ability to stack and flatten each dataset individually. Error bars are supported for many of the plot types. Changes can be saved as template or theme for repeat use.



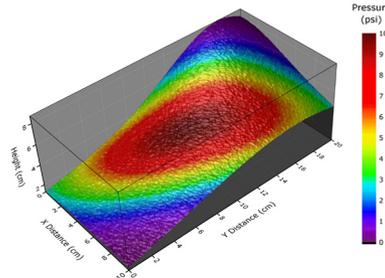
Stacked plot with contour, surface, and wireframe



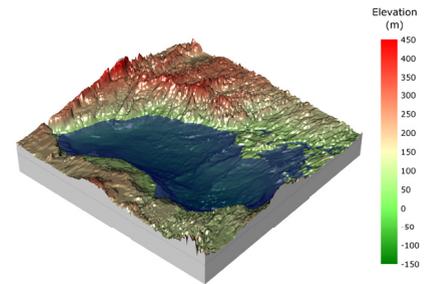
Stacked surface plot



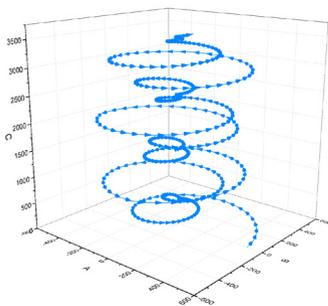
Surface plot with contour projection



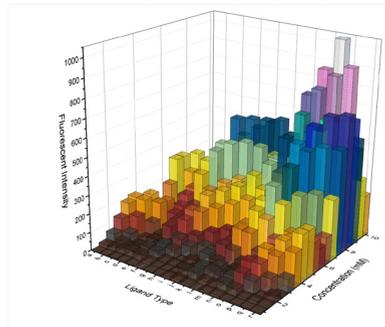
Surface plot with colormap from another dataset



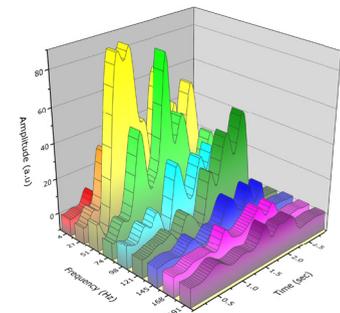
Surface plot with constant plane



Vector Plot

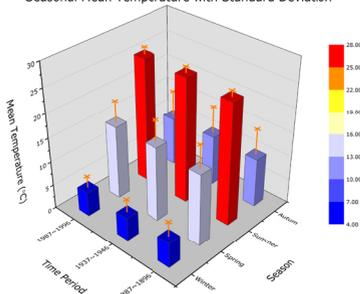


Bar plot with transparency



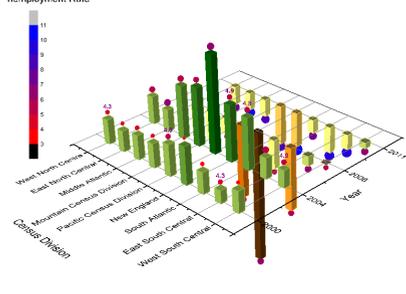
XYY Wall plot

Seasonal Mean Temperature with Standard Deviation



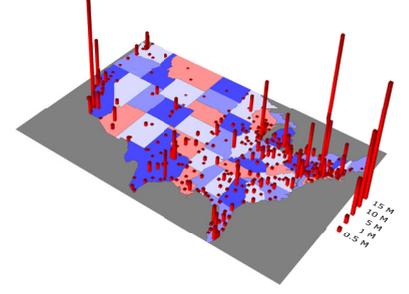
Bar plot with error bars

Unemployment Rate



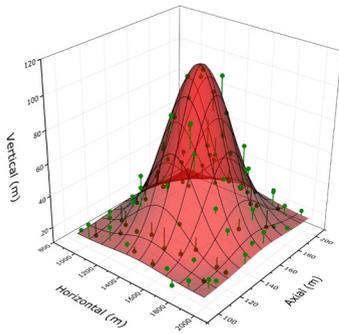
Bar plot with scatter and labels

Changes in HPI

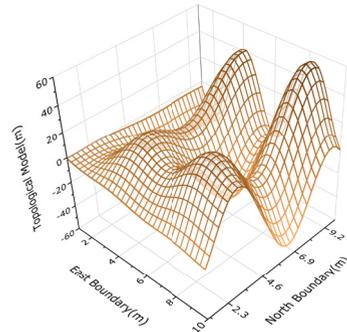


Contour and Bar plot

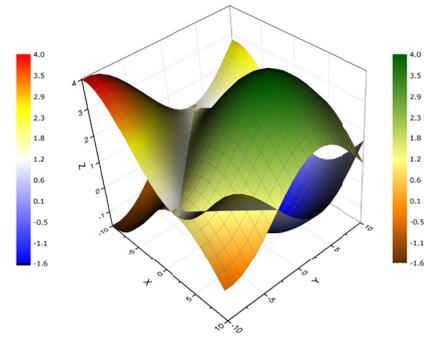
View more 3D graphs at: [originlab.com/GraphGallery](http://originlab.com/GraphGallery)



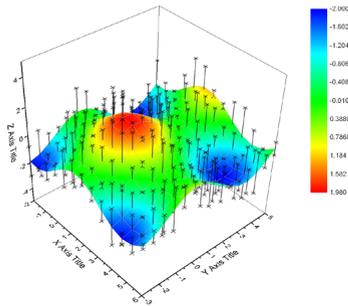
Surface plot with scatter and drop lines to surface



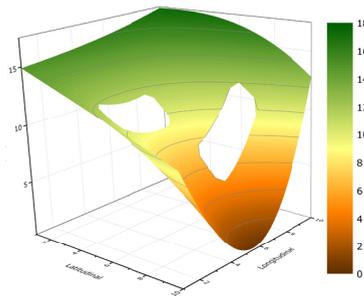
Wireframe plot



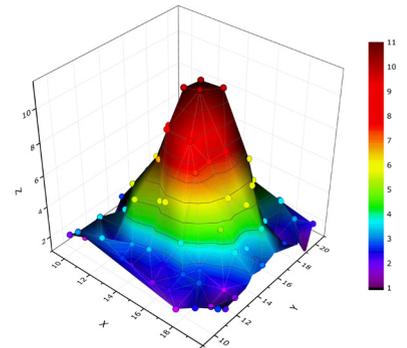
Intersecting surface plots



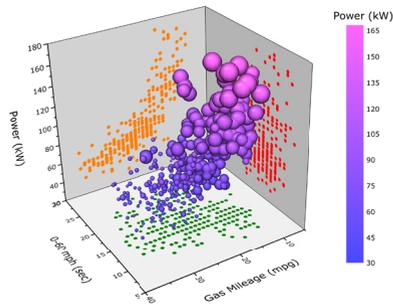
Surface with error bars



Surface plot with missing values

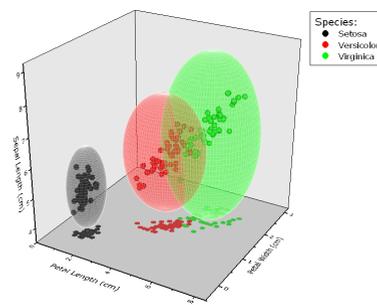


Surface plot from XYZ data

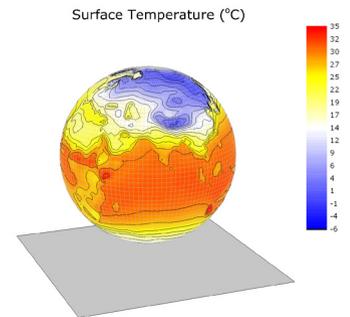


Symbol Size proportional to Engine Displacement

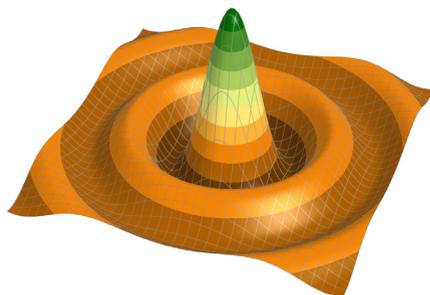
Scatter plot with size and color mapping



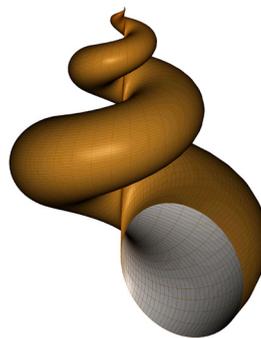
Scatter plot with parametric surfaces



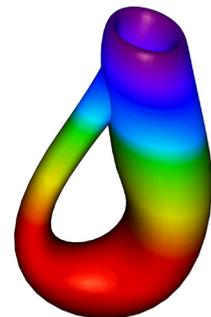
3D Parametric function plot with colormap from another dataset



Mexican hat



Sea shell



Klein bottle

View more 3D Function Plots at: [originlab.com/3DFunctions](http://originlab.com/3DFunctions)

# Data Management

Origin provides powerful tools for data access and management:

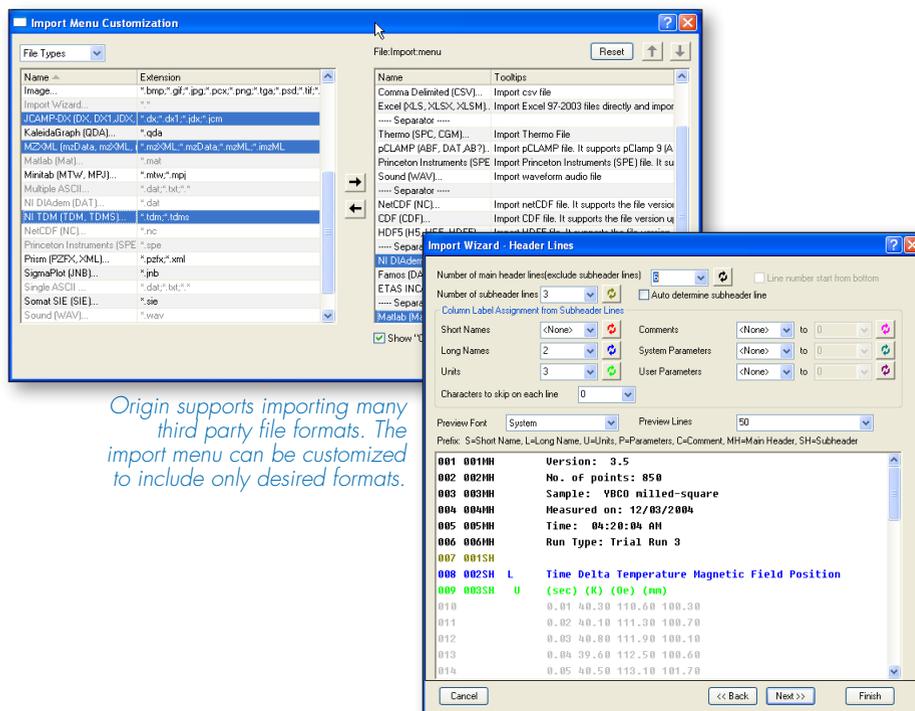
- Import tools for ASCII, EXCEL, Database, and many third-party formats
- Project Explorer with hierarchical folder structure
- Metadata support in worksheets and matrices
- Tools to graphically explore your data
- Tools to filter or manipulate your data

## Import Data

Origin supports importing ASCII, binary, CSV, Excel, as well as many other third party formats.

An Import Wizard is available for customized importing of ASCII files with the ability to extract metadata from header lines.

All import dialogs support saving import settings as a theme or filter, for repeated use.



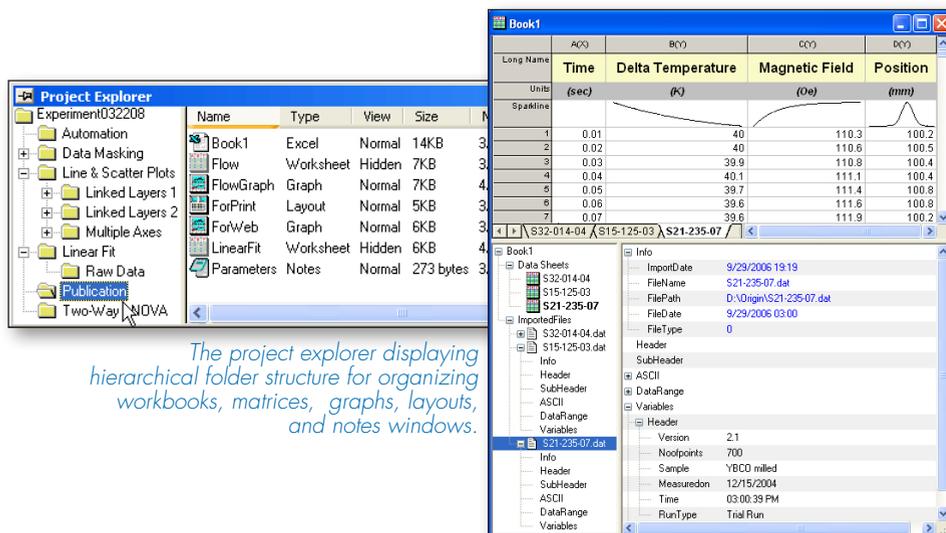
*Origin supports importing many third party file formats. The import menu can be customized to include only desired formats.*

*The Import Wizard can be used to flexibly import files, including extracting header lines, and partial import.*

## Organizing Data

Origin provides an easy, flexible, and hierarchical approach to organize your data:

- The Origin Project file (.OPJ) combines data, notes, graphs, and analysis results in one document with flexible hierarchy for folder structure
- The Project Explorer window allows easy navigation within the project
- Workbooks and Matrices support multiple sheets, and columns/objects, and an organizer panel for additional metadata



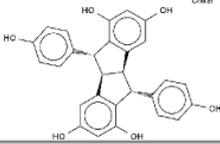
*The project explorer displaying hierarchical folder structure for organizing workbooks, matrices, graphs, layouts, and notes windows.*

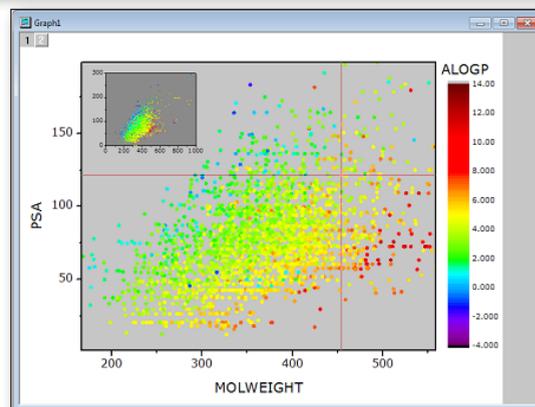
*Workbook with multiple sheets, data columns, sparklines, and organizer panel displaying metadata.*

## Data Info Tool

Origin provides Data Reader and Data Info tools to explore data from a graph.

The Data Info tool can be configured to display related information from other columns in the worksheet, including data or images.

Data Info		
[Book1]ChEMBLBioactivitySearchResults[5494]		
Long Name	Data(Reader)	Molecule Image
MOLWEIGHT	454.47067	
PSA	121.38	
ALOGP	5.197	
JOURNAL	J. Nat. Prod.	
ORGANISM	Homo sapiens	
ASSAY_TYPE	B	
TARGET_TYPE	PROTEIN	

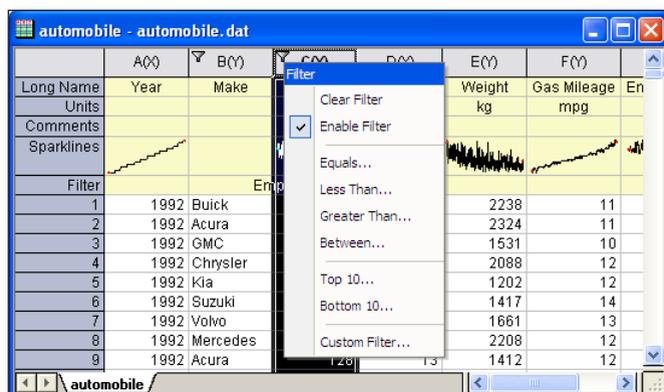


The Data Info tool lets you explore data from your graph, including display of related information from other columns.

