Lesson 42: SpreadSheet or WorkSheet?

SYNOPSYS™ users with experience with other lens design codes can get confused when they encounter the great many features in the program. Which interface should they use? Why not just do things the way they always did before? A common confusion centers around the SpreadSheet, which in some codes is always shown on the monitor. New users sometimes think that is a good idea. We disagree.

SYNOPSYS has a spreadsheet, of course, and we actually use it once or twice a year. It is provided for when you need it, but *is not supposed to be open all the time*. Fig. 1 shows the data for a starting triplet, displayed by the **SPS** command.
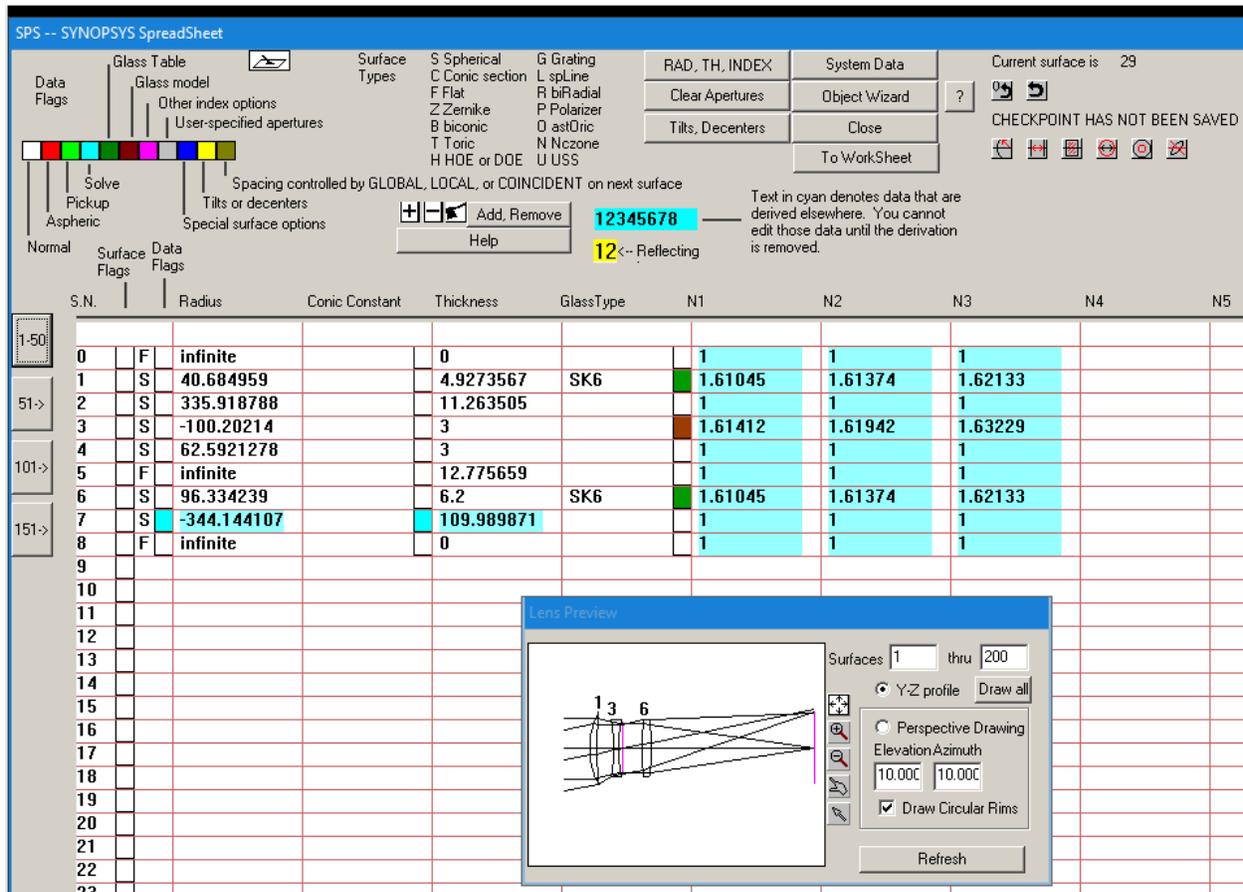

Fig. 1. The SYNOPSYS SpreadSheet display.

