

Orientation

How do I use SYNOPSIS™? What does it do?

Those are both important questions, and the orientation in this section will make it easier for you to understand what's going on when you go through the other chapters of this Online Tutorial.

Many of the lessons in these chapters involve systems with more than 12 surfaces or require saving lens files. If you do not yet have a license, you should still read the chapters – but you will not be able to run the examples yourself until you have received your SYNOPSIS key.

SYNOPSIS™ is one of the largest lens-design programs in the world, able to do hundreds of different tasks. One of our major goals has been to make all that power available even to a beginner. When you think about it, that's not easy. How do you make so many things easy to find? What kind of interface is easiest to use?

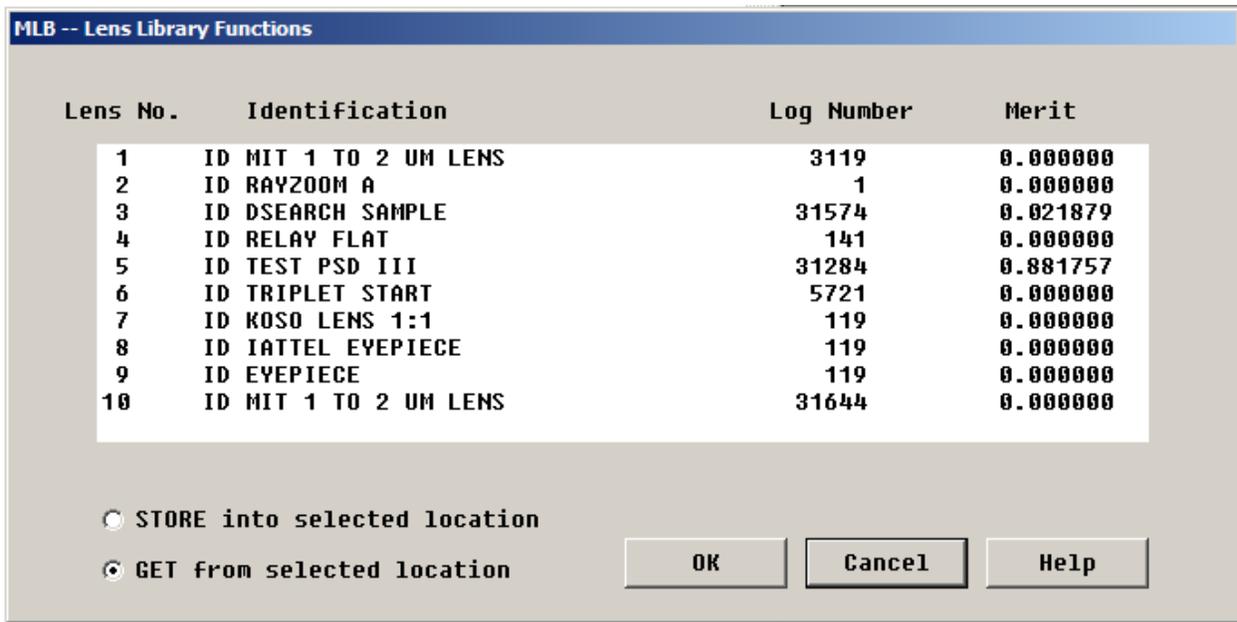
The Interface

The one we have chosen combines the best of two worlds: mouse-driven dialogs on the one hand, and short and fast commands on the other. Most of your tasks can be done either way, so you get to decide which is best in each case. For example:

To get a lens out of the library, you can type, in the Command Window (CW):

GET 1.

Or, you can click a sidebar button, , which opens a dialog:



