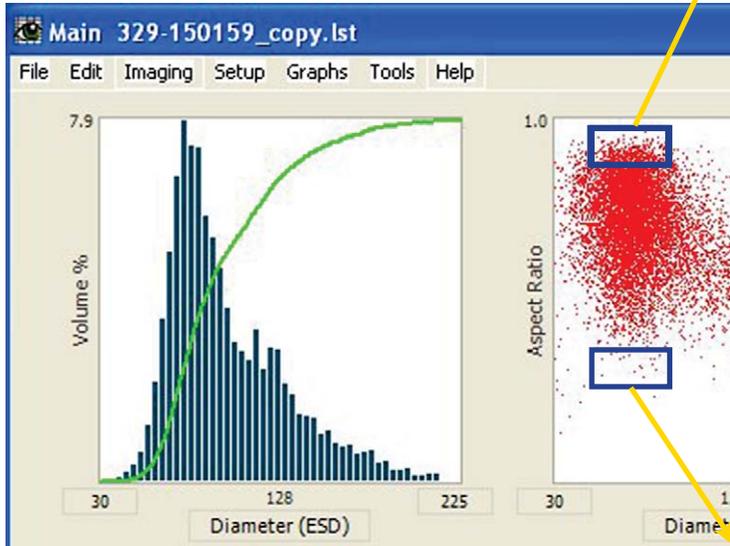


VisualSpreadsheet[®]: Interactive, Intuitive Particle Analysis Software

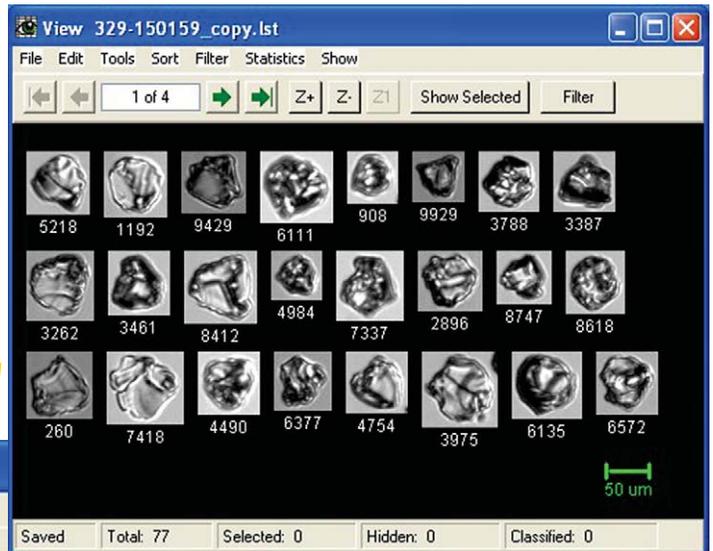
Most particle analyzers show you a distribution of particle *size* only. FlowCAM[®] is the imaging-based particle analysis system that gives you a *picture* of every particle measured. VisualSpreadsheet[®] software allows you to interactively view every particle image contained in the distribution. Filter and sort particle images just like you would in a spreadsheet. Use powerful pattern recognition algorithms to identify and quantitate individual particle types in a heterogeneous sample.

What's under the curve?