## Data Manipulation

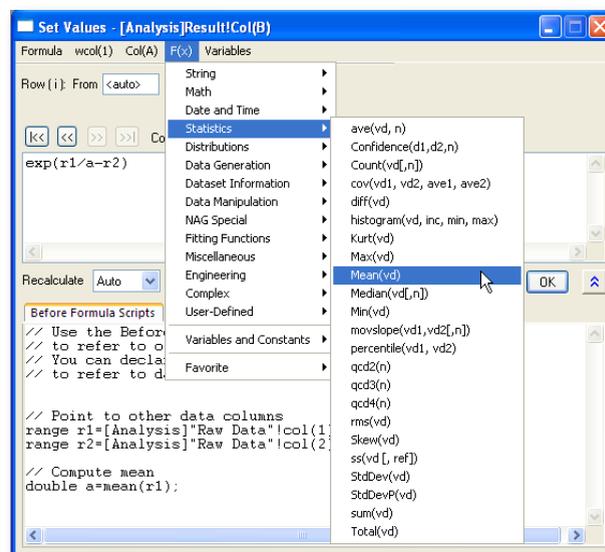
Origin provides multiple tools and menu items to easily manipulate or reduce your data:

- Reorganize data by sorting, splitting, stacking columns, or by constructing pivot tables
- Extract data using queries based on worksheet columns
- Interpolate data with uniform, or custom X values
- Reduce data by applying column filters to text, numeric or date/time data. Rows eliminated by filtering will be excluded from graphing and analysis
- Use Set Values dialog to transform data in columns, compute new column values, or execute LabTalk script for advanced data manipulation



Long Name	Year	Make	Weight (kg)	Gas Mileage (mpg)
1	1992	Buick	2238	11
2	1992	Acura	2324	11
3	1992	GMC	1531	10
4	1992	Chrysler	2088	12
5	1992	Kia	1202	12
6	1992	Suzuki	1417	14
7	1992	Volvo	1661	13
8	1992	Mercedes	2208	12
9	1992	Acura	1412	12

Data Filter capability can be used to hide rows based on filter conditions on columns. Hidden rows are excluded from graphing and analysis.



The 'Set Values' dialog box is shown with the 'Formula' field containing the expression  $\exp(r1/a-r2)$ . The 'Variables' list is expanded, showing a large collection of built-in functions such as `ave(vd, n)`, `Confidence(d1, d2, n)`, `Count(vd, n)`, `cov(vd1, vd2, ave1, ave2)`, `diff(vd)`, `histogram(vd, inc, min, max)`, `Kurt(vd)`, `Max(vd)`, `Mean(vd)`, `Median(vd[,n])`, `Min(vd)`, `movslope(vd1, vd2[,n])`, `percentile(vd1, vd2)`, `qcd2(n)`, `qcd3(n)`, `qcd4(n)`, `rms(vd)`, `Skew(vd)`, `ss(vd [, ref])`, `StdDev(vd)`, `StdDevP(vd)`, `sum(vd)`, and `Total(vd)`.

The Set Column Values dialog offers a large collection of built-in functions, the ability to access other columns, and perform advanced data manipulation, using LabTalk script.

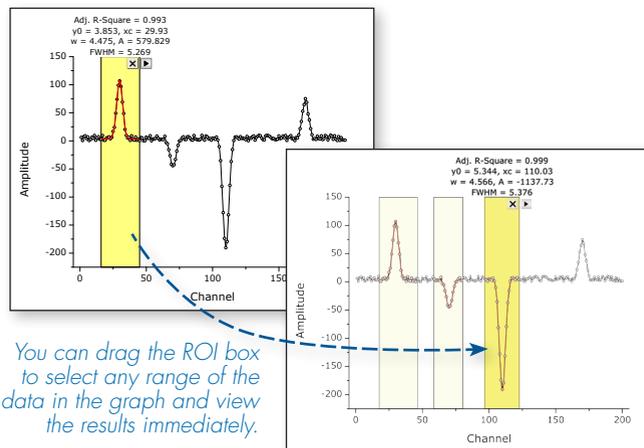
# Gadgets

When your data is plotted in a graph, Origin gadgets provide a quick and easy way to perform exploratory analysis on the graph. Perform the analysis on a specific range of the data plot by appropriately positioning a region-of-interest (ROI) object to select the desired range. The ROI object provides a fly-out menu with various options that are tailored to each specific gadget. All gadgets have a fly-out menu with a Preferences option allowing you to customize desired settings.

With Origin gadgets you can:

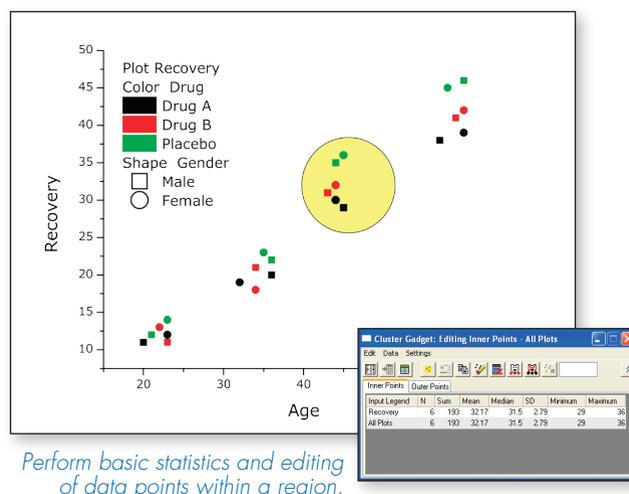
- Select the desired data range for analysis directly from the graph
- Get immediate visual output of results
- View updated results on screen when the ROI is moved or resized
- Customize the output, including appending results to a worksheet for each ROI position
- Save settings as a Theme for repeat use

A selection of the gadgets available in Origin and OriginPro are described below. Please see other sections for additional gadgets.



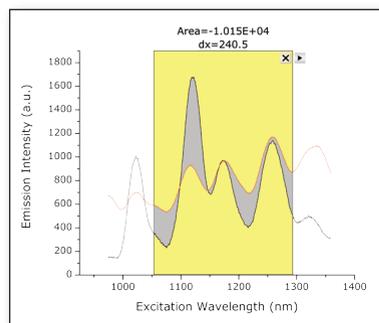
## Cluster PRO

The Cluster Gadget makes it convenient to perform simple statistics on a region of interest (ROI) in a graph. The gadget also allows you to easily edit the data points, such as to clear or mask points. The statistics results are dynamically updated as the ROI object is moved or resized.



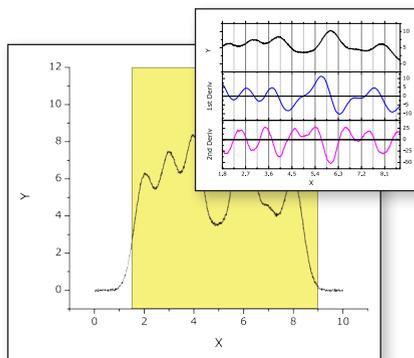
## Integrate, Differentiate, and Interpolate

Origin provides three gadgets for the common tasks of integration, differentiation, and interpolation of your data.



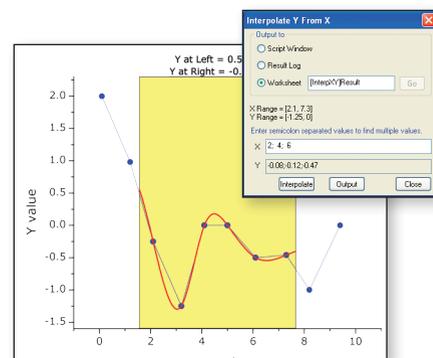
### Integrate Gadget

Simplifies peak area calculations.



### Differentiate Gadget

Lets you specify the desired derivative order and view the result in a separate graph.



### Interpolate Gadget

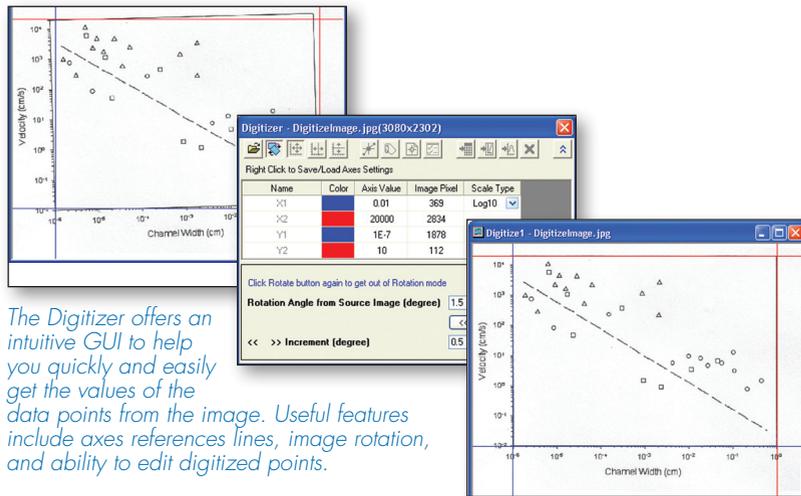
Allows easy up-or-down sampling of existing data and finding desired X/Y values.

## Digitizer

The Digitizer Gadget can extract data from images of graphs such as photocopied, faxed, or scanned images. Easily define coordinate values for the axes, and digitize multiple data curves to create an Origin worksheet and graph.

With this gadget you can:

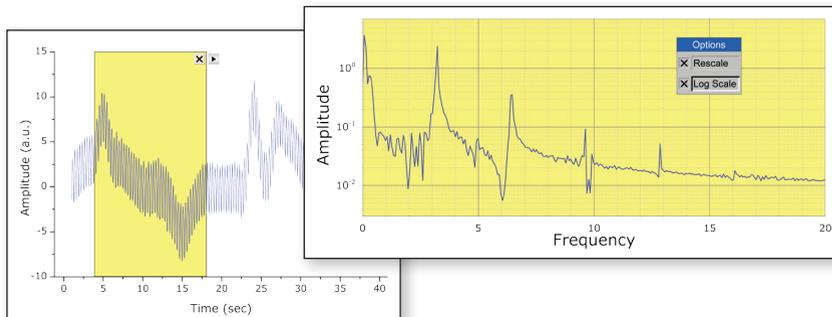
- Digitize an image using an intuitive GUI
- Rotate image
- Define X, Y axes coordinates using movable line
- Use vertical and horizontal reference lines to check accuracy of axes coordinates
- Digitize multiple traces creating multiple data sets
- Add labels for data points



## FFT

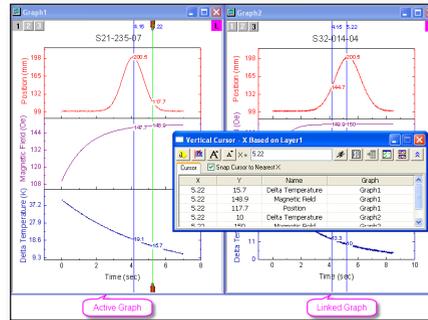
The FFT Gadget provides a simple and quick way to examine the frequency spectrum of data plotted in a graph. The frequency spectrum is displayed in a separate preview graph window, and is dynamically updated as the ROI object is moved or resized.

The Amplitude axis scale of the FFT result graph can be switched between linear and log scales.



## Vertical Cursor

The Vertical Cursor Gadget provides an easy way to read X and Y coordinate values for data points on stacked panel plots and/or multiple linked graphs.



Use vertical cursor for multiple graph windows simultaneously

With this gadget you can:

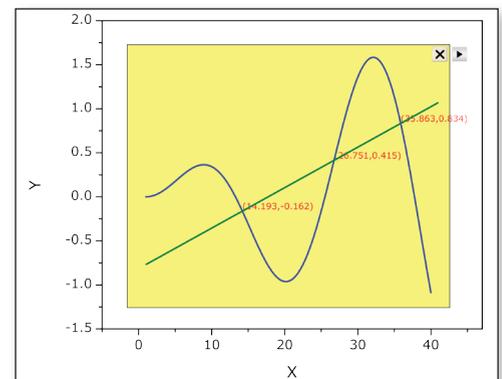
- Link multiple graphs to read coordinates simultaneously
- Drag by the handle, or enter an X value in the dialog, to place on the reference layer
- Tag crossing points on a graph and output the XY values to a worksheet
- Add multiple tags on a graph, labeling each with a unique name
- Select the plots for which to show labels
- Snap to the nearest data point in the X direction

## Intersection

The Intersection Gadget gives you an interactive way to calculate the intersection points of the input curves in the ROI.

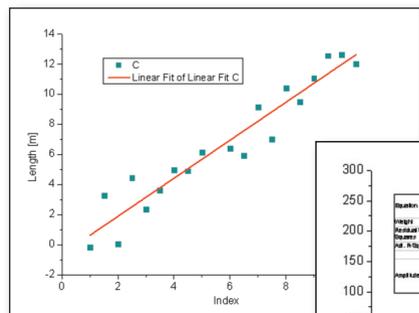
With the intersection gadget you can:

- Find intersection points for more than two curves
- Tag intersection points with symbols and XY values
- Output the XY values of intersection points to a worksheet
- Change input to show intersection points on different curves
- Interpolate the input curves with a specified number of sampling

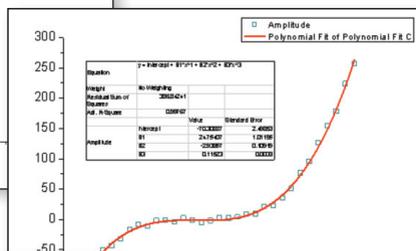


# Curve Fitting

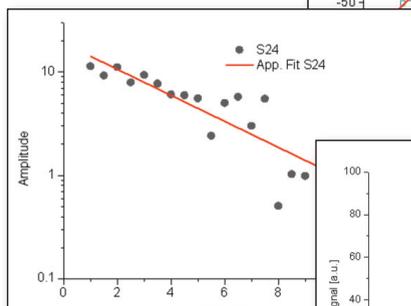
Origin supports linear, polynomial and nonlinear fitting from both worksheets and graphs. Fit only a portion of your data, an entire dataset, or fit multiple datasets simultaneously.