You can of course change the lens data by typing into the edit boxes, and the lens preview picture updates to show the changes. SPS also lets you access many more dialogs that control specific parameters. For example, look at the dark red square to the left of the index data for surface 3. Those squares are the gateway to sub-dialogs with more options and possibilities; that one is the index flags box. The boxes for the actual index *values* of all of the elements of this lens are currently filled with a light cyan color, indicating that you cannot directly edit those numbers. They are derived from something else, and you have to edit the derivation instead.

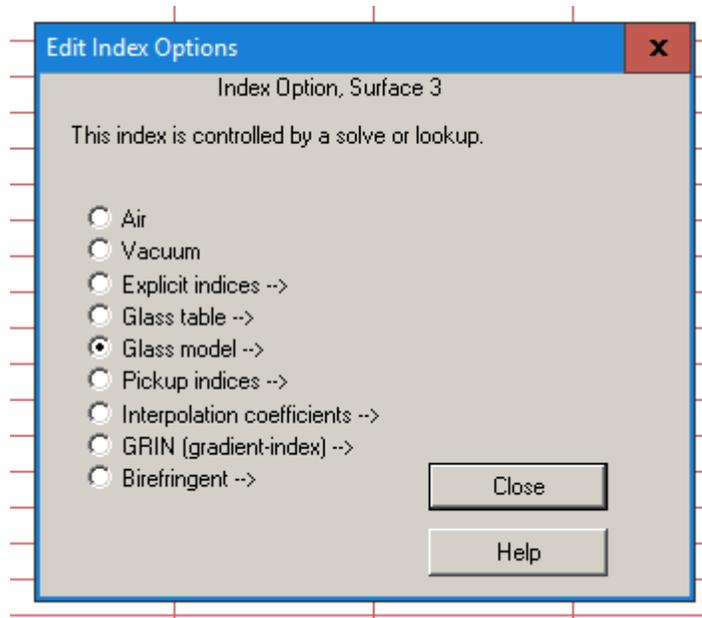To illustrate, we click the **index flags box** for surface 3. A new dialog opens.

Fig. 2. The Index Options dialog.

This surface already has a glass model defined. We can change the declaration by selecting one of the other radio buttons – but let us just click the **Glass model →** button, which opens yet another dialog:
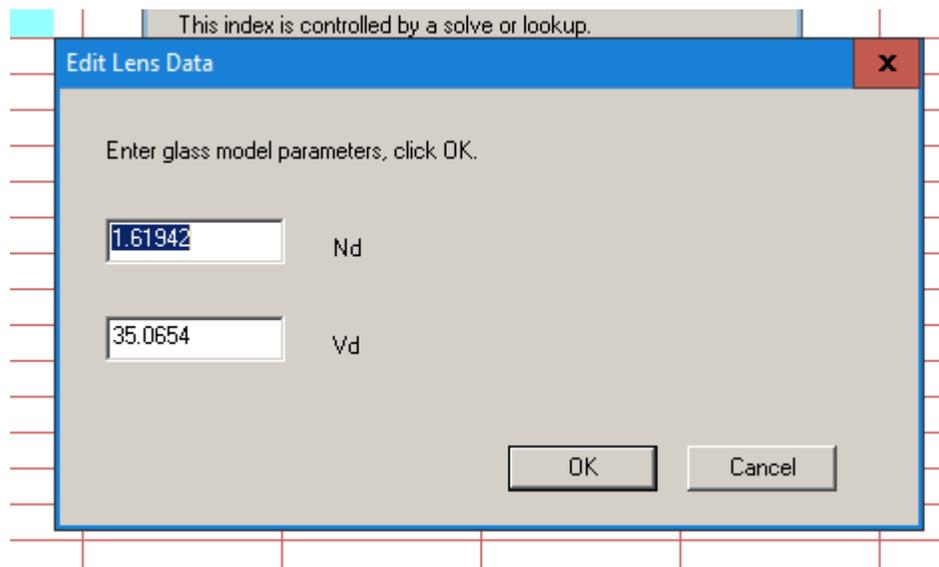

Fig. 3. The glass model edit dialog.