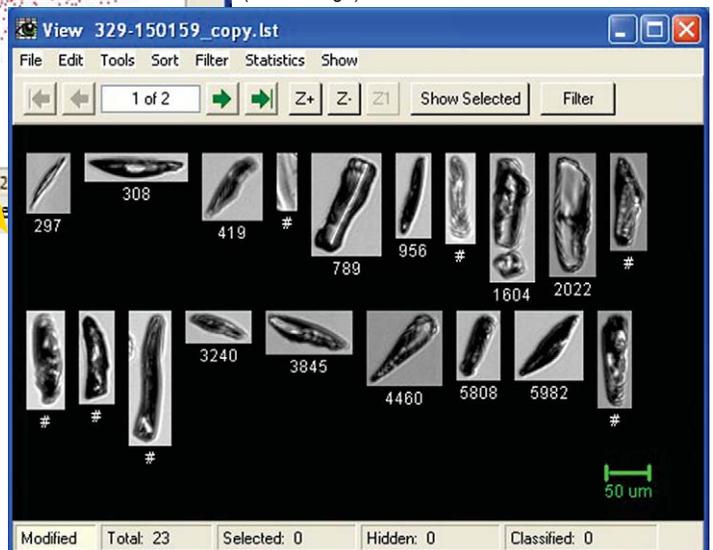


Particle analyzers using techniques other than imaging can only *count* particles and report their *size* based upon Equivalent Spherical Diameter (ESD). So the results consist of a large spreadsheet containing particle size information only. Statistics can be calculated from the spreadsheet such as mean size, standard deviation and Coefficient of Variability (CV). The spreadsheet can also be filtered via standard queries to produce summary data for these queries. The *only* visual representation that can be made from this data is simple graphs such as the Volume versus ESD graph seen above on the left.

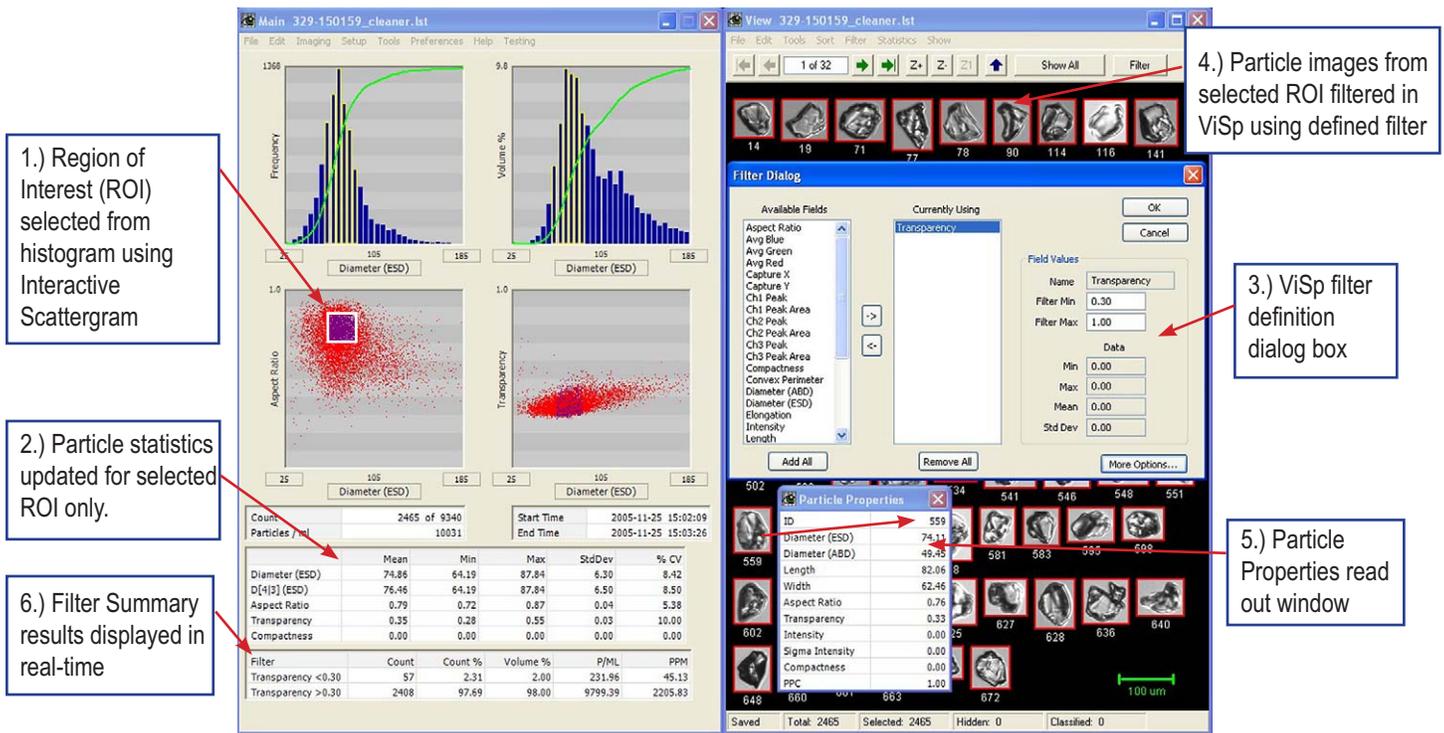
Since FlowCAM can measure up to 26 different image-based parameters for each particle, data can be filtered and sorted in very complex ways to produce *volumes* more information than these other particle analysis methods. With VisualSpreadsheet (ViSp), the difference is that while the data can also be presented as graphs and statistics, it is also displayed *visually* by displaying all particle images that meet a particular query condition.