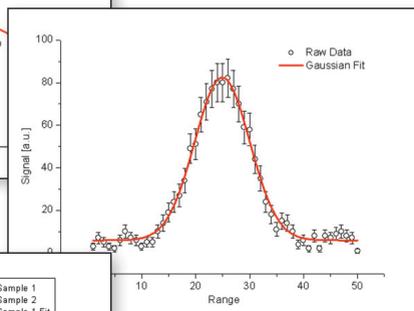
Linear



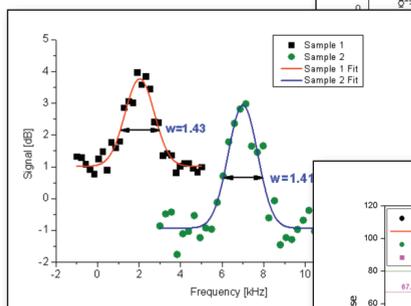
Polynomial



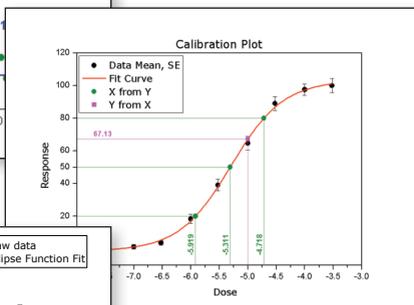
Apparent



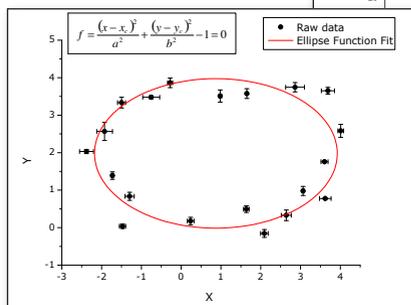
Weighted



Global



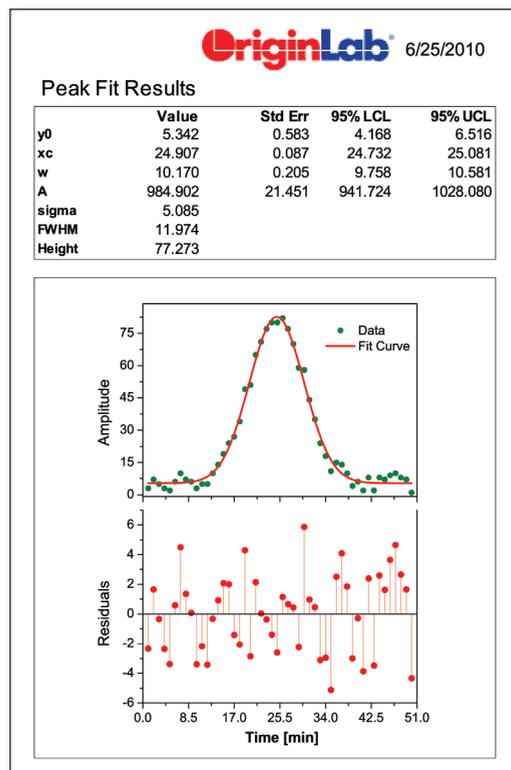
Concatenate/Replicate



Implicit

# Origin provides full control of the fitting process...

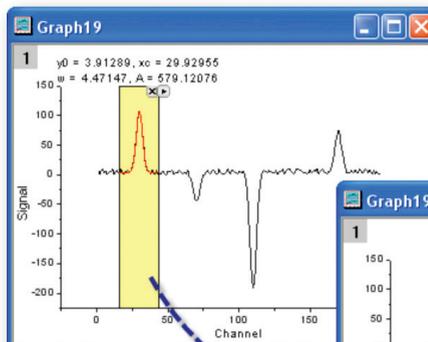
- Flexible data input
- Fit with various built-in functions, including both explicit and implicit
- A wizard for defining custom fitting functions
- Multi-dataset fitting modes: fit multiple datasets independently, in concatenate fit mode, or use a global fit with shared parameters
- Fit statistics and parameters output to the fit report
- Residuals analysis
- Interpolation on the fit curve to compute new X/Y values at desired locations
- Recalculation of your fitting results automatically when data or parameters are changed
- Analysis Templates to save your settings and desired results for repeat use or batch processing



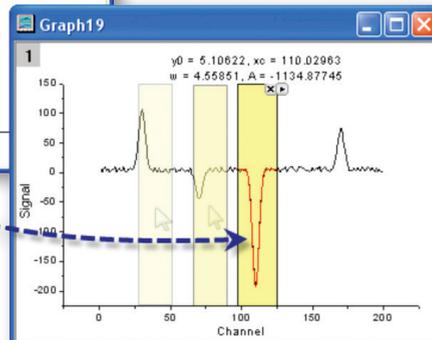
Create a custom fitting report sheet that presents the desired fitting results and related graphs.

## Quick Fit Gadget

Origin provides a simple tool to quickly fit data plotted in a graph. Move or resize a region of interest (ROI) object to update results. Interactively perform fit operations on multiple ranges of the same dataset, or on multiple datasets in the graph.



You can drag the ROI box to fit any sub range of the curve in the graph. Fit results displayed on the graph update immediately.



Fit parameters and other key values can be output directly to the graph or to a worksheet.

	A	B	C	D	E(Y)	F(YEr±)	G(Y)	H(YEr±)	I(Y)	J(YEr±)
Long Name	Function	Input	Range	Weighting	y0	y0-Error	xc	xc-Error	w	w-Error
1	Gauss	Signal	[154:181]	No Weighting	4.56663	0.68765	170.00289	0.0641	4.64227	0.14407
2	Gauss	Signal	[141:168]	No Weighting	5.4106	0.58756	169.1392	1.31362	3.82151	1.20206
3	Gauss	Signal	[96:123]	No Weighting	5.40797	0.56778	110.02963	0.01825	4.56804	0.0409
4	Gauss	Signal	[61:88]	No Weighting	4.32127	0.60784	70.15248	0.07754	4.61447	0.17405
5	Gauss	Signal	[16:43]	No Weighting	3.91289	0.71431	29.92955	0.04407	4.47147	0.09838
6	Gauss	Signal	[157:184]	No Weighting	4.49203	0.65383	170.00288	0.06091	4.6491	0.13693
7										

NL Fit (Gaussian2D)\*

Dialog Theme

Settings | Code | Parameters | Bounds

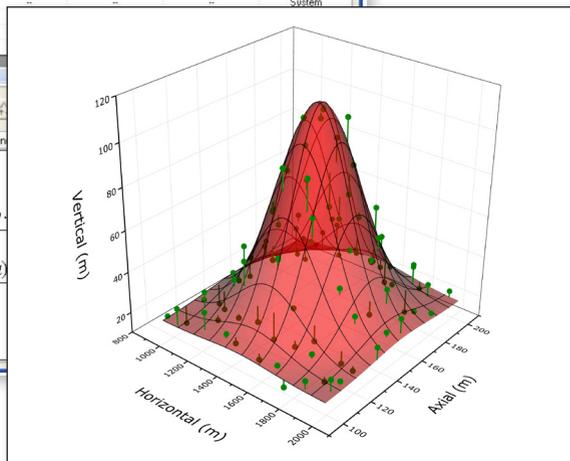
Auto Parameter Initialization

Right click: editable cell for more options

NO.	Param	Meaning	Fixed	Value	Error	Dependency	Lower Conf Limits	Upper Conf Limits	Significant Digits
1	z0	z offset	<input type="checkbox"/>	0.09152	--	--	--	--	System
1	A	height	<input type="checkbox"/>	0.97351	--	--	--	--	System
1	xc	x center	<input checked="" type="checkbox"/>	-0.02041	--	--	--	--	System
1	w1	x width	<input type="checkbox"/>	0.43767	--	--	--	--	System
1	yc	y center	<input type="checkbox"/>	-0.02041	--	--	--	--	System
1	w2	y width	<input checked="" type="checkbox"/>	0.44145	--	--	--	--	System
1	theta	angle	<input type="checkbox"/>	0	--	--	--	--	System

Fit Curve | Residual | Formula | Sample Curve | Messages | Fun

$$z = z0 + A \cdot \exp\left(-\frac{1}{2} \left( \frac{x \cdot \cos(\theta) + y \cdot \sin(\theta)}{w1} - \frac{-x \cdot \sin(\theta) + y \cdot \cos(\theta)}{w2} \right)^2\right)$$



## 3D Surface Fitting PRO

Origin performs 3D surface fitting on XYZ worksheet data and matrix data using one of 19 built-in models or your own custom formula.

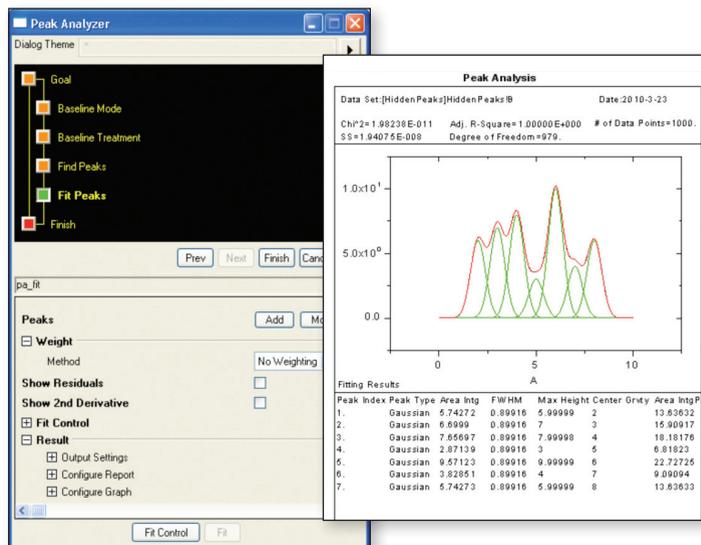
Data points and fit surface are shown together. The fit surface has been made transparent to show more of the data. Drop lines from the data points to the surface have been added.

# Peak Analysis

Origin's Peak Analyzer is a powerful and versatile tool for peak and baseline detection and analysis.

- A wizard guides you through the fitting process
- Find and treat the baseline, find and select peaks, integrate peaks
- Generate a detailed report sheet with tables and relevant graphs
- Generate a worksheet with peak properties, including FWHM, centroid, area, peak index, and y-max

The additional features of peak fitting and baseline fitting described below are only available in OriginPro.

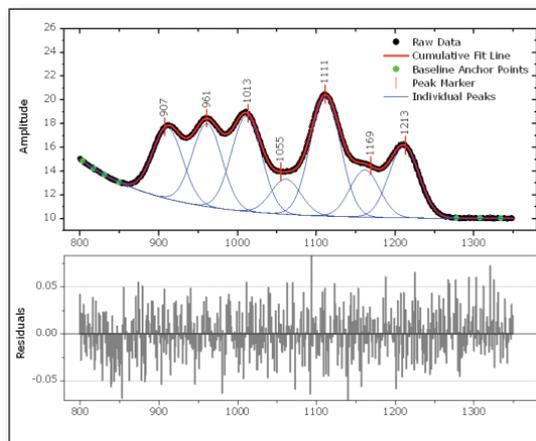


Multi-peak fitting with a detailed report

## Peak Fit Control PRO

When using the Peak Analyzer to fit peaks, many options are available to customize your analysis.

- Add, delete or adjust the position of peaks directly on the graph
- Assign the same fitting function to all peaks, or use different fitting functions for each peak, or group of peaks
- Fix peak parameters to a constant value
- Share parameters across peaks
- Apply bounds and linear constraints to fitting parameters
- Plot residuals and second derivative of the fit curve
- Use over 20 built-in peak functions—including Gauss, Voigt, and Lorentz—or create your own



Control the fitting process directly on the graph

NO.	Peak Type	Param	Meaning	Share	Fixed	Value	Error	Dependency	Significant Digits	Lower Bound
0	Constant	y0	unknown	0	<input checked="" type="checkbox"/>	0.7	0	0	System	--
1	Lorentz	xc_1	center	0	<input type="checkbox"/>	1.00016	0.0362	8.4325E-4	System	--
1	Lorentz	w_1	FWHM	1	<input type="checkbox"/>	0.42666	0.11958	0.63425	System	0
1	Lorentz	A_1	area	2	<input type="checkbox"/>	82.85819	19.63085	0.74389	System	--
2	Gaussian	xc_2	center	0	<input checked="" type="checkbox"/>	4	0	0	System	--
2	Gaussian	A_2	amplitude	0	<input type="checkbox"/>	119.84023	11.9359	0.41196	System	--
2	Gaussian	w_2	FWHM	0	<input type="checkbox"/>	0.75756	0.0836	0.36139	System	0
3	Gaussian	xc_3	center	0	<input type="checkbox"/>	5.98962	333535.65745	0.52358	System	--
3	Gaussian	A_3	amplitude	1	<input type="checkbox"/>	0.42666	0.11958	0.63425	System	0
3	Gaussian	w_3	FWHM	2	<input type="checkbox"/>	82.85819	19.63085	0.74389	System	--

With the Peak Fit Parameters dialog, you have full control of the fitting parameters.

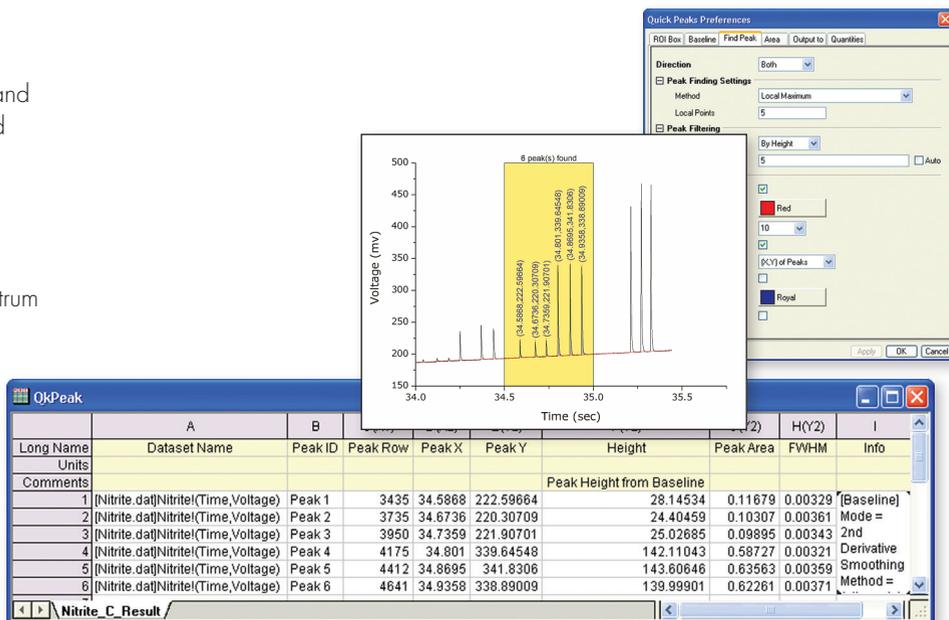
Share a common parameter between peaks, fix the value of any parameter, or apply bounds. Right-click on a parameter value to share it with other peaks in the fitting operation.

## Quick Peaks Gadget

The Quick Peaks Gadget provides a simple and quick way to perform peak analysis of plotted data within a ROI.

With this gadget, you can

- Locate positive and negative peaks
- Define baseline and subtract from the spectrum
- Integrate peaks within base markers
- Perform peak fitting with frequently used functions
- Create a report sheet with parameters from each peak

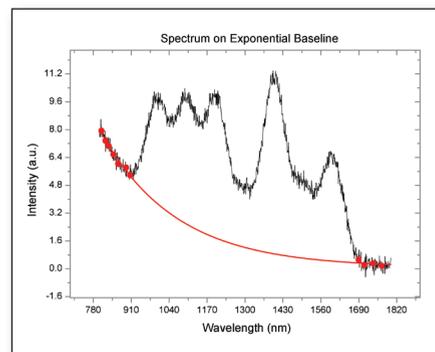


Create baseline, find Peaks, integrate peaks and output results.

## Fitting a Baseline PRO

OriginPro not only fits peaks, but can fit a function to your baseline data as well. The following options allow flexibility in fitting your baseline:

- Select baseline anchor points, or have Origin automatically find them.
- Fit baseline anchor points using a pre-defined fitting function, or create your own.
- Fix the baseline anchor points, or allow them to vary with the peak fit.
- Subtract the baseline prior to fitting peaks.



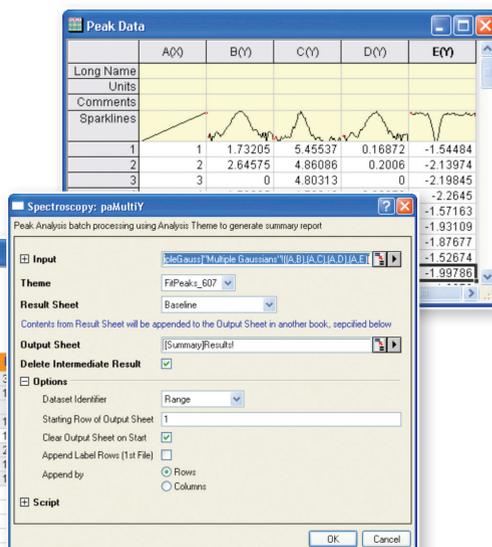
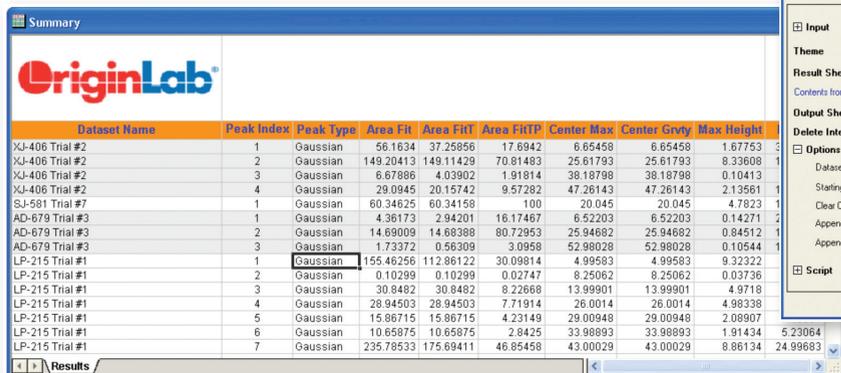
Fit a baseline to an exponential function using anchor points

## Batch Peak Fitting PRO

With batch peak fitting, OriginPro can handle many datasets, each containing multiple peaks.