Now we can change the glass model parameters if we wish. (Those give the Nd and Vd of a location on the glass map, and the program calculates the actual index at all defined wavelengths to closely match real glasses in that region.)

By using the SpreadSheet and its sub-dialogs, you can enter or change anything in the lens – much as you would with other programs. Some users like that interface.

But they will probably like the WorkSheet even more, once they get used to it. Click the **WorkSheet** button at the top of the SPS display. (Or type **WS** after closing SPS, or click the button ⊞, which is found in the top toolbar and also in the PAD toolbar.) The WorkSheet opens, showing the lens data in a different format.
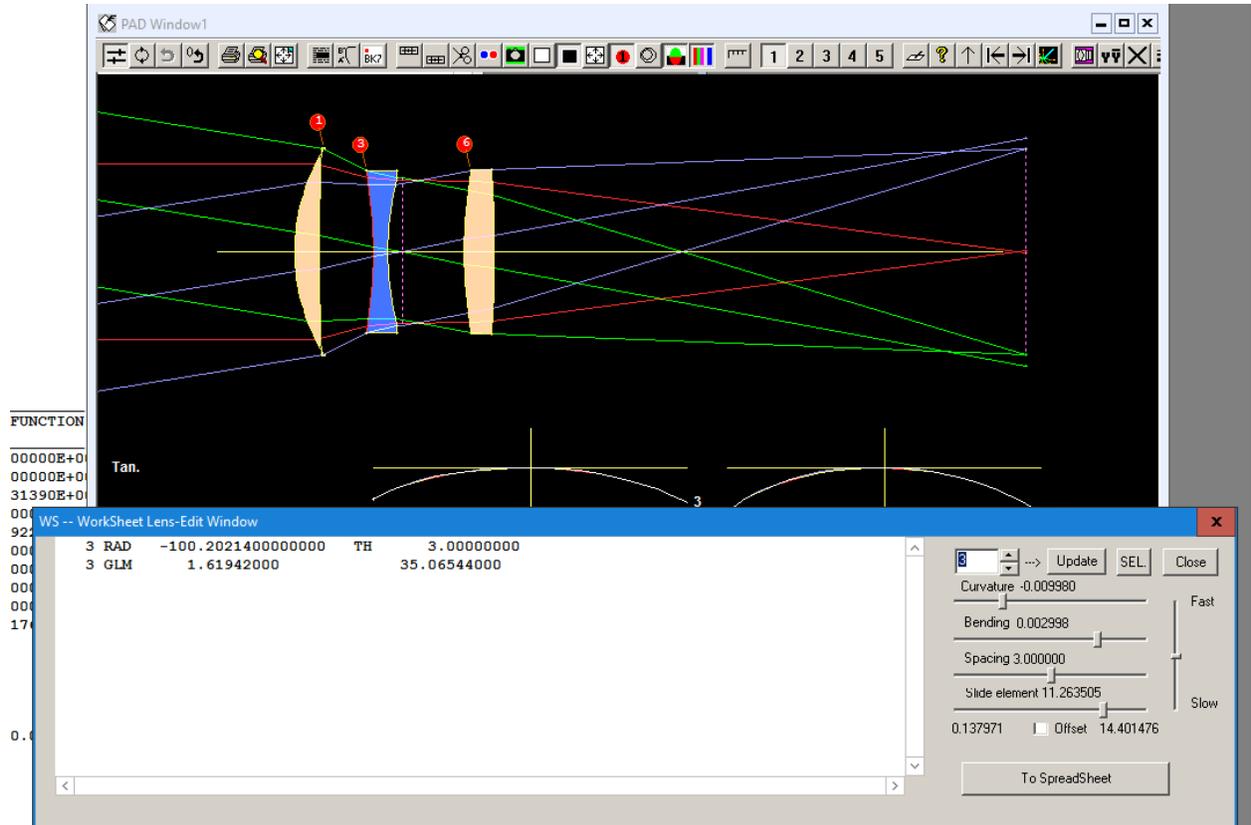

Fig. 4. The WorkSheet dialog and edit pane.