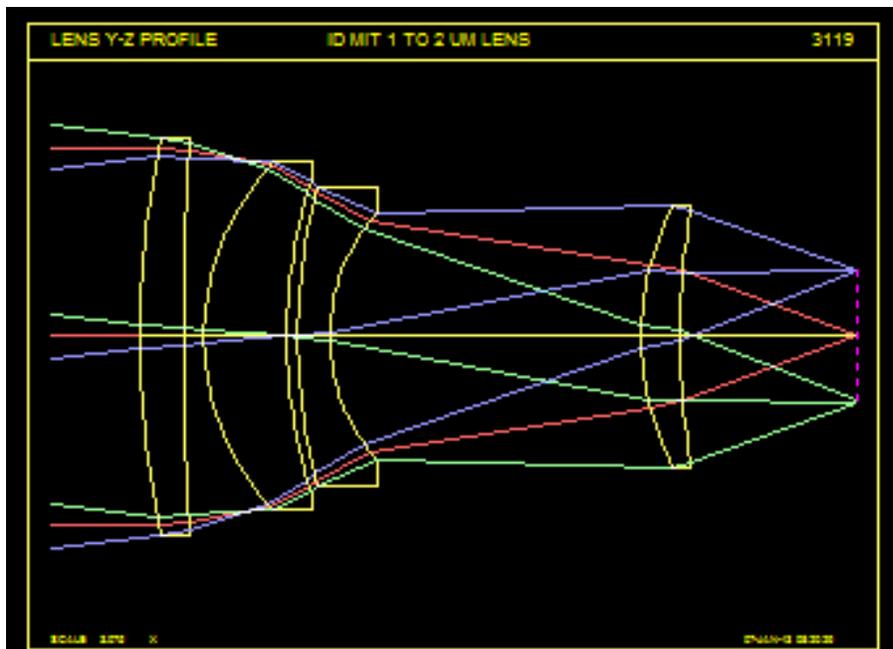
Then click on the top item (for lens number 1), and click OK. Either way, the lens opens, and you see the output from a paraxial raytrace on the screen;

```

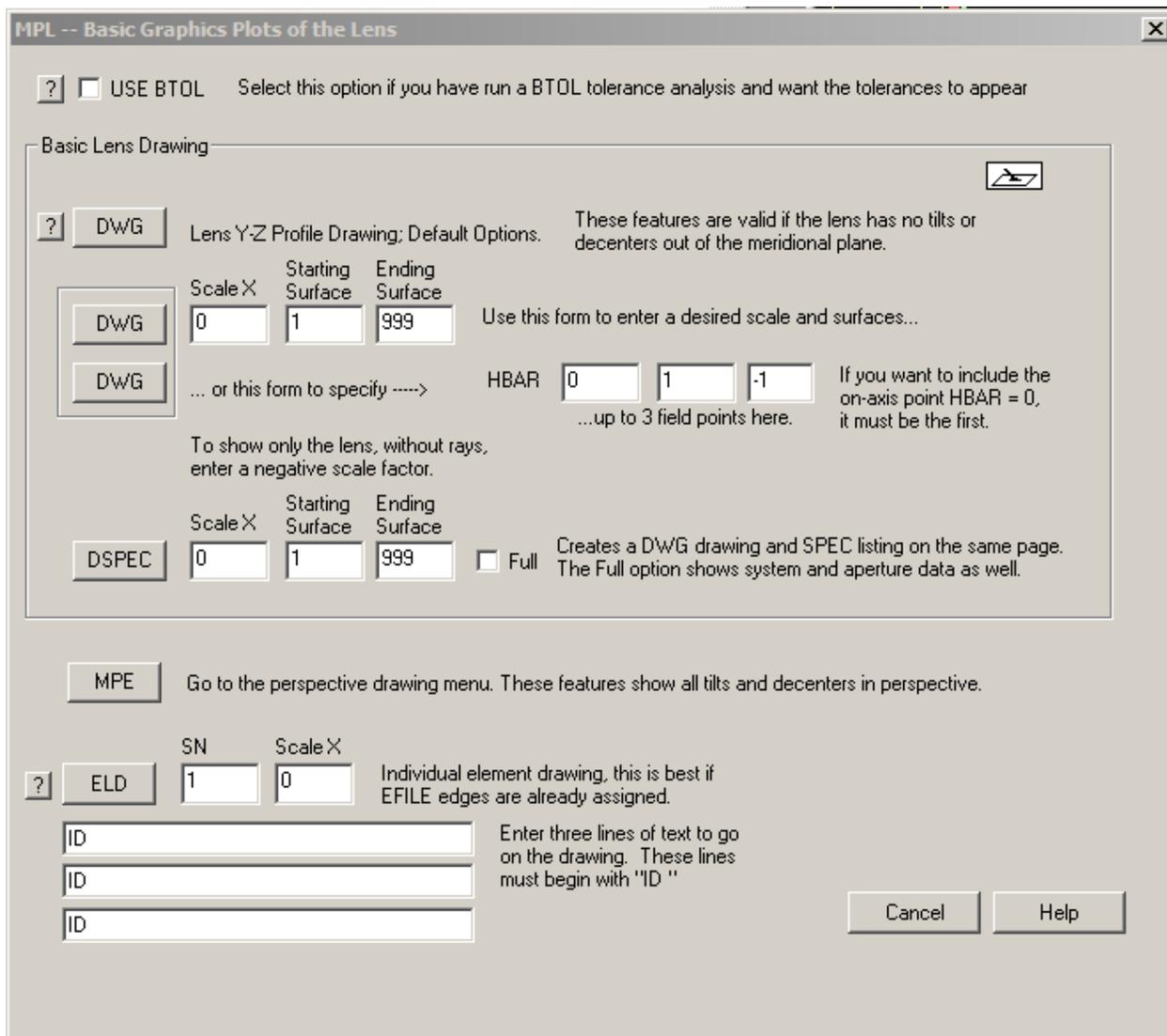
Get lens no. 1          ID MIT 1 TO 2 UM LENS          3119
          GIHT          FOCL          FNUM          BACK          TOTL          DELF
          6.13932       50.00075       1.42859       16.29978       49.77532       0.00000
Type <ENTER> to return to dialog.
SYNOPTSYS AI>
  