- Perform batch peak fitting using a pre-defined theme, an analysis template, or script.
- Output a custom report of peak parameters for each peak in each dataset.

Perform peak fitting on multiple datasets using a pre-defined theme; output the results to a customized worksheet



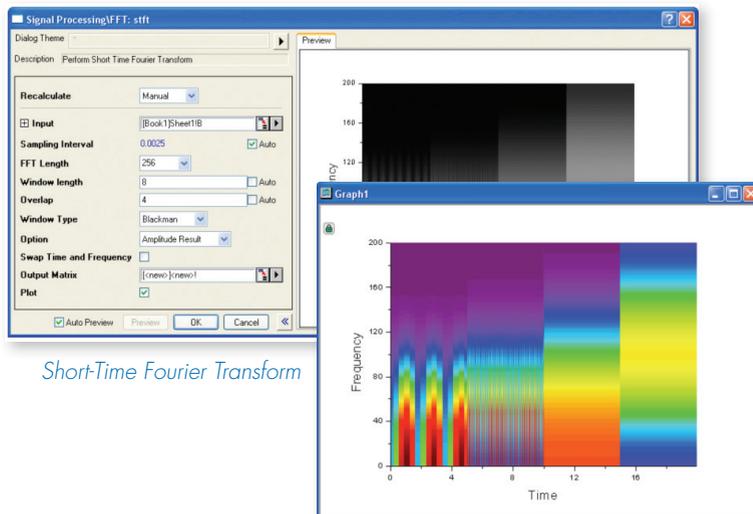
# Signal Processing

Origin provides tools for smoothing and filtering, convolution, correlation, and Fast Fourier Transforms (FFT). OriginPro contains many additional routines for advanced signal processing, which are described in this page.

## Fourier Transform **PRO**

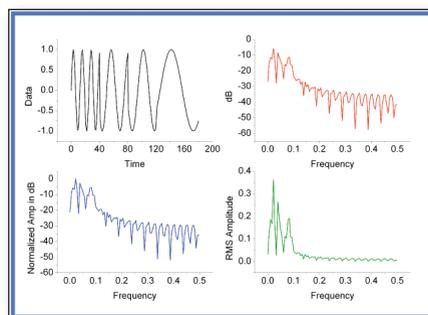
Many additional options for FFT-based analysis are available in OriginPro:

- Advanced features for FFT:
  - Power Density Normalization
  - Spectrum Type, One-sided or Two-sided
  - Output dB of Amplitude
  - Output Normalized dB of Amplitude
  - Output RMS Amplitude
  - Output Square Amplitude
  - Output Square Magnitude
- 2D FFT & 2D Inverse FFT
- Short-Time Fourier Transform



Short-Time Fourier Transform

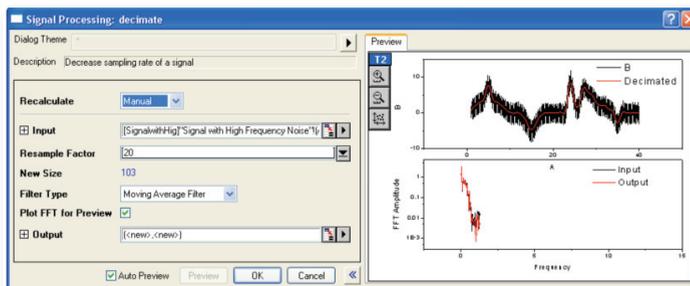
Results of FFT, including original signal and results in frequency domain



## Decimation **PRO**

Decimation is used to reduce the number of elements in an input sequence. Every N samples are merged into one. Two filters are available:

- Moving Average
- Finite Impulse Response (FIR)



Decimation on Signal with High Frequency Noise

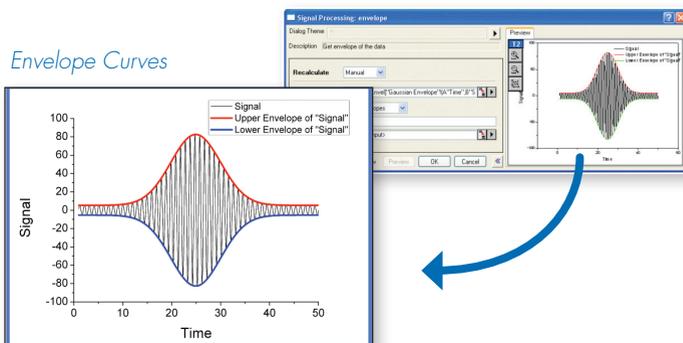
## Coherence **PRO**

Coherence—the degree of linear dependency of two signals—is evaluated by testing whether the signals contain similar frequency components.

## Envelope Curves **PRO**

An envelope curve traces the crests and troughs of a periodic signal.

- Choose upper, lower or both
- Smoothing option during envelope detection



Envelope Curves

## 2D Correlation **PRO**

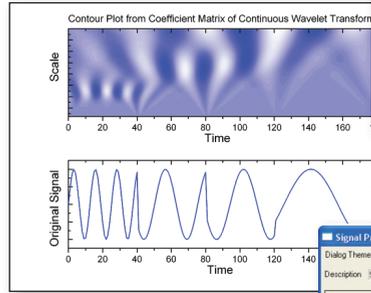
Two methods of 2D correlation are supported:

- FFT
- Shift Accumulation
- Linear Correlation
- Circular Correlation

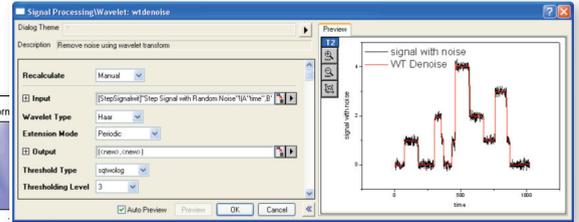
## Wavelet Analysis **PRO**

Wavelet Transforms are used in many applications, including data compression, signal smoothing, noise removal, and image analysis. Wavelet analysis tools include:

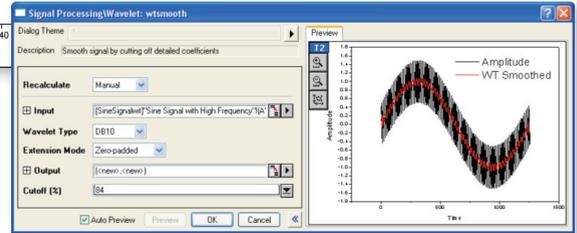
- Continuous Wavelet Transform
- Discrete Wavelet Transform - (Decomposition)
- Inverse Discrete Wavelet Transform - (Reconstruction)
- Multi-Scale Wavelet Decomposition
- Smoothing
- Noise Removal
- 2D Wavelet Decomposition
- 2D Wavelet Reconstruction



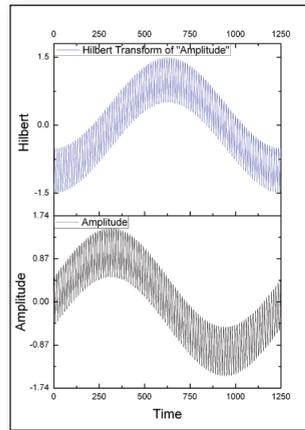
Continuous Wavelet Transform



Remove Noise Using Wavelet Transform



Wavelet Smoothing



Hilbert Transform

## Hilbert Transform **PRO**

The Hilbert Transform of a signal results in a +90 degree shift of the signal's negative frequency components, and a -90 degree phase shift of its positive frequency components. The Hilbert Transform tool will calculate both the Hilbert Transform and the analytic representation of the input signal.

## Rise Time Gadget **PRO**

Three methods of finding the rise/fall time are supported:

- Linear search
- Histogram
- Largest triangle

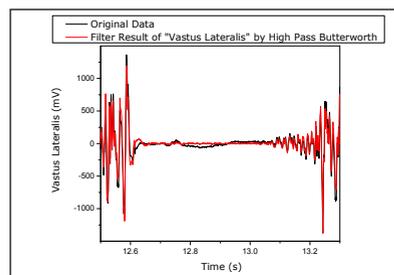
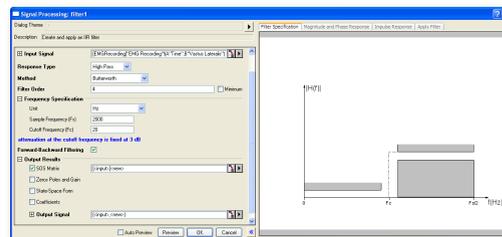
- Select a specific region of the signal by moving and resizing a region of interest (ROI)
- Easily select desired data plot from the graph layer with multiple plots
- Display low and high levels inside the ROI control
- Display rise/fall time and rise/fall range on top of ROI

## IIR Filter **PRO**

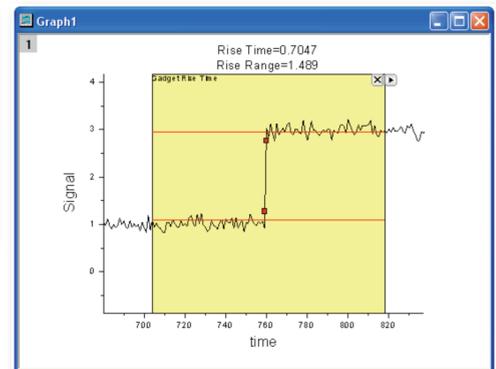
In Origin, you can design, analyze, and implement IIR (Infinite impulse response) digital filters.

Four methods are supported:

- Butterworth
- Chebyshev Type I
- Chebyshev Type II
- Elliptic



IIR Filter Design Dialog and Result



Rise Time Gadget

# Statistics

Origin provides tools for descriptive statistics, 1D and 2D frequency counting, parametric tests, and one-way and two-way ANOVA.

The features presented below are more advanced tools available only in OriginPro.

## Correlation Coefficient **PRO**

Obtain a correlation coefficient, scatter plot and confidence ellipse using the following methods:

- Pearson R
- Spearman R
- Kendall Tau-b

## Discrete Frequency **PRO**

Count categorical data values in a sample and report the relative and cumulative frequencies.

## Parametric Hypothesis Tests **PRO**

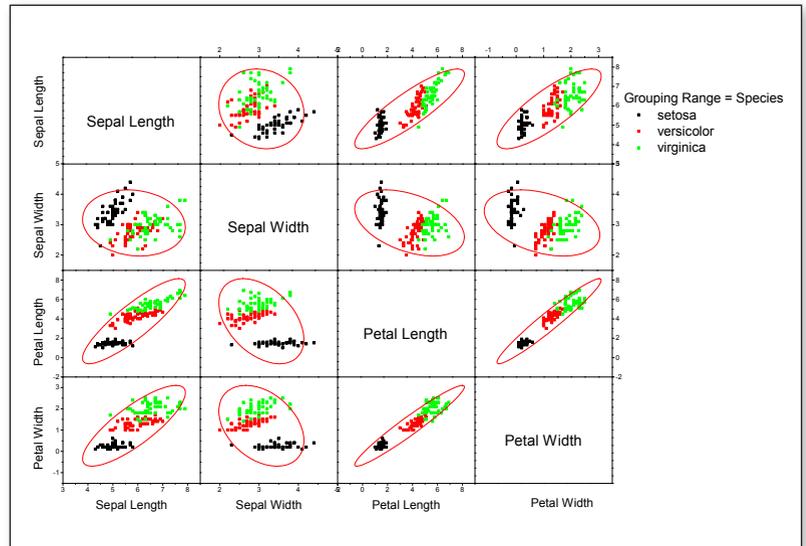
Two additional parametric tests are available:

- One-sample Chi-square test for variance
- Two-sample F-test for variance

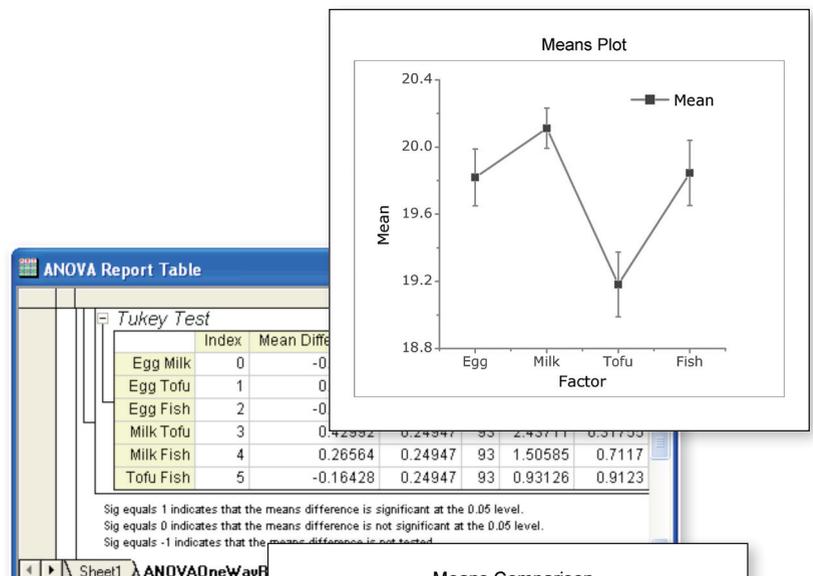
## Repeated Measures ANOVA **PRO**

Eight powerful means-comparison tests, both one-way and two-way:

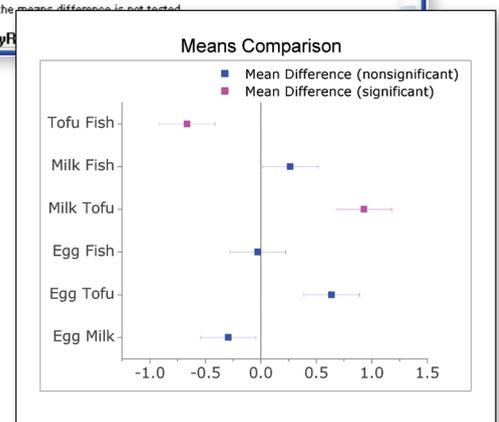
- Tukey
- Bonferroni
- Dunn-Sidak
- Fisher LSD
- Scheffé
- Dunnett
- Holm-Bonferroni
- Holm-Sidak



Scatter matrix plot with confidence ellipse for correlation analysis



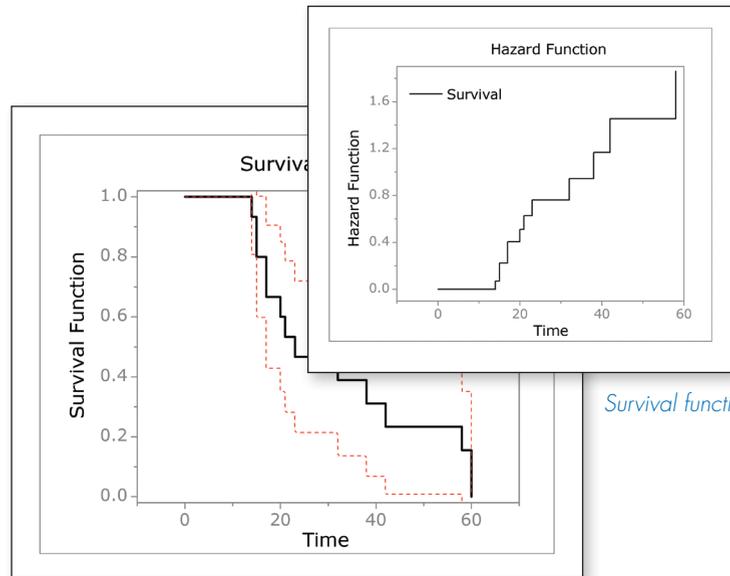
Means-comparison table, means plot, and mean-comparison plot in an ANOVA report