The idea here is to show *all* of the data that apply to a given surface – or to the system if you click the

Object and system button ⬀. SPS, on the other hand, shows *some* of the data for the entire system. Both forms are useful. We already selected surface 3 when SPS was open, and the edit pane shows those data. (You can also click in the lens drawing in PAD to select a surface.)

Let us change the data defining the glass model on this surface. Simply edit those numbers as you would with any text editor. We change the index from 1.61924 to 1.55, and then click the **Update** button. The glass model is changed.

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Fig. 5. Changing a glass model parameter in the WorkSheet.

We find this kind of editing to be faster and more convenient than clicking down through a dialog tree in SPS. You can also access the same sub-dialogs that can be reached from SPS through WS by clicking on one of the buttons

In the WorkSheet toolbar, should you ever need to get there.

Now we'll look at some features of the WorkSheet that you cannot find in a spreadsheet. The most important of these is the set of slider bars to the right of the edit pane. The **Spacing** slider for surface 3 is currently set to the value 3.00000 mm, the thickness of that element. We slide the thumb to the right, watching the numbers increase, until we get to 5.22mm. The number in the edit pane has also increased, and the lens drawing shows the increased thickness, as shown in Fig. 6.

What if you want to change something in the edit pane that is not assigned to a slider? Simple: *assign it*!

Let us demonstrate. We will now assign the top slider to the same thickness. With the mouse, select the thickness value by clicking and dragging over the *entire number*. Then click the **SEL** button. The top slider gets assigned to that number and can be used to change it. The purpose, of course, is not to duplicate the function of the existing Spacing slider; we only used that for illustration. The power of this tool is its ability to assign *any* numeric value in the edit pane to that slider. No spreadsheet ever had that kind of power. Change anything and watch the lens drawing and ray fans change as you move the slider. Are spreadsheets paying attention?
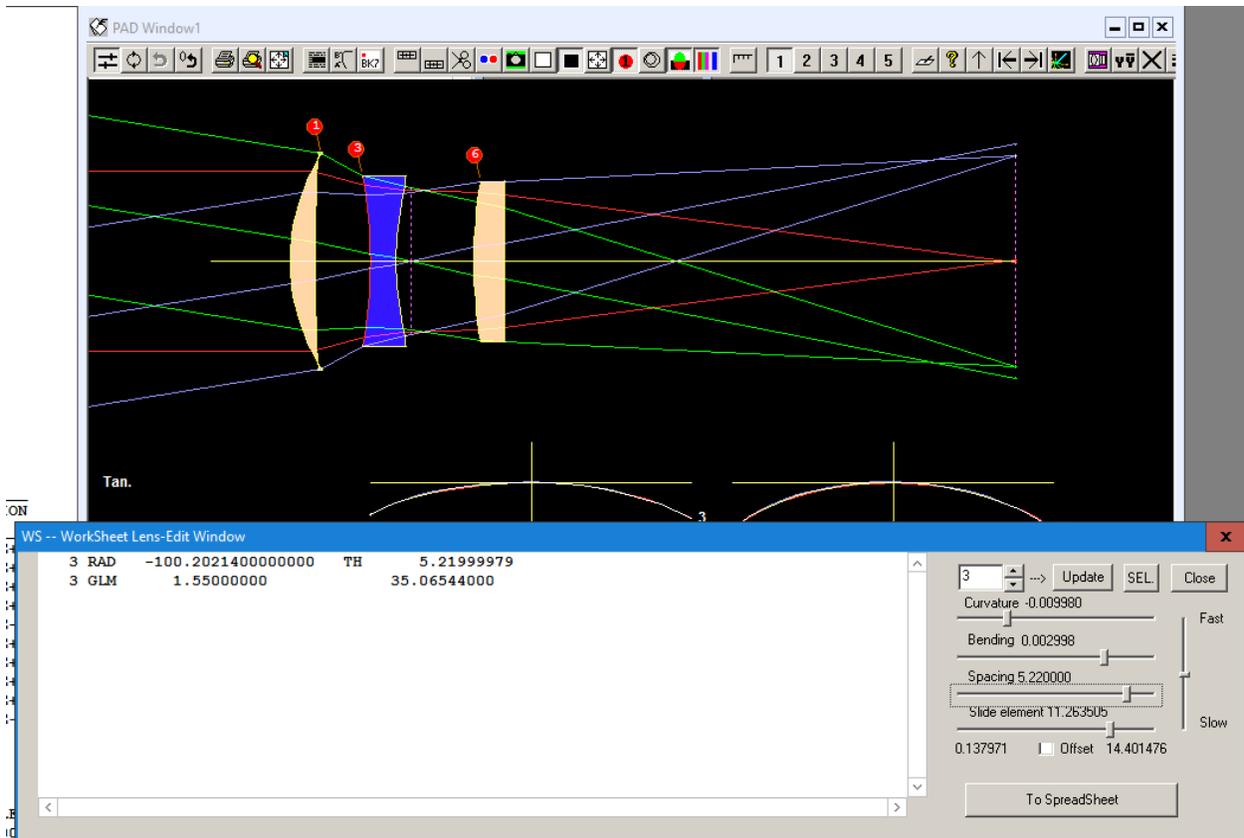
Fig. 6. The WorkSheet display after the Spacing slider for surface 3 has been moved to the right.