```

In much the same way, you can open a lens file that was saved on the disk. In this case, the command is **FETCH** instead of **GET**, and the button is . (There are 10 slots in the lens library, but no limit to the number of saved files.)

Now, let's get a drawing of this lens. Again, there are several ways to get it. Click the sidebar button, , and a picture pops up.



Or you can use a dialog. In this case, you want the dialog called “MPL”, which means “Menu, PLots”. You can simply type **MPL** into the Command Window to open it.

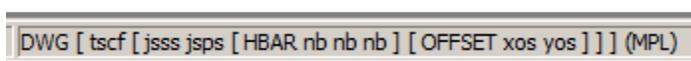


Then you select the options you want and click one of the DWG buttons. The lowest of the three gives the same picture.

When you click the buttons as shown above, the program creates a command for you as though you had typed it into the Command Window:

DWG 0 1 99 HBAR 0 -1 1

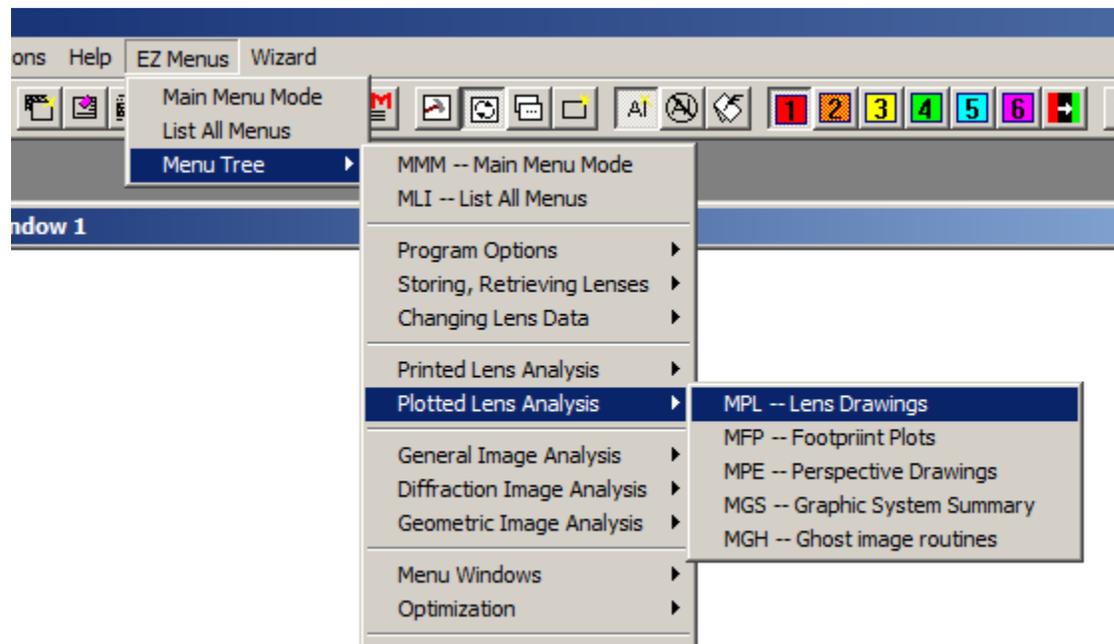
and in this case you don't have to type it yourself. But sometimes you want to type it yourself – or enter it into a MACro, so the drawing will show up along with whatever else the MACro does. How do you remember the format? Well, you don't *have* to remember very much. Type DWG, and look down at the tray, on the lower right of the screen:



There you see the whole format, and it's not hard to enter the remaining data yourself. (If you need more than just this hint, press the **F2** key when the TrayPrompt is displayed, and the Help file automatically opens to the section describing the DWG command. There you can read about the many options available for this command.)