VisualSpreadsheet's patented *Interactive Scattergram*[®] shows here how particles can be interactively selected from any graph displayed. In this example, the Aspect Ratio (width/length) Scattergram was used to isolate rounder particle images (top image) from "rod-like" particle images (lower image).



VisualSpreadsheet allows the user to perform complex filtering and queries against the data and *interactively* see the results instantly as the actual particle images. This interaction gives instant visual feedback, enabling the user to better understand the data, perform "what-if" analyses, and simply do deeper *data mining*. Taking this one step further, ViSp also contains sophisticated pattern recognition capabilities for quickly quantifying different particle types in a heterogeneous sample.



As can be seen from the example above, ViSp gives the user an extremely powerful and intuitive methodology for analysis of particle data acquired by the FlowCAM. The first operation was to define a region of interest (ROI) within the scattergram using the Interactive Scattergram feature (1). In this instance, a region of interest of particles between 54 and 88 microns in Equivalent Spherical Diameter (ESD), and having an Aspect Ratio (width/length) between 0.72 and 0.87, was defined interactively with the cursor in the Aspect Ratio Scattergram (represented by the white box). As soon as this is done, the Interactive Scattergram finds all particle images meeting that criterion within the entire run and displays those particle images in the View Images window on the right hand side of the screen. Note that the particle statistics in the lower left hand box of the main window are updated to represent the statistics for the particles selected in the ROI only (2). In this case, 2,465 particles out of a total of 9,340 total acquired particles were found meeting the criteria of the ROI.

At this point, the ViSp filtering feature was used to further refine the results within the ROI. As seen from the ViSp filter dialog box (3), the particles in the ROI were filtered to find only those particles that met the defined filter parameters (4), which in this case were only those particles having a transparency value between 0.30 and 1.00. By default, the selected and filtered particle images are displayed in the order in which they were acquired (Sort on ID). The ViSp Sort menu allows for the particle images to be sorted on any of the measurements collected. In the example above, ViSp has been told to sort the particle images in ascending order based upon the particle Transparency. As an additional aid in the analysis process, ViSp displays an Image Properties dialog (5), which shows all of the particle measurements for the particle the cursor is placed over in the display. Finally, ViSp can display the summary results of any defined filter in the summary statistics on the

main window (left). The filter summary statistics include count, volume percent, Particles/ml and PPM. Not only are these filter results displayed after a run, but they can also be displayed in real-time during data acquisition. Time series graphs can also be plotted during acquisition, for example to graph concentration of a particular particle type over time.

The most powerful feature of ViSp, however, is the automated statistical pattern recognition capabilities. The user interactively selects particle images to build "libraries" of individual particle types ("classes"), and the system then automatically categorizes every particle in a given data set which belongs to each class. Once the libraries are built, they can then be used on any subsequent data set generated by FlowCAM.

VisualSpreadsheet Features:

- Up to 26 measurements collected per particle
- Sort, Filter and Query data with instant visual results
- Intuitive "spreadsheet-like" interface
- Sophisticated Pattern Recognition capabilities
- Real-Time filtering during acquisition
- Configurable graphs and statistics
- Time-Series graphing
- Remote (networked) control with alarms supported

To see VisualSpreadsheet in action, log onto our web site at www.fluidimaging.com to watch the ViSp videos. Better yet, contact us to arrange for an interactive demonstration via your web browser. We can even show you VisualSpreadsheet working with your own sample data by taking advantage of our free FlowCAM sample analysis.