Let us tilt the second element by 5 degrees. In SPS you have to click several places and eventually you get to a Tilt Dialog. You can get there from WS too: just click on the button [icon].
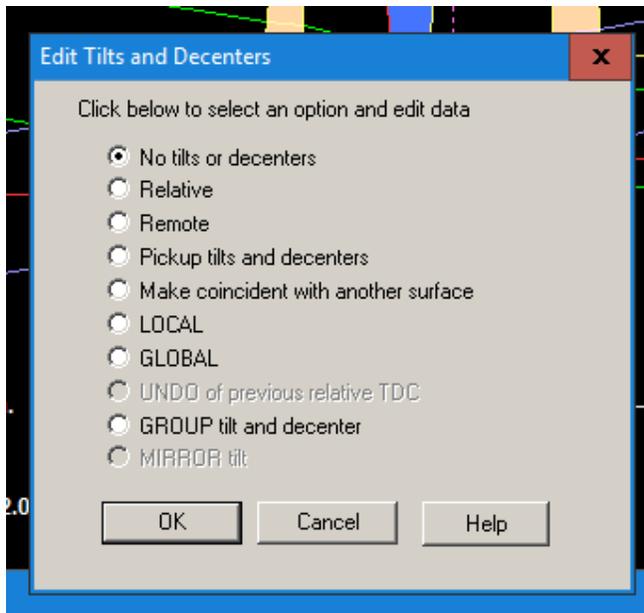

Fig. 7. The Tilt dialog.