So that's the first step in this orientation: you can usually choose between mouse-driven input or command input.

What about that dialog name "MPL"? How do you remember it? Well, you don't have to do that either. See the hint at the end of the Tray Prompt "**(MPL)**"? That's a clue. And if you are really a novice, you have a menu tree to guide you. Click the top menu item "EZ Menus", and quickly navigate to the MPL menu.



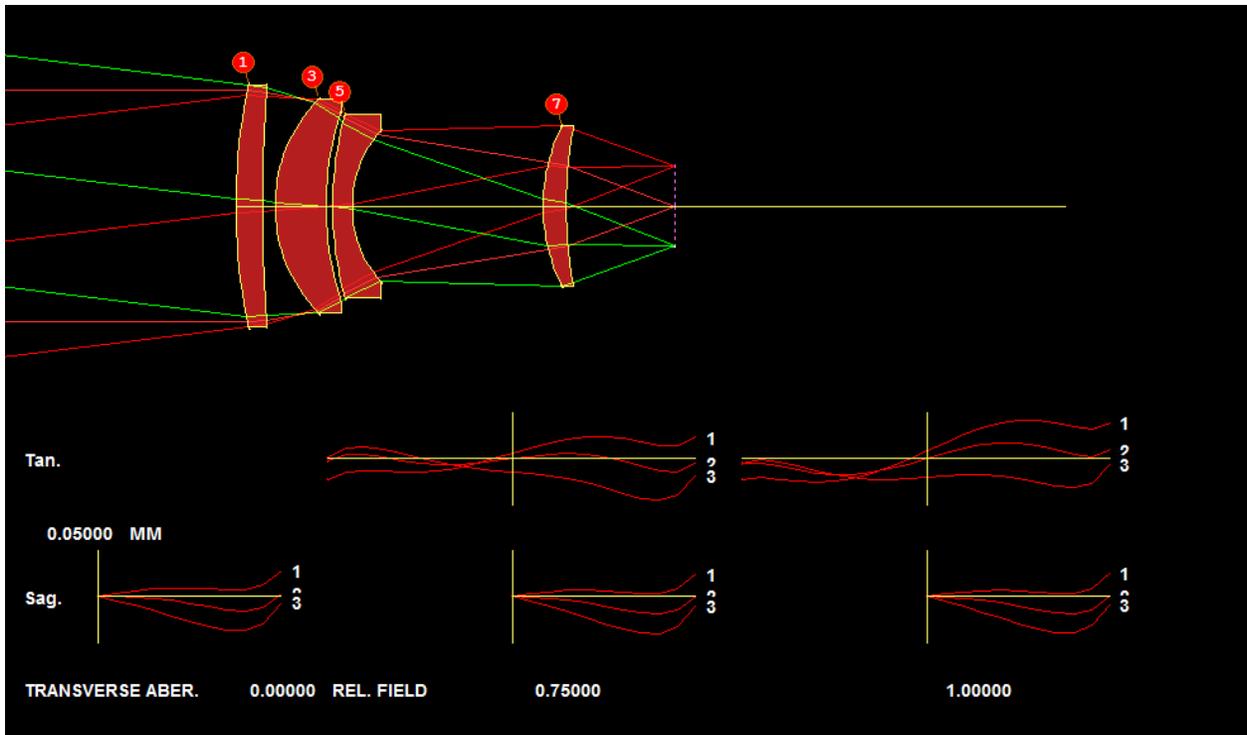
We have devoted a great deal of effort to making all of the power of SYNOPSIS™ as simple to use as possible.