## Nonparametric Tests PRO

Several nonparametric tests are available, including:

- One-Sample Wilcoxon Signed Rank
- Paired-Sample Sign
- Paired-Sample Wilcoxon Signed Rank
- Two-Sample Kolmogorov-Smirnov
- Mann-Whitney
- Kruskal-Wallis ANOVA
- Mood's Median
- Friedman ANOVA

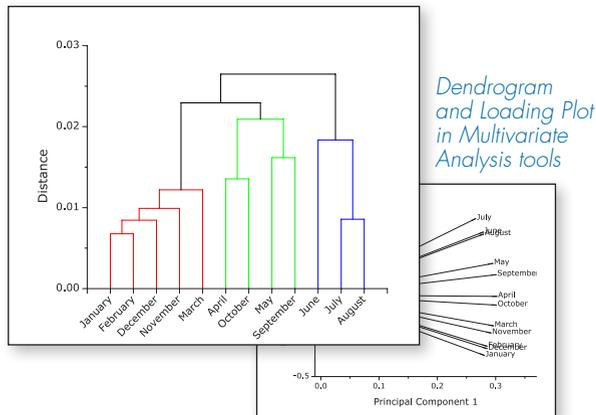


*Survival function plots*

## Multivariate Analysis PRO

Four commonly used multivariate tools are available:

- Principal Component Analysis
- K-Means Cluster
- Hierarchical Cluster
- Discriminant Analysis



*Dendrogram and Loading Plot in Multivariate Analysis tools*

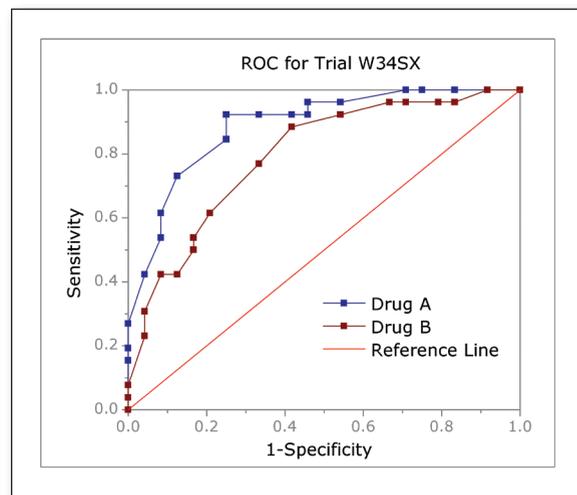
## Survival Analysis PRO

Choose from three widely used survival analysis functions:

- Kaplan-Meier product-limit estimator, with three equality test methods
  - Log-rank
  - Breslow
  - Tarone-Ware
- Cox Proportional Hazards Model
- Weibull Fit Model

## ROC Curves PRO

Create Receiver Operating Characteristic (ROC) Curves, summarizing the trade-off between the false-positive and true positive rates for all possible cutoff value.



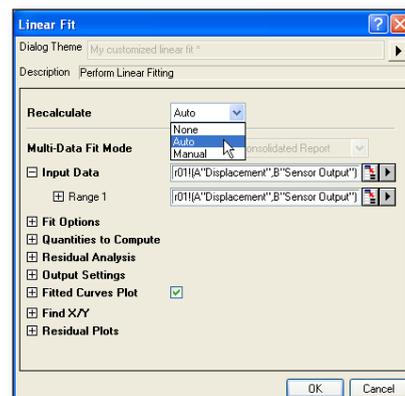
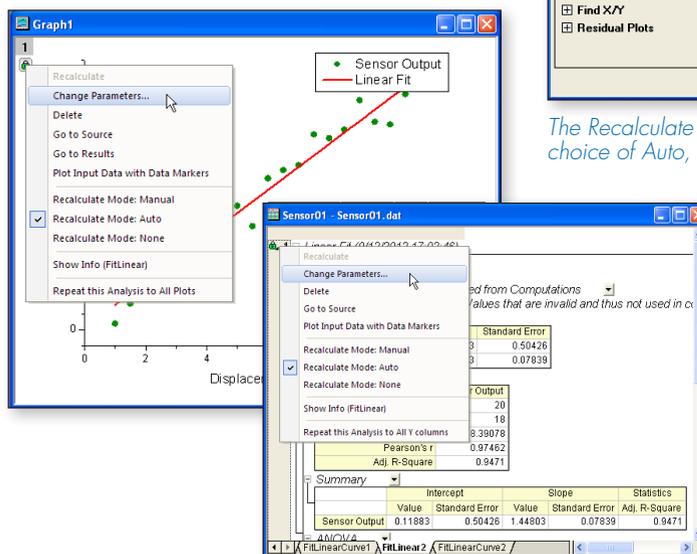
*ROC curve comparing two samples*

# Recalculation of Results

Origin supports automatic or manual recalculation of results from most analysis and data processing operations. This allows you to easily update results when data or analysis parameters are changed, and avoid having to repeat the procedure from the beginning. The output of one operation can be used as input for another, allowing for a chain of operations and their associated results to be updated.

If the recalculate mode is set to Manual instead of Auto, you can decide when to update the results. The update can be done one operation at a time, or for all pending operations in the current Origin project.

All output sheets, columns, and graphs of operations enabled for recalculation are marked with a green lock icon. This icon provides several context menu options, including a Change Parameters option to re-open the dialog with exact same settings used at the time of creating the output. This allows you to make changes to your analysis settings, and update the results and associated graphs.

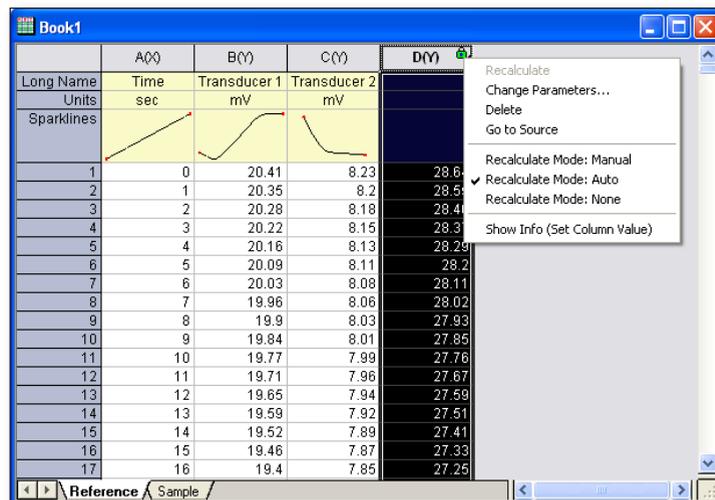


The Recalculate drop-down in dialogs offer choice of Auto, Manual, or None.

The "Change Parameters..." menu item allows you to re-open dialog and change analysis parameters to repeat the analysis.

The output can also be updated by simply changing input data to the operations. This allows you to either import or copy-paste new data, and easily update all results and associated graphs.

The auto update feature also applies to simple operations such as Set Column Values used to compute new columns. Contents of the new columns are updated when either the input data or the column formula is changed.



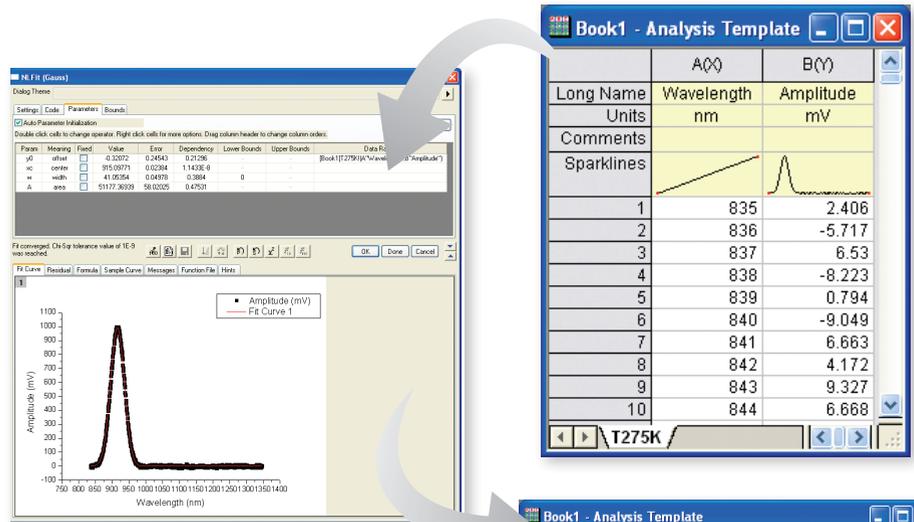
Recalculation can be used with Set Column Values to compute new columns based on raw data. Values in the new columns are updated when raw data or formula is changed.

# Analysis Templates™ and Batch Processing

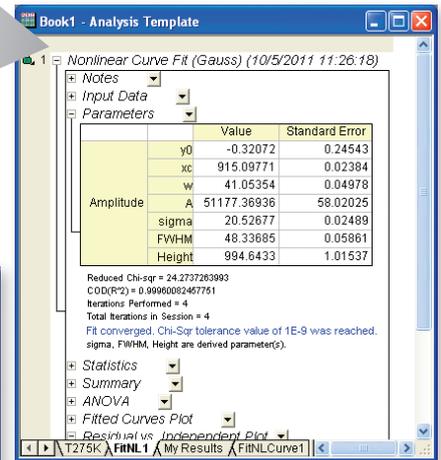
## Analysis Templates™

Origin's ability to recalculate results on parameter or data change, can be used to create Analysis Templates for repeat analysis.

Analysis templates can be a single workbook or an entire Origin project. Import data, perform analysis, and optionally create a custom report sheet combining graphs and results. Save the book or project as an Analysis Template, and then re-use to analyze similar data.



Set up your analysis the way you want. After your initial analysis has completed, just save the workbook as an Analysis Template.

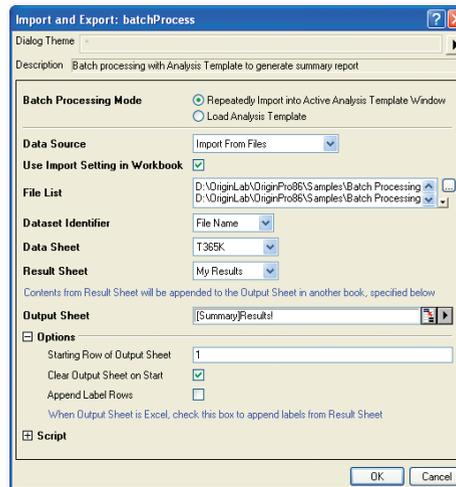


## Batch Processing

The Batch Processing tool allows you to perform repeat analysis on multiple datasets using an existing Analysis Template.

Multiple data files from disk can be processed, or the tool can loop over all (or selected) data already existing in your project.

A summary report can be created, with dataset identification, and desired analysis results for each dataset that was processed.



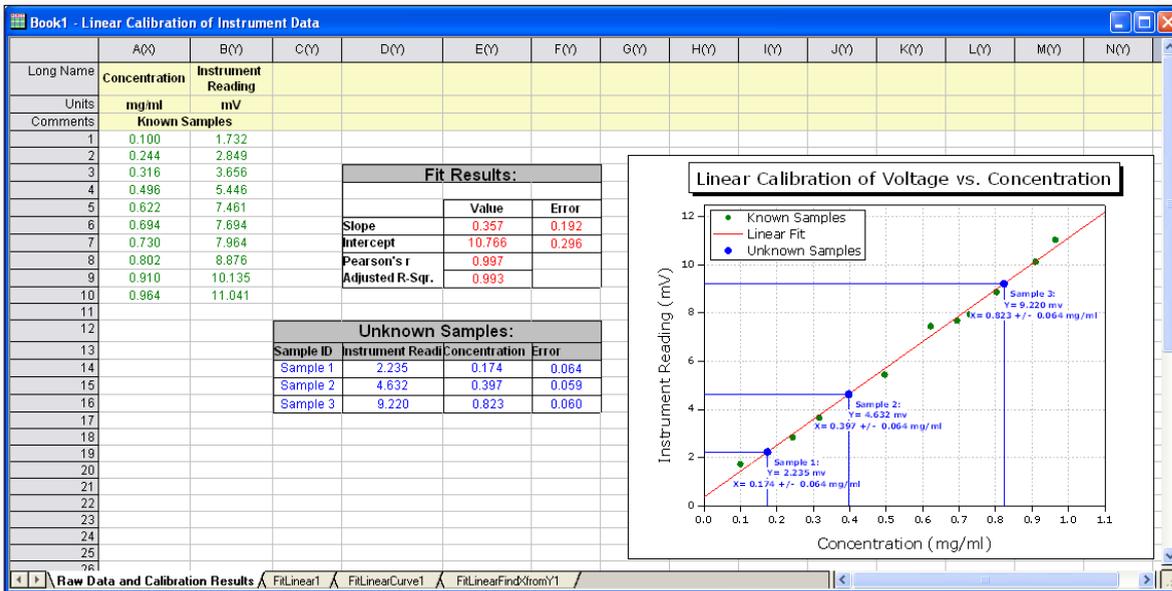
Use your Analysis Template and the Batch Processing dialog to analyze multiple data files or data sets in your project. Create a summary report with data identifier and selected results for each data set.

	A(γ)	B(γ)	C(γ)	D(γ)	E(γ)	F(γ)	G(γ)	H(γ)
Long Name	Dataset	File Name	Peak Center	Peak Width	Peak Width	Peak Width	Peak Area	Peak Height
Comments			w	sigma	FWHM			
1	T275K.csv	T275K.csv	915.09771	41.05354	20.52677	48.33685	51177.36936	994.6433
2	T285K.csv	T285K.csv	945.89011	43.35595	21.67798	51.04773	53294.13629	980.77809
3	T295K.csv	T295K.csv	977.5276	45.96913	22.98456	54.12451	55298.70742	959.81779
4	T305K.csv	T305K.csv	1009.93406	49.0259	24.51295	57.72358	57616.89048	937.70088
5	T315K.csv	T315K.csv	1043.1428	52.16647	26.08323	61.42132	59406.8903	908.6266
6	T325K.csv	T325K.csv	1077.12324	55.89471	27.94735	65.81099	61038.73221	871.31437
7	T335K.csv	T335K.csv	1111.88461	59.74574	29.87287	70.34523	62487.42014	834.49884
8	T345K.csv	T345K.csv	1147.4659	63.93499	31.9675	75.2777	63416.07431	791.40866
9	T355K.csv	T355K.csv	1183.86578	68.57247	34.28623	80.73791	63700.12042	741.19166
10	T365K.csv	T365K.csv	1221.05614	73.40072	36.70036	86.42274	63447.01932	689.68533

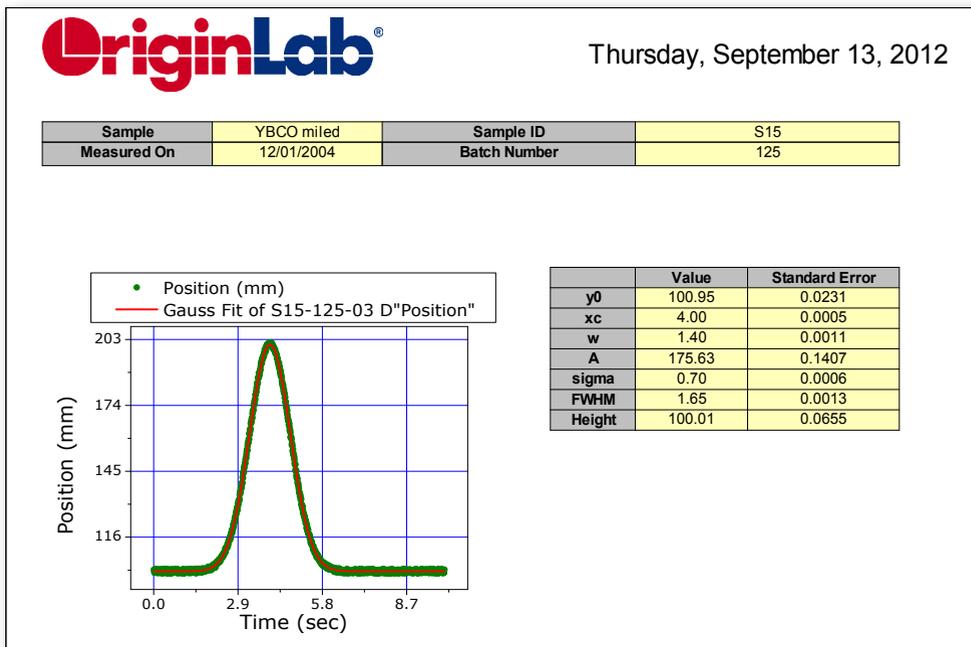
# Custom Reports

Use Origin to perform repetitive analysis and create custom reports without any programming.