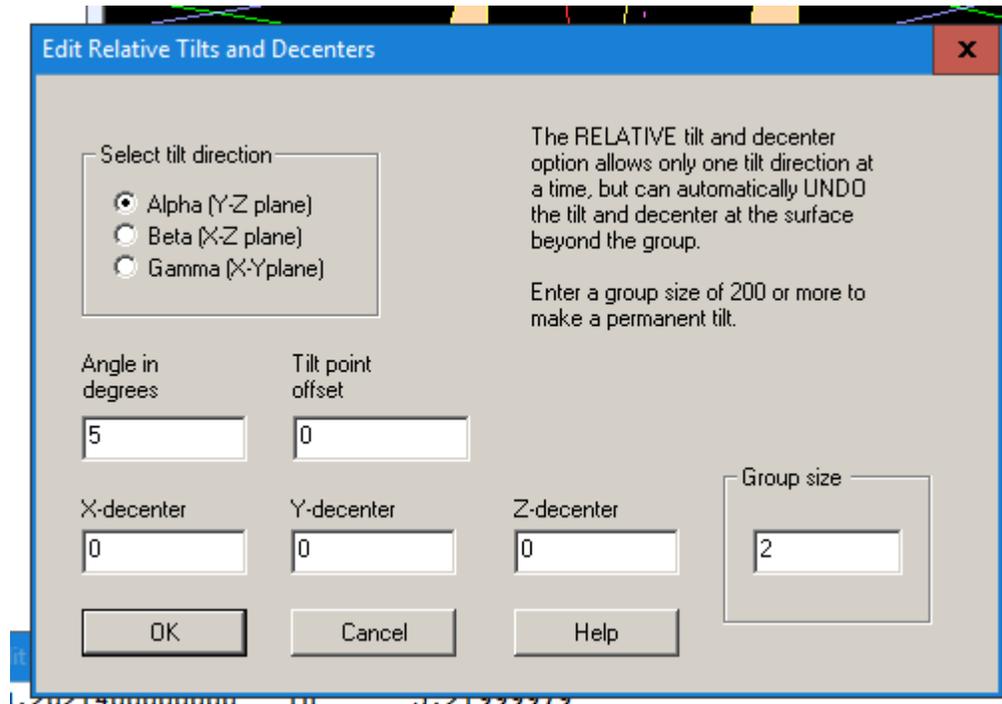Select the **Relative** option, and a new dialog opens.

Fig. 8. Dialog for editing relative tilts and decenters.

We enter a tilt angle of five degrees and a group size of 2. Then click **OK** and **OK**. The second element is tilted.
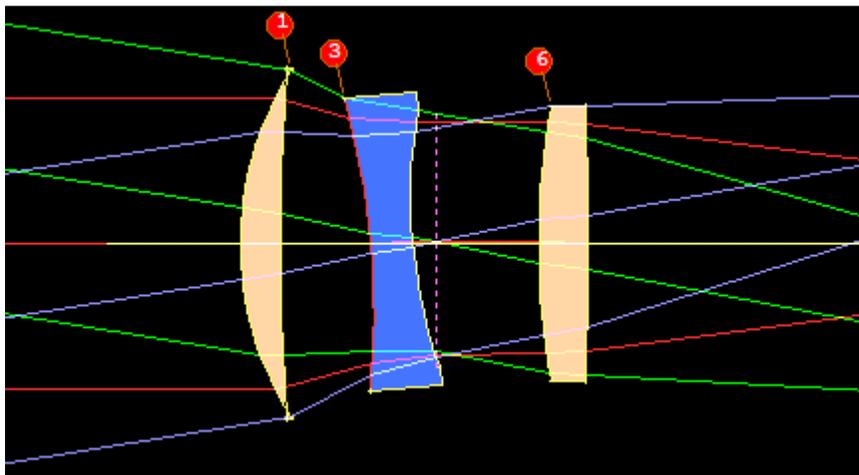

Fig. 9. Lens after tilting the second element.

The point of this is to show how you can edit your lens using the same dialogs you could open from SPS. But consider this: In the edit pane we could have simply typed

    5 AT 5 0 2

and the same tilt would have showed up. Once you learn some of the formats of a SYNOPSYS RLE file, you will use this method all the time. And save a lot of time. Spreadsheets everywhere are jealous.

