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Question:

I know that you have used an oscilloscope to plot z+y versus X. I don't understand this graph. How can you decipher what is happening in the topography of the sample by looking at this graph?

This is a really crude imaging technique it is basically just a series of plots of Z versus X at different Y positions if you look at the image you can see features on the surface but you can't have many lines in Y before the image becomes very messy. A quick test of the microscope is to just plot Z vs. X on the scope. And leave the Y signal turned off. At the tip moves back and forth you can see if the trace repeats as it goes over the same point see the progress section on my web page that was the second thing I posted

The other way I plot images on the scope is to just put in X and Y as before and use the tunneling current or Z signal to change the brightness of the spot by using the "Z input" on the back of the scope. The Z signal needs to be offset and gain adjusted to get a useful image on the scope. This is the most common way to display the data on the computer to make a topographic plot with the convention that the highest points are light and the lowest points are dark. At each point (X, Y) in the plot set the brightness according to the Z data. Usually the Z data must be adjusted to fit the number of gray shades you can display on the screen. To normalize the data you need to find the largest and smallest Z point in the image call them Z_max and Z_min. say for example you have 128 gray shades (0 to 127) to use, that is more than the human eye can distinguish. The code would be something like this.

```
G_scale = 127/( Z_max - Z_min);  
for (Y=0; Y <256, Y++)  
for (X=0; X < 256, X++)  
{  
Zpix = (Z(X,Y) - Z_min) * G_scale;  
Gray_plot ( X +x_offset, Y + y_offset), Zpix);  
}
```

The function Gray_plot(x,y,z) I just made up it draws a pixel at an x,y position on the computer screen. Check your graphics libraries. You will probably find a function like this. You may have to create a color table for this function if so you can also make different heights different colors or just shade the whole image, gray does get boring after a while.

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