Origin's new multi-sheet workbooks allow you to format the appearance of cell contents, merge cells and apply borders and other formatting changes. Further, you can paste-link result values from any analysis results and graphs contained in the book or project, thus creating a custom report sheet. With the ability of automatic recalculation of analysis results, your custom report sheets can become templates for repeated tasks—simply import new raw data and watch your custom report automatically update. When your report is ready, export it as a PDF file or as an image file by choosing a popular image format such as EPS and JPEG.



Include data, analysis results and floating graphs in the custom report sheet, it will automatically update when input data is changed.



Another custom report displaying company logo, date stamp, and meta data values associated with the measurement, in addition to fit results and graph.

# Publishing

Origin provides a number of tools for preparing files for publication and presentation. Graphs, Worksheets, and layout pages can be exported with custom settings for publication. Use Origin's built-in slide show capability to present graphs and layout pages, or send to PowerPoint, or copy-paste into other applications. Export graphs, layouts, and worksheets as vector or raster format for submitting to publications.

## Exporting Graphs

When you have completed your graph for publication, exporting your final results is very easy with Origin.

- Export presentation quality graphs to a wide variety of formats, including both raster and vector format.
- Customize the exporting, to make figures that meet the requirements of publication under a variety of circumstances.
- Export graphs to a Microsoft® PowerPoint Slideshow or send graphs directly to a Microsoft® PowerPoint presentation.

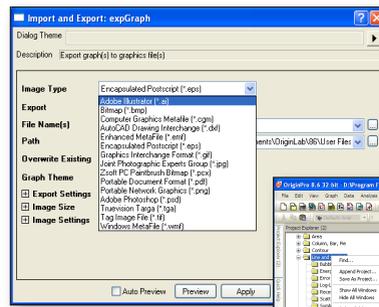
Note that you can also include Origin graphs in other application's files either by pasting or embedding, so that you can later edit these graphs with Origin.

## Creating Movies

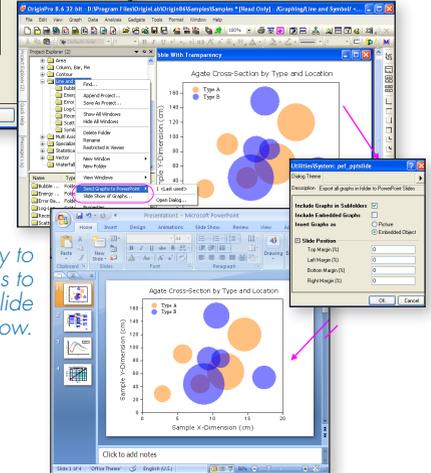
Origin supports creating movies (AVI file format) from any graph window. A simple tool is provided to configure settings such as compression, and then add individual frames to create the movie. The LabTalk and Origin C programming environments can also be used to create movies, allowing users to integrate movie creation as part of their data processing or computing tasks.

## Publishing Custom Reports

Custom reports created by placing numerical results and graphs in an Origin worksheet, can be exported as image files. Vector formats such as PDF and raster formats such as PNG are both supported. Reports that occupy more than one page can be exported as multi-page PDF files.

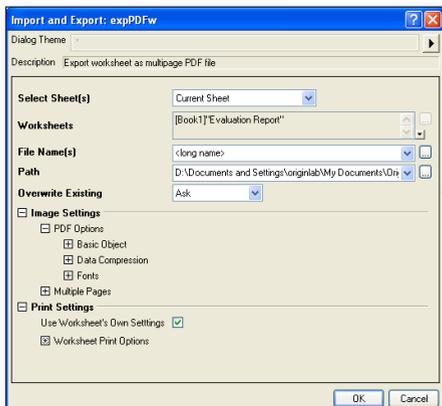
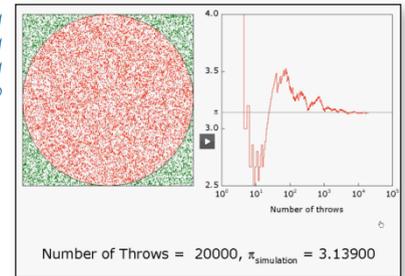


Export graphs or worksheets as raster or vector files. Controls in dialog include page size, resolution, and color depth. Save settings as theme for repeat use.



It is very easy to export graphs to a ppt/pptx slide show.

Movie displaying value of  $\pi$  being computed using Monte Carlo method.



In the export PDF dialog, you may customize the publishing with size, fonts, color translation, multiple page numbering .etc , so that to publish your custom report according to the specific needs.

Laboratory of Biomechanics and Physiology

### EVALUATION REPORT

Ergocycle Force/Velocity Test  
Asymmetry detection + downstroke-upstroke separation

Name: Doe First name: John Date: 18/02/2008  
Age: 25 yrs Height: 180 cm Weight (kg): 75  
Specialty: kilometer Best time (200m):  
Mean Velocity: ~ km/hr Mean Pedaling Rate: ~ rpm

#### SEATED POSITION EXERCISE

##### Anthropometrics Data

4 skin folds method, Durnin and Womersley (1974) - Harpenden Skinfold Caliper

Sum of skin folds (mm) : 30.2 Total leg volume (litre) : 7.9  
Percentage of body fat (%) : 19.6 Maximal thigh circumference (cm) : 49

Sum of leg skin folds (mm) : 63.5  
Lean leg volume\* (litre) : 5.5  
\*without knee

#### Global Force-Velocity Results

Load Excalibur ergocycle (strain gauges in cranks). 3 sprints of 5 to 7 s : 2 sprints with high and medium resistance, 1 flying start sprint 70 rpm without resistance

##### Force-Velocity Relationship

##### Power-Velocity Relationship

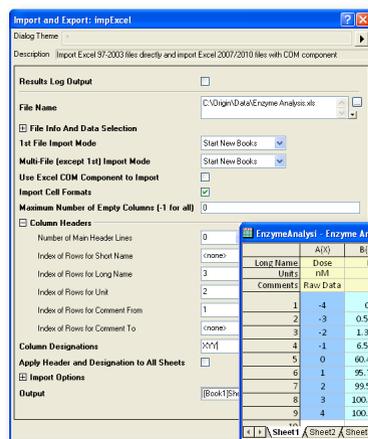
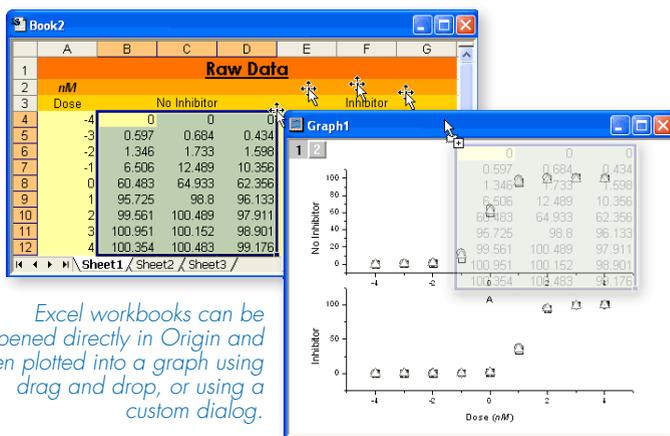
Individual results						
Vmax (rpm)	Fmax (N)	Fmax (N/kg)	Vopt (rpm)	Pmax (W)	Pmax (W/kg)	Pmax Peak (W)
245	1467	19.6	122	1608	21.4	1670
INSEP group mean						
255	1289	16.3	127	1457	18.7	1513

Vmax: Maximal theoretical velocity (rpm)      Vopt: Optimal velocity (corresponding to Pmax)  
Fmax: Maximal theoretical force (N)          Pmax: Maximal theoretical power (W)  
Pmax/Wkg: Relative maximal power (W/kg)      PmaxPeak: Mean of the three highest measured powers (W)

# Working with Excel®

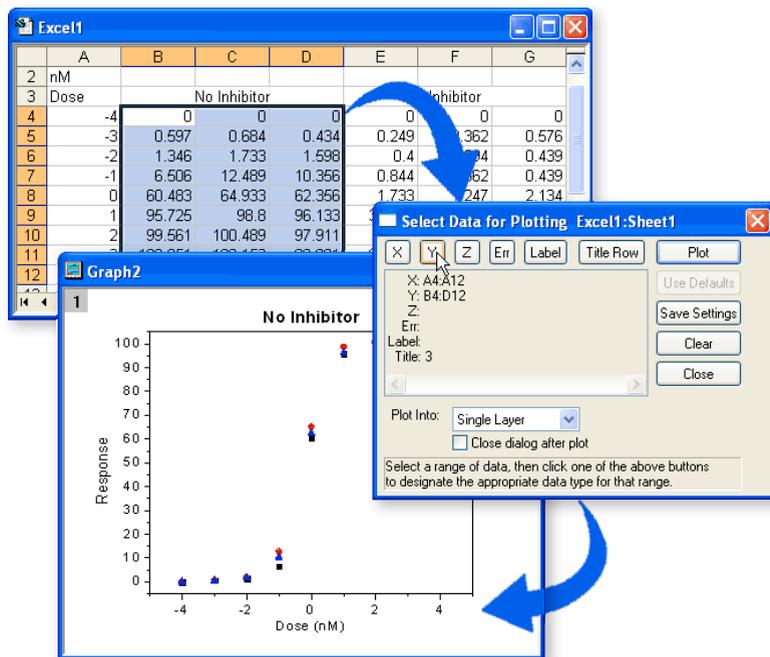
Origin provides easy access to your Excel data:

- Copy-paste data from Excel to Origin with full precision
- Import Excel files into Origin worksheets keeping cell formatting and specifying header rows
- Open Excel workbooks directly in Origin
- Optionally save Excel workbooks open in Origin with path relative to the Origin Project (OPJ) file, for easy sharing of OPJ and related Excel files.

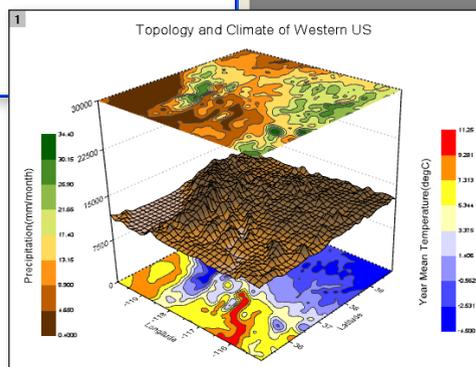
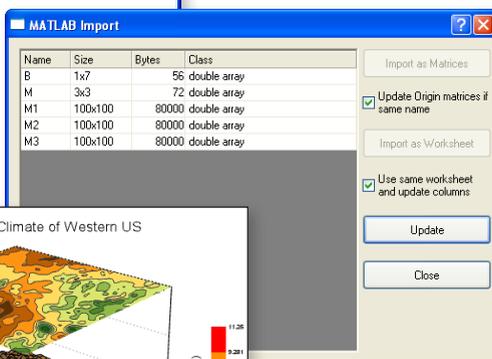
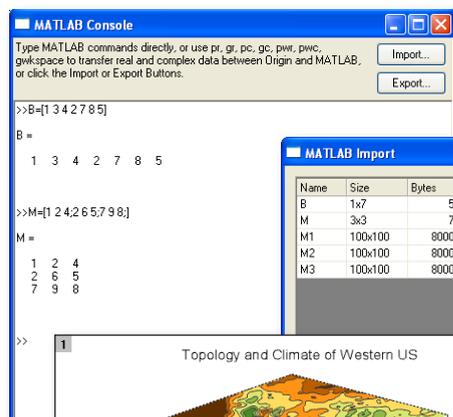


Importing Excel Files, keeping cell formatting, and specifying which rows to treat as header.

Long Name	Dose (nM)	No Inhibitor			Inhibitor		
Raw Data							
1	-4	0	0	0	0	0	0
2	-3	0.597	0.684	0.434	0.249	0.362	0.576
3	-2	1.346	1.733	1.598	0.4	0.394	0.439
4	-1	6.506	12.489	10.356	0.844	0.362	0.439
5	0	60.483	64.933	62.356	1.733	1.247	2.134
6	1	95.725	98.8	96.133	34.622	97.911	95.68
7	2	99.561	100.489	97.911	94	94.059	94.833
8	3	100.951	100.152	98.901	99.244	99.136	98.758
9	4	100.354	100.483	99.176	100.601	99.841	99.561



# MATLAB® Connectivity



## Importing MATLAB® Files

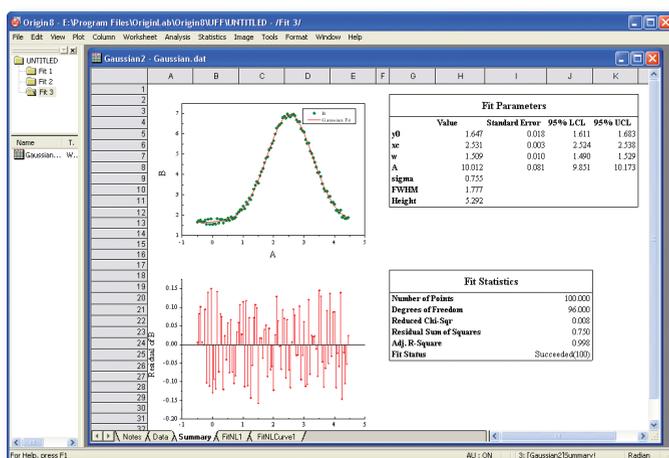
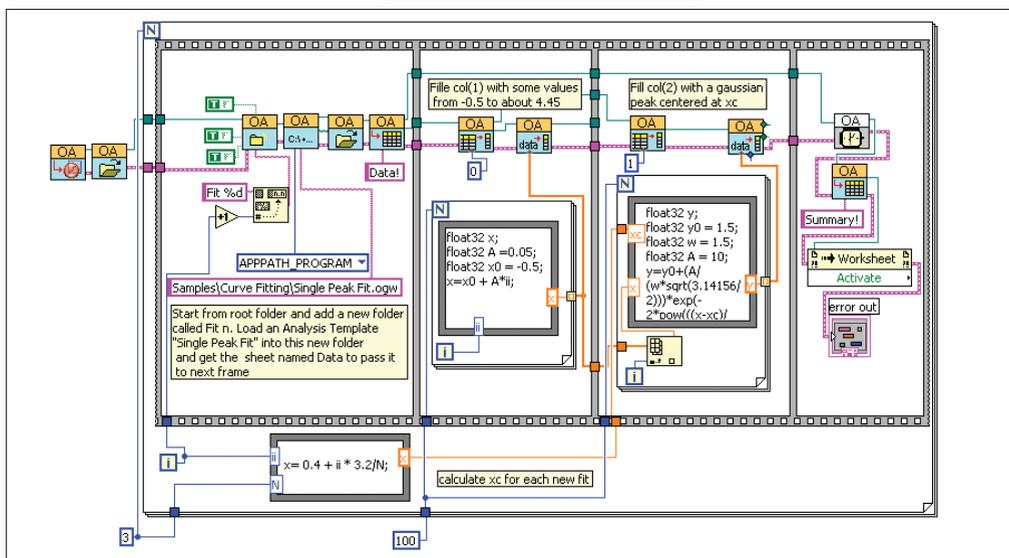
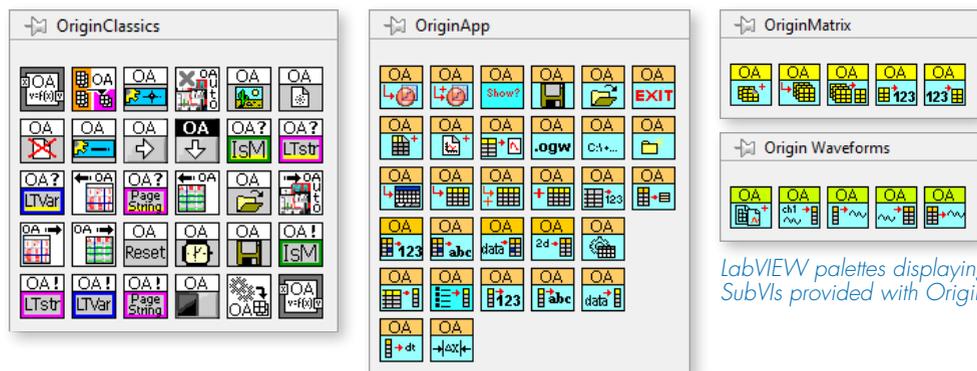
Origin offers a dialog for importing MATLAB (.mat) files into Origin worksheets and matrices. This import functionality does not require MATLAB to be installed.