Now let's show a really snazzy feature. First, we will remove the tilt on surface 3. This can be done with the same dialogs we used above, but it's much faster to simply type

      3 NAS

in the edit pane and then click the Update button. (This means No ASymmetry.) The tilt is gone. Now make a checkpoint by clicking the button on the PAD toolbar. (We use that button constantly, so we can instantly get back to where we were a moment ago by clicking the button just to the left of that one.) (Yes, even we screw up now and then.) Now, click the button in the WS toolbar. That opens the Lens Layout Tool. No spreadsheet ever had this kind of talent. The PAD drawing changes, showing the axial marginal ray in red, the chief ray in blue, and two rim rays in grey.
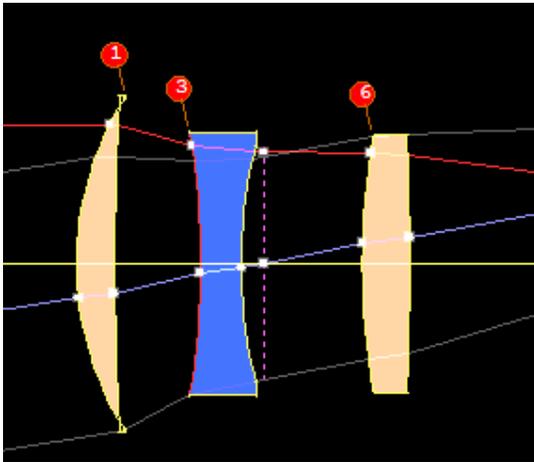

Fig. 10. The PAD display when the Lens Layout Tool is open.

See those little boxes at the intersections of the rays and the surfaces? You can click and drag those handles around. The handles on the blue ray let you alter thicknesses and airspaces. We drag the blue-ray handle on surface 2 to the right.
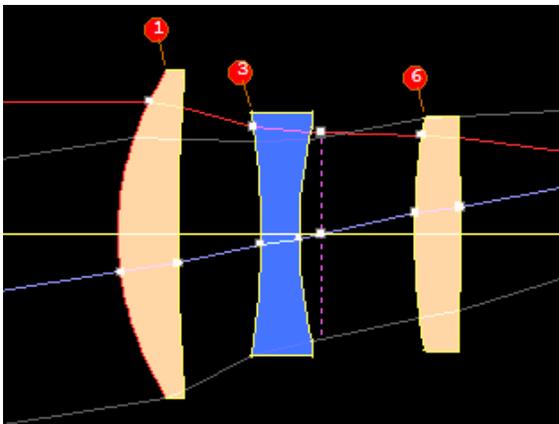

Fig. 10. The Lens Layout Tool has altered the thickness of element 1.

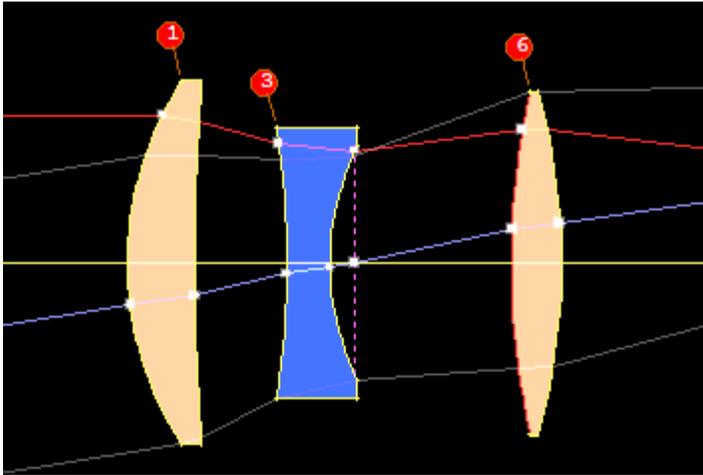Now we drag the red-ray button on surface 6 up and to the right.

Fig. 11. Lens as altered by the Lens Layout Tool

The program has recalculated the curvature of 4 and thickness of 5 to put the red ray at the drag endpoint. Good luck doing that with a spreadsheet. And there's more. If you hold the <Shift> key and drag a red-ray button on the first side of an element, you alter the *bending* of the element. Holding the <Ctrl> key while dragging that button alters the element *power*. Spreadsheets everywhere are really jealous now. There are even more tricks. Type HELP LLT in the Command Window to read about them.

Now, do you still want to stare at a dumb spreadsheet all day?