

Vernier Gel Analysis

Using the Blue Digital Bioimaging System and Logger *Pro* software

The use of gel electrophoresis has become a common practice in biotechnology units offered in high school and college biology laboratories. Molecular methods employing the isolation of nucleic acids, digestion of plasmid or phage DNA, restriction analysis and assessment PCR products have greatly expanded practical and conceptual learning capabilities in the current life science classrooms. Analysis and visualization of gel electrophoresis results offer new-found opportunities to advance understanding, develop skills useful in current, future technology and research. The gel analysis option also assists users by enhancing laboratory reports and presentations.

The Gel Analysis feature in Logger *Pro* offers users a new tool to analyze gel electrophoresis results actively from a digital camera or from a saved digital photo. Capabilities include:

- Establishing a Standard Curve.
- Measuring base pair values of experimental bands.
- Comparing bands on the basis of their respective number of base pairs.

MATERIALS

computer
Logger *Pro*
Gel (photo)
ProScope with stand

Imaging Hood
BlueView Transilluminator

PROCEDURE

Part 1: Obtain a Digital Photo

There are two ways to obtain a digital photo for Gel Analysis in Logger *Pro*. In one method, a photo is inserted into Logger *Pro* from an existing file on your computer. In the second method, Logger *Pro* actively captures a photo of a gel using a digital camera such as the ProScope. You will have the opportunity to try both of these methods.

Method 1A: Insert from File

1. Start Logger *Pro*.
2. Choose Gel Analysis from the Insert menu, then choose From File...
3. Choose the photo you want to analyze.
4. Once the photo is on the screen, choose Auto Arrange from the Page menu. Your screen should now look similar to Figure 1.

5. Proceed directly to Part 2 Gel Analysis.

Method 1B: Take a Photo

1. Start *Logger Pro*.
2. Choose Gel Analysis from the Insert menu, then choose Take Photo. A dialog box with a live picture from the ProScope should appear on the screen.
3. Position the gel on the BlueView Transilluminator, cover with the Imaging Hood, and adjust as needed to obtain a good image.
4. When you are satisfied with the image, click the Take Photo button. Note: The resulting photo may be hidden behind the dialog box. Close the Take Gel Photo dialog box.
5. Choose Auto Arrange from the Page menu. Your screen should now look similar to Figure 1.

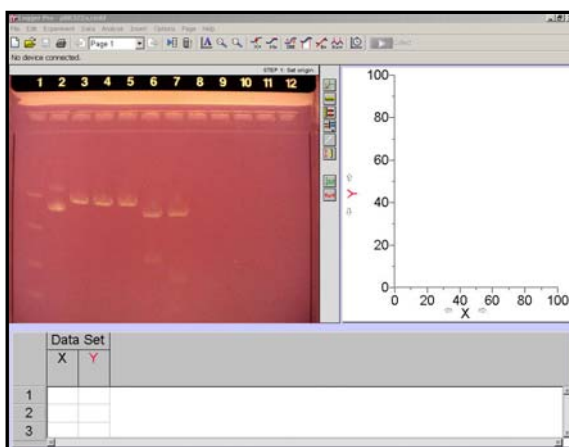


Figure 1 *Logger Pro* ready to begin Gel Analysis

Part 2: Gel Analysis

The buttons along the right side of the photo will be used. The first four, shown below, are the primary Gel Analysis tools. Holding the mouse over each button will display its function. Text above the photo serves as a reminder of the next step in the analysis.

 **Set Origin**

 **Set Scale**

 **Set Standard Ladder**

 **Add Lane**

6. Set Origin. In this step, you will show *Logger Pro* the position of the wells on the photo.



- Click the *Set Origin* button. Click on the photo just to the left of the first well. A yellow coordinate system will appear on the photo. The x-axis should go directly along the bottom edge of the wells. You can move the origin by grabbing either axis with the mouse and dragging it to the desired location. The axes can be rotated by grabbing the round handle on the x-axis.

7. Set Scale. This optional step converts the units of distance measured from number of pixels into millimeters or centimeters.



- Click the *Set Scale* button. Drag the mouse between two points of known distance apart. A window will appear prompting you to enter this distance and its units. Note: If your gel tray does not have a built-in ruler, you could measure either the width or length of the gel tray and use as your reference. If no reference is available, distances will be displayed in pixels, but base pair calculations will be correct.

8. Set Standard Ladder. In this step, you will identify the bands of the standard ladder and input their base pair values. *Logger Pro* will automatically create a standard curve on the graph.



- Click the *Set Standard Ladder* button. Click on the band closest to the well of the standard ladder lane. Type the corresponding number of base pairs into the field provided in the resulting dialog box and click OK. Moving down this lane, repeat these steps for each visible band of the standard ladder. Notice the Standard Curve being created on the graph once you have added the second point.

9. Add Lane. In this step, you will identify the experimental bands on the photo. *Logger Pro* will then plot and calculate their respective number of base pairs



- Click the *Add Lane* button and choose the Add Lane option. Position the cursor over the leading edge of the band closest to the well of the first experimental lane and click. Take a moment to notice that when you click, three things happen: a marker with a distinct shape and color was placed on the photo, a matching marker was placed on the graph, and the distance and number of base pairs is added to the data table as shown in Figure 2.

- Continue in order down the lane, clicking on each of the remaining bands.

10. To analyze another lane, click on the *Add Lane* button again, choose Add Lane, and repeat Step 9. Repeat this process for each experimental lane until the entire gel has been analyzed.

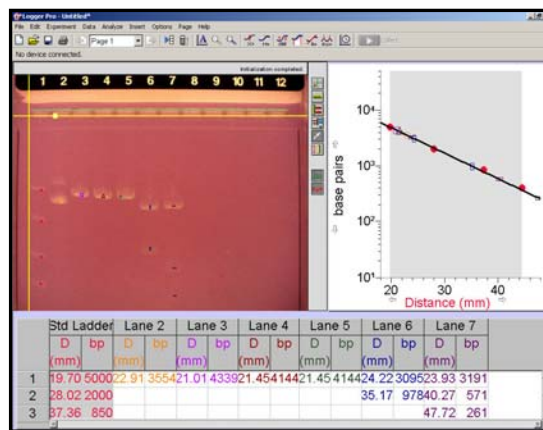


Figure 2. Completed Gel Analysis of plasmid pBR322 digested with three different restriction enzymes (REs). Lanes 6 & 7 exhibit the result of multiple REs acting on the plasmid.