## MATLAB® Console

If you have MATLAB installed, you can use the Console tool to issue MATLAB commands from within Origin. Buttons and commands are also provided to transfer data from the MATLAB workspace to Origin, and to create MATLAB variables from data in Origin worksheet and matrices.

# LabVIEW™ Connectivity

Origin provides a collection of custom LabVIEW sub-VIs that are included in the installation. LabVIEW users can incorporate these custom sub-VIs in their main LabVIEW application to communicate seamlessly with Origin. These sub-VIs take advantage of Origin's automation server classes and can be used for operations such as opening and closing communication with Origin, exchanging data between Origin and LabVIEW, and sending commands to Origin.



The VI diagram above demonstrates an example of how to perform batch analysis of multiple datasets using an Analysis Template in Origin.

In this example, the experimental data has been fitted to a Gaussian curve. The fitted curve, residuals and fit statistics are presented in a user-created report sheet.

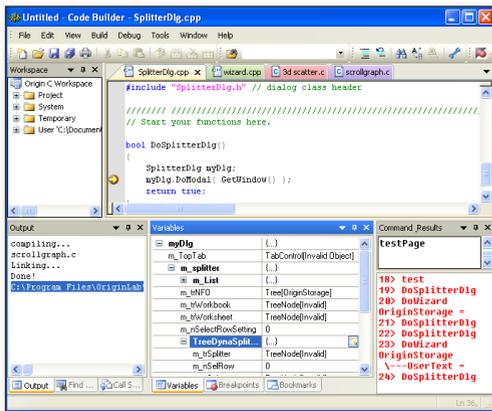
Once the VI has executed, the Origin project will have separate subfolders for each dataset. Within each subfolder the Analysis Template will contain the raw data, the analysis results, and the custom report sheet ready for printing or exporting.

# Programming

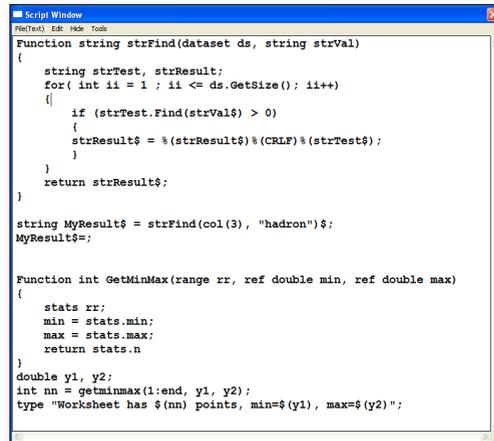
As your Origin use expands, you may want to programmatically access existing features in Origin, or add your own custom routines and tools, or communicate with Origin from other applications. To facilitate such customization, Origin provides the following programming options:

## LabTalk

LabTalk is a scripting language native to Origin. For simple customization such as automating tasks, LabTalk is a good place to start. You can access a rich set of existing script commands and functions, including a large collection of X-Functions, to create script routines for your specific needs. Your custom script code can be easily assigned to new toolbar buttons or custom menu items.



Code Builder displaying Origin C code



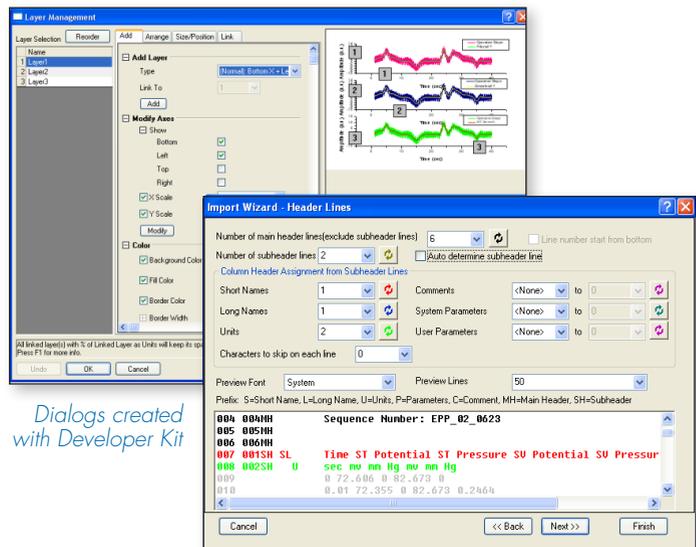
Script Window displaying LabTalk Script

## Origin C

Origin C is an ANSI C compatible programming language, which also utilizes elements of C++ and C#. In addition to accessing all graphing and analysis features present in Origin, you can also access external DLLs and the NAG Library. Custom resource DLLs such as dialogs and wizards created using external compilers can also be accessed in Origin C.

## Developer Kit

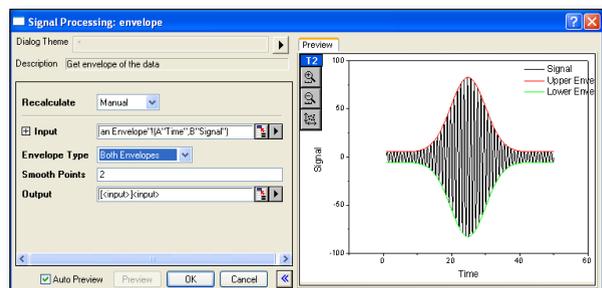
The Developer Kit is a built-in capability in Origin, allowing you to access complex dialog boxes, floating tools and wizard resources created using external compilers such as Microsoft Visual C++. Resource elements can then be accessed and controlled from Origin C. Custom tools can be packaged with associated files using Origin's Package Manager tool. End user can simply drag and drop the package in Origin to add the customization.



Dialogs created with Developer Kit

## X-Functions

X-Functions provide a framework for building custom tools in Origin. Simply define what controls you want in your dialog and Origin will create the tool from your definition. You can focus on the actual data processing task by providing Origin C code to be run by your tool. Once an X-Function is created, it can be placed in the Origin menu, accessed from LabTalk script, and shared with other Origin users.



*X-Function dialog with preview panel*



*Wizard created with X-Functions*

## Automation Server

Origin can be accessed as an automation server from client applications such as LabVIEW, Excel, MATLAB, and custom tools built using Visual Basic or Visual C++ .NET. Data can be streamed into Origin, and tools in Origin such as Gadgets can be used on the graphed data to perform online analysis. Post analysis of data can also be performed by pushing data into Analysis Templates.

### OEM

Origin OEM is available to vendors who want to package it with their own products. Origin OEM can either be directly bundled with your products or it can be customized to meet your specific data analysis and graphing needs.

### Consulting Service

OriginLab provides consulting services to customize and enhance Origin to meet your specific analysis and graphing needs. Our Applications engineers will work with you to design and implement your custom Origin solution.

### Training

Our training programs range from basic training that helps you get started with our products, to advanced training that teaches you how to customize our products to meet your special needs. All training courses are hands-on, providing attendees with the information and expertise to make optimum use of our products.

# Comparison of Origin and OriginPro

OriginPro provides all of the features of Origin, plus additional analysis tools and capabilities. The following tables provide comparisons between Origin and OriginPro in such areas as curve fitting, peak analysis, statistics, signal analysis, and image handling.\*

CURVE FITTING		Origin	OriginPro
Linear and Polynomial Fitting	Linear Regression	✓	✓
	Linear Fit with X Error		✓
	Confidence Ellipse for Linear Fit	✓	✓
	Polynomial Regression	✓	✓
	Multiple Linear Regression	✓	✓
	Partial Leverage Plots in Multiple Regression	✓	✓
	Residual Analysis	✓	✓
Nonlinear Fitting	Fitting Multiple Datasets	✓	✓
	Built-in Fitting Function and User-defined Fitting Function	✓	✓
	Parameter Initialization and Derived Parameter Definition	✓	✓
	Bounds and Constraints	✓	✓
	Weighted Fitting	✓	✓
	Fitting with Error	✓	✓
	Global Fit with Parameter Sharing	✓	✓
	Fitting Replica Data	✓	✓
	Residual Analysis	✓	✓
	Orthogonal Regression for Implicit Functions		✓
	Fitting Comparison		✓
	Surface Fitting		✓
MATHEMATICS		Origin	OriginPro
Simple Mathematics Operations	Simple Mathematics Operations on or Between Datasets	✓	✓
	Set Column or Matrix Values by Using Mathematics Operations	✓	✓
	Normalization	✓	✓
Interpolation and Extrapolation	1D Interpolation and Extrapolation	✓	✓
	Interpolation and Extrapolation of Y From X	✓	✓
	Trace Interpolation on XY Data		✓
	Trace Interpolation on XYZ Data	✓	✓
	2D Interpolation and Extrapolation		✓
	3D Interpolation		✓
Differentiation and Integration	Numerical Differentiation	✓	✓
	1D Numerical Integration	✓	✓
	2D Volume Integration		✓
Area Calculation	Polygon Area	✓	✓
	XYZ Surface Area		✓
	Matrix Surface Area		✓
Others	Average Multiple Curves	✓	✓
	Inverse of a Matrix	✓	✓

STATISTICS		Origin	OriginPro	
Descriptive Statistics	Basic Descriptive Statistics	✓	✓	
	1D and 2D Frequency Counts	✓	✓	
	Correlation Coefficient		✓	
	Discrete Frequency		✓	
	Normality Test (Shapiro-Wilk, Lilliefors, Kolmogorov-Smirnov, Anderson-Darling, D'Agostino-K Squared, Chen-Shapiro)	✓	✓	
	Normality Test (Lilliefors, Kolmogorov-Smirnov)		✓	
	Statistics Charts: Histogram, Box Chart, Scatter Matrix, QC Chart, Probability Plot, Q-Q Plot, and Pareto Chart	✓	✓	
	Grubbs Test and Q-test to Detect Outliers	✓	✓	
	Hypothesis Testing	One Sample and Two-Sample t-Test, Pair-Sample t-Test	✓	✓
		One Sample and Two Sample Hypothesis Tests for Variance		✓
Welch Corrected t-Test		✓	✓	
Analysis of Variance	One Way ANOVA, Two Way ANOVA	✓	✓	
	ANOVA: Mean Comparison (Tukey, Bonferroni, Scheffe)	✓	✓	
	One Way and Two Way Repeated Measure ANOVA		✓	
	ANOVA: Mean Comparison (Dunn-Sidak, Fisher LSD, Holm-Bonferroni, Holm-Sidak)	✓	✓	
Nonparametric Tests	Sign Test		✓	
	Wilcoxon Test for One Sample and Paired Sample		✓	
	Two Sample Kolmogorov-Smirnov Test		✓	
	Mann-Whitney Test		✓	
	Kruskal-Wallis ANOVA		✓	
	Mood's Median Test		✓	
	Friedman ANOVA		✓	
Multivariate Analysis	Principal Component Analysis		✓	
	Cluster Analysis		✓	
	Discriminant Analysis		✓	
	Canonical Discriminant Analysis		✓	
Survival Analysis	Kaplan-Meier Estimator		✓	
	Test Equality of Survival Functions (Log-Rank, Breslow and Tarone-Ware)		✓	
	Cox Proportional Hazard Model		✓	
	Weibull Fit		✓	
Power and Sample Size	One, Two and Paired-Sample t-Test, One Way ANOVA		✓	
ROC Curve	ROC Curve		✓	
PEAK ANALYSIS		Origin	OriginPro	
Peak Analysis	Baseline Detection	✓	✓	
	Baseline Subtraction	✓	✓	
	Peak Finding	✓	✓	
	Peak Integration	✓	✓	
	Peak Fitting	✓	✓	
	Fit Baseline with Peaks		✓	
	Fit Individual Peaks with Different Fitting Functions		✓	
	Batch Peak Analysis		✓	

SIGNAL ANALYSIS		Origin	OriginPro
Smoothing and Filtering	Smoothing using Savitzky-Golay Filter, Adjacent Averaging, FFT Filter, and Percentile Filter	✓	✓
	FFT Filters: Low Pass, Low Pass Parabolic, High Pass, Band Pass, Band Block, and Threshold	✓	✓
	IIR Filter Design		✓
Fast Fourier Transform (FFT)	FFT	✓	✓
	2D FFT and 2D FFT Basic Filtering		✓
	Short-Time Fourier Transform (STFT)		✓
Wavelet Analysis	Discrete Wavelet Transform (DWT) and Inverse Discrete Wavelet Transform (IDWT)		✓
	Wavelet Smoothing		✓
	Wavelet Denoising		✓
	Continuous Wavelet Transform (CWT)		✓
	Evaluation of Continuous Wavelet Function		✓
Others	Convolution and Deconvolution	✓	✓
	Coherence		✓
	1D Correlation	✓	✓
	2D Correlation		✓
	Hilbert Transform		✓
	Signal Envelope		✓
	Signal Decimation		✓
	Rise and Fall Time Analysis		✓
DATA MANIPULATION		Origin	OriginPro
Reorganization	Sort Worksheet or Columns	✓	✓
	Stack and Unstack Columns	✓	✓
	Pivot Table	✓	✓
	Split Worksheet	✓	✓
Transformation	Converting XYZ Data to a Matrix	✓	✓
	Transpose Worksheet or Matrix	✓	✓
	Shrink or Expand a Matrix	✓	✓
Extraction and Reduction	Worksheet Query	✓	✓
	Reduce Duplicate X Data	✓	✓
	Reduce Data by Skipping Every N Points	✓	✓
	Reduce Data to Evenly Spaced X		✓
	Reduce XY Data by Group		✓
Others	Find and Replace Numeric and Text Values	✓	✓
	Translate Curve Vertically or Horizontally	✓	✓
	Excel-Like Data Filtering		✓

IMAGE HANDLING		Origin	OriginPro
Image Adjustments	Brightness	✓	✓
	Contrast	✓	✓
	Gamma	✓	✓
	Hue	✓	✓
	Invert	✓	✓
	Saturation	✓	✓
	Histogram Contrast	✓	✓
	Histogram Equalization	✓	✓
	Auto Leveling	✓	✓
	Color Level	✓	✓
	Function Look Up Table		✓
	Leveling		✓
	Balance	✓	✓
	Color Replace	✓	✓
Arithmetic Transforms	Alpha Blend		✓
	Extract to XYZ		✓
	Image Simple Math		✓
	Math Function		✓
	Morphological Filter		✓
	Pixel Logic		✓
	Replace Background		✓
	Subtract Background		✓
Subtract Interpolated Background		✓	
Image Conversion	Convert Image to Data	✓	✓
	Convert Color Image to Grayscale	✓	✓
	Convert Data to Image	✓	✓
	Binary and Auto Binary	✓	✓
	Dynamic Binary		✓
	Threshold		✓
	RGB Merge / RGB Split		✓
	Image Scale		✓
	Image Palette	✓	✓
	Geometric Transforms	Auto Trim Image	✓
Crop Image		✓	✓
Flip Image Horizontally or Vertically		✓	✓
Offset Image		✓	✓
Resize Image		✓	✓
Image Rotation		✓	✓
Shear Image		✓	✓
Average Filter, Gaussian Filter, and Median Filter		✓	✓
Spatial Filters	Add Random Noise to Image	✓	✓
	Edge Detection	✓	✓
	Increase or Decrease Image Sharpness	✓	✓
	Apply Unsharp Mask	✓	✓
	User-Defined Spatial Filter		✓

\*To view the complete list of comparison tables go to: [originlab.com/ProductComparison](https://originlab.com/ProductComparison)

# Reasons to Upgrade

Use the following tables to check what new features have been added to Origin, compared to your version. \*\*

ORIGIN INTERFACE	9	8.6	8.5*	8.1	8	7.5
Floating Graphs in Worksheet	✓					
Much Faster Performance of Plotting and Editing	✓					
Native 64-Bit and 32-Bit Application	✓	✓				
Auto-Hide Project Explorer Window and Other Dockable Windows	✓	✓				
New Message Log Window	✓	✓				
Excel-Style Horizontal and Vertical Dividers to Split Worksheet	✓	✓	✓			
Zoom and Pan on Graphs, Worksheets, Matrices and Layouts	✓	✓	✓			
Embed and Edit Microsoft Word, Excel and Equation Objects Inside Graphs and Layouts	✓	✓	✓			
Customizable Data Info Display Window	✓	✓	✓			
Thumbnail and Metadata Support for Matrix	✓	✓	✓			
Password Protection for Project, and Audit Log of Project Save with Optional Password Protection	✓	✓	✓	✓		
GRAPH TYPES	9	8.6	8.5*	8.1	8	7.5
3D Surface/Bar Plot From Worksheet XYZ Columns	✓					
3D Parametric Function Plot	✓					
3D Scatter/Bar Plot with Z Error Bars	✓					
Improved Scatter Matrix	✓					
Radar/Spider Chart	✓	✓				
2D/3D Function Plot and 2D Parametric Function Plot	✓	✓				
Contour Profile Plot from Worksheet Data with Uneven Spacing (Virtual Matrix or XYZ Columns)	✓	✓	✓			
3D Vector Plot	✓	✓	✓			
Ternary Contour Plot	✓	✓	✓	✓		
Probability Plot and Q-Q Plot	✓	✓	✓	✓		
Polar Contour Plot	✓	✓	✓	✓	✓	
IMPORTING	9	8.6	8.5*	8.1	8	7.5
Specify Channel When Import MDF, NITDM, DIADem, Prism, pClamp, Matlab Data	✓					
File Import Menu Customization Dialog	✓	✓				
Digitizer Tool	✓	✓	✓			
SQL Editor for Database Import	✓	✓	✓			
Import Data in Unicode ASCII, CDF, and HDF5 Formats	✓	✓	✓	✓		
Import Excel, Multi-Line CSV and Binary 2D Array	✓	✓	✓	✓	✓	
3rd Party Formats Support for pCLAMP 2.0, NI DIADem/TDM, ETAS MDF, CAMP-DX, NetCDF, etc.	✓	✓	✓	✓	✓	
Graphically Construct SQL Queries	✓	✓	✓	✓	✓	
ASCII and Binary Import Wizard Provides Visual Feedback during Import	✓	✓	✓	✓	✓	✓
Drag-and-Drop Data File from Windows Explorer into Origin	✓	✓	✓	✓	✓	✓

DATA MANIPULATION	9	8.6	8.5*	8.1	8	7.5
Excel-Like Data Filtering	✓					
Split a Worksheet into Multiple Worksheets by Number of Columns/Rows, or by Column Label	✓	✓				
Pivot Table Improvements	✓	✓	✓			
Stack Columns and Unstack Columns Improvements	✓	✓	✓			
XYZ Gridding in Logarithmic Scale	✓	✓	✓			
Reduce XY Data by Group, Reduce Data to Evenly Spaced X	PRO	PRO	PRO	PRO		
Reduce Duplicate X Data, Reduce Data by Skipping Every N Points	✓	✓	✓	✓		
New Find and Replace Tool for Numeric and Text Values	✓	✓	✓	✓		
Convert Table-Like Data into XYZ Columns	✓	✓	✓	✓	✓	
Worksheet Query (Extract Values from Worksheet)	✓	✓	✓	✓	✓	
GRAPH CUSTOMIZATION	9	8.6	8.5*	8.1	8	7.5
Manually Move 3D Planes Along the Axis Direction	✓					
Ability to Shift 3D Plot in Z Direction Using Percent of Scale Range	✓					
Move, Rotate and Resize 3D Graphs in an Intuitive Way	✓					
3D Surface Improvements: Lighting Effect, Mesh	✓					
Support Reverse Axes for Ternary Plots	✓					
New Axis Dialog for 3D Graphs	✓					
Output Distribution Curve Data and Parameters to Bin Worksheet for Histogram Plot	✓	✓				
Axis Tick Locations from Dataset	✓	✓	✓			
Transparency and Gradient Fill Control for Graph Objects	✓	✓	✓			
Non-Linear Z-Axis and Y- and Z-Value Colormap Support for Waterfall Plots	✓	✓	✓			
Multiple Intersecting Surfaces in 3D Graphs	✓	✓	✓			
EXPORTING	9	8.6	8.5*	8.1	8	7.5
Creating Movies from Origin Windows using GUI Tool or Script	✓					
Graph Export Supports Transparency for PDF and EPS Format	✓	✓	✓			
Export All Graphs to PowerPoint	✓	✓	✓	✓		
Export Worksheet as Multi-Page PDF Document	✓	✓	✓	✓		
Export ASCII Data to Existing File by Appending or Replacing	✓	✓	✓	✓		
Slide Show Graphs and Layouts	✓	✓	✓	✓		
Export Worksheet as Image, WAV, NI TDM/TDMS File	✓	✓	✓	✓	✓	
Graph Export Formats Include: AI, CGM, EPS, TIFF, PDF, JPEG, EMF, PSD, etc.	✓	✓	✓	✓	✓	✓
Export Image to Raster File Format	✓	✓	✓	✓	✓	✓

\*\* To view the complete list of reasons to upgrade go to: [originlab.com/VersionComparison](http://originlab.com/VersionComparison)

GENERAL ANALYSIS	9	8.6	8.5*	8.1	8	7.5
Support Data With Y Error in Batch Processing	✓					
User Defined Data Identifier in Report Sheets	✓					
Repeat Analysis on All Plots in Graph or All Columns in Worksheet	✓	✓				
Batch Processing with Summary Report Using Analysis Templates™	✓	✓	✓	✓		
Batch Peak Fitting of Multiple Datasets Using Peak Analyzer Theme	PRO	PRO	PRO	PRO		
Generate LabTalk Script Command from Current Dialog Settings	✓	✓	✓	✓		
Analysis Templates™ with Custom Report Sheets for Repeat Analysis	✓	✓	✓	✓	✓	
Consolidated Reports with Collapsible Tables	✓	✓	✓	✓	✓	
Theme Support for Saving Dialog Settings	✓	✓	✓	✓	✓	
Recalculation of Results on Data or Parameter Change	✓	✓	✓	✓	✓	
Run Analysis with Theme Settings Without Opening Dialog	✓	✓	✓	✓	✓	
GADGETS	9	8.6	8.5*	8.1	8	7.5
Global Vertical Cursor Gadget Across Graphs	✓					
Intersect Gadget	✓	✓				
Quick Sigmoidal Fit Gadget	✓	✓				
Cluster Gadget	PRO	PRO	PRO			
Quick Peaks Gadget	✓	✓	✓			
Differentiate and Interpolate Gadget	✓	✓	✓			
Quick Fit Gadget	✓	✓	✓	✓		
Rise Time Gadget	PRO	PRO	PRO	PRO		
Integrate, FFT and Statistics Gadget	✓	✓	✓	✓		
PEAK ANALYSIS	9	8.6	8.5*	8.1	8	7.5
Add More Baseline and Peak Finding Methods	✓	✓				
Multiple Peak Fit Tool Improvements	✓	✓	✓			
Improved Peak Analyzer Wizard	✓	✓	✓			
Batch Peak Fitting	PRO	PRO	PRO	PRO		
Peak Analyzer: Fit Individual Peaks with Different Fitting Functions	PRO	PRO	PRO	PRO	PRO	
Peak Analyzer: Fit Baseline with Peaks	PRO	PRO	PRO	PRO	PRO	
Peak Analyzer: Peak Fitting	PRO	PRO	PRO	PRO	PRO	
Peak Analyzer: Peak Integration	✓	✓	✓	✓	✓	
Peak Analyzer: Peak Finding	✓	✓	✓	✓	✓	
Peak Analyzer: Baseline Detection and Subtraction	✓	✓	✓	✓	✓	

CURVE FITTING	9	8.6	8.5*	8.1	8	7.5
Orthogonal Regression for Implicit Functions	PRO					
Nonlinear Fit with Integral Function	✓	✓				
Calculate Standard Error for Derived Parameter	✓	✓				
Linear Fit with Support for X Error	PRO	PRO				
Surface Fit with Multiple Peaks	PRO	PRO	PRO			
New Fitting Function Builder for Fitting Function Creation	✓	✓	✓			
Rotated 2D Gaussian Function for 2D Surface Fitting	PRO	PRO	PRO	PRO		
Partial Leverage Plot in Multiple Regression	✓	✓	✓	✓	✓	
Improved Residuals Analysis with Additional Residuals Plots	✓	✓	✓	✓	✓	
Improved Find-X/Find-Y Tool for Linear, Polynomial, and Nonlinear Fit	✓	✓	✓	✓	✓	
New Find-Z Tool for Nonlinear Surface/Matrix Fit	PRO	PRO	PRO	PRO	PRO	
Fitting Comparison	PRO	PRO	PRO	PRO	PRO	PRO
SIGNAL PROCESSING	9	8.6	8.5*	8.1	8	7.5
IIR Filter Design	PRO					
2D FFT Filter	PRO	PRO	PRO	PRO		
Signal Envelope, Coherence	PRO	PRO	PRO	PRO		
Signal Decimation to Reduce/Resample Data	PRO	PRO	PRO	PRO		
1D FFT, Inverse FFT and 1D FFT Filter	✓	✓	✓	✓	✓	
2D FFT and 2D Inverse FFT	PRO	PRO	PRO	PRO	PRO	
Short-Time Fourier Transform (STFT)	PRO	PRO	PRO	PRO	PRO	
Wavelet Analysis	PRO	PRO	PRO	PRO	PRO	
Hilbert Transform, 2D Correlation	PRO	PRO	PRO	PRO	PRO	
STATISTICS	9	8.6	8.5*	8.1	8	7.5
More Distance Measures for Hierarchical Cluster Analysis	PRO					
Grubbs Test and Qtest to Detect Outliers	✓					
Multivariate Analysis	PRO	PRO				
More Normality Test Methods: Anderson-Darling, D'Agostino-K Squared, and Chen-Shapiro	✓	PRO				
Survival Analysis: Kaplan-Meier, Cox Proportional Hazard ,log-Rank ect.	PRO	PRO	PRO	PRO	PRO	
Nonparametric Tests: Mann-Whitney Test ect.	PRO	PRO	PRO	PRO	PRO	
Power and Sample Size	PRO	PRO	PRO	PRO	PRO	
One Way ANOVA, Two Way ANOVA	✓	✓	✓	✓	✓	
One Way and Two Way Repeated ANOVA	PRO	PRO	PRO	PRO	PRO	
Hypothesis Testing	✓	✓	✓	✓	✓	
Hypothesis Testing: One Sample and Two Sample Hypothesis Tests for Variance	PRO	PRO	PRO	PRO	PRO	
Correlation Coefficient, Discrete Frequency and ROC Curve	PRO	PRO	PRO	PRO	PRO	
Basic Descriptive Statistics, Normality Test, 1D and 2D Frequency Count	✓	✓	✓	✓	✓	✓

## What Our Customers Are Saying

“ I have used Origin for many years. It gives me the ability to control every aspect of the graph I am creating. This flexibility combined with its statistical tools have made Origin an indispensable part of my daily work. ”  
— Scott Jackson, Ph.D., Principal Scientist, North American Regulatory Strategy and Stewardship BASF Corporation

“ Origin has become the de facto standard for archiving and analysis of experimental data in the field of condensed matter physics. ”  
—Dr. C.M. Roland, U.S. Naval Research Laboratory

*Note: These opinions are personal opinions and do not imply any statement or endorsement by the United States Naval Research Laboratory.*

“ The work of a scientist heavily depends on graphic presentation and statistical analysis of data. For the past 10 years, I have used exclusively Origin to prepare figures for over 40 manuscripts that have been published in scientific journals with strict academic requirements. ”  
—Detcho A. Stoyanovsky, Ph.D., University of Pittsburgh

“ If I had to pick three software packages to take to a desert island, Origin would be at the top of the list. Not only does Origin handle the most demanding curve fitting and data analysis tasks with ease, and makes superior publication quality graphs; it also has a built in C compiler that allows me to customize complex functions - a feature that has been crucial to my research. To top it off, OriginLab has a knowledgeable and responsive technical support staff, second to none. I wholeheartedly recommend Origin. ”  
—Mark Kuzyk, Ph.D., Regents Professor of Physics and Astronomy, Washington State University

“ I began using Origin because of its versatility in the varied experimental work that we do, from electrophysiology to clinical studies. I have stayed with Origin because of the high level of statistical expertise and customer service that we get from technical support staff. ”  
—Dr. Pamela Flood, University of California, San Francisco, Department of Anesthesia and Perioperative Care

“ Great product. I have only had the product for 2 weeks and find that it is easy to use, very powerful and that data presentation is very flexible. The help videos on the Origin website are very useful to show you how to quickly use the features of the software product. ”  
— David Bakst, Operations Director, Sabien Technology Ltd

“ I have been extremely happy with Origin. I found it easy to get started with. Although I am still probably only using a fraction of its abilities, the tech support and forum have been great at helping me to learn and use more features and to solve occasional problems. ”  
—John W. Rudnicki, Ph.D., Northwestern University

## Licensing

OriginLab offers many licensing options, including Single-User, Multi-Seat, Research Lab, Teaching, Student, and OEM. Discounted pricing is available for academic and government customers.

Please visit [originlab.com/LicensingOptions](https://originlab.com/LicensingOptions) to learn more.

## Product Support

Standard support is available to all registered customers with active maintenance, and to customers evaluating our products. First year of maintenance is included at the time of purchase.

Support is available by phone, e-mail, and online chat from 8:30 AM to 6:00 PM EST. Extended support hours from 7:30 PM to 4:00 AM EST are available for online chat and e-mail.

Support resources are also available from the OriginLab website, including video tutorials, FAQs, and a product forum. Our forum contains more than 20,000 posts and questions are answered daily by OriginLab staff and other users.

## About OriginLab Corporation

OriginLab is a leading developer of scientific graphing and analysis software. Since 1992, we have sold over 150,000 copies of Origin around the world. Our customer base includes over 130 Fortune Global 500 companies, over 75 government research laboratories and agencies in the US and Canada, and more than 800 universities and colleges worldwide.

Sign up for our e-newsletter to read featured customer stories, technical tips and resources, news about Origin, and to follow us on social media:  
[originlab.com/Newsletter](https://originlab.com/Newsletter)



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