Editing and Changing Lens Data

You will frequently want to examine and change your lens, and we have provided a very friendly interface, the SketchPAD, with its companion, the WorkSheet. Type, in the CW, **PAD**, or click the button,

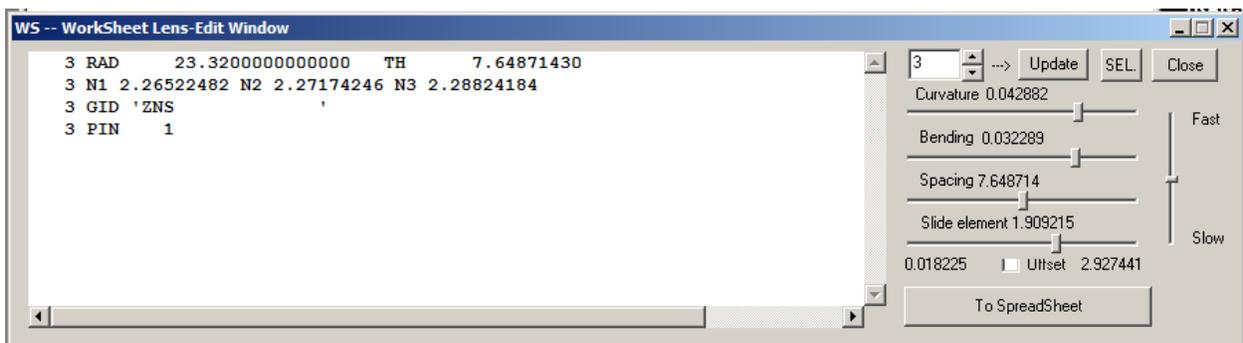


, near the center of the top toolbar. The PAD window opens.

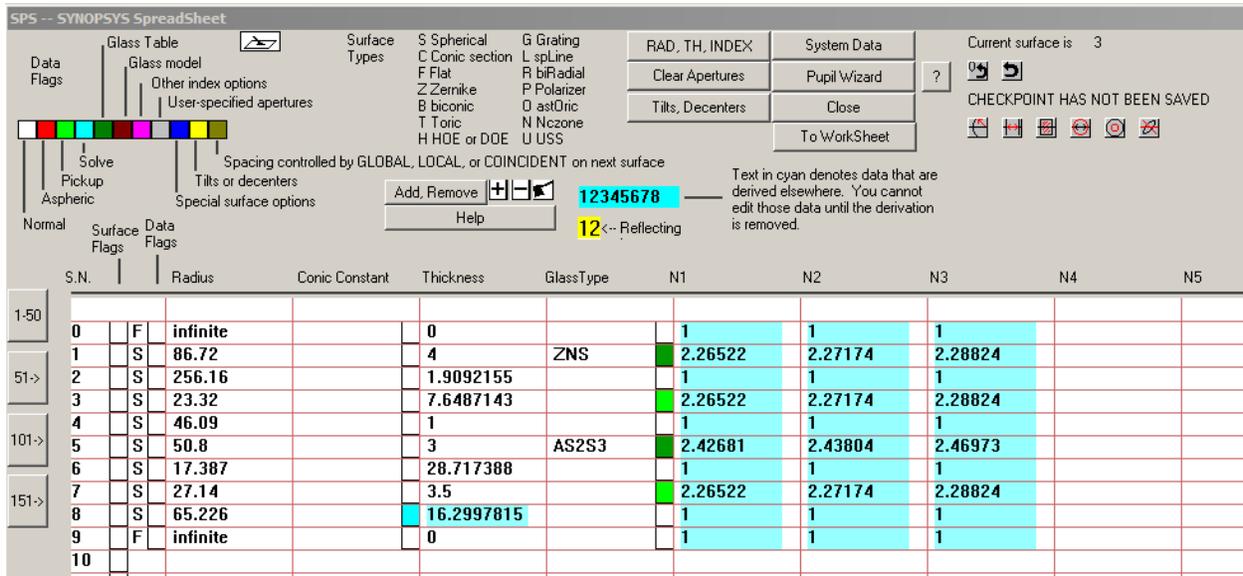


Try clicking on the buttons, , which let you select what kind of display you want to see on the top and bottom half of the PAD display. There are seven options for each, and the default, shown here, displays a Y-Z profile drawing on top and RayFAN plots on the bottom, both with default scales. You can define five different combinations, identifying each set with a button . Then you can switch back and forth with a single click – so you could examine the lens as a perspective drawing on top with spot diagrams on the bottom, as a profile with a custom set of rays on top, and so on.

To edit your lens, you can type **WS** (WorkSheet) in the CW, or click the button , which opens the WS editor window, where you can change anything in the lens. Open the WS, and then click on surface 3 in the lens drawing.



Here you see the data for surface 3: radius of curvature, thickness, index data at three wavelengths, and the entry “3 PIN 1”, which says that this surface will pick up whatever index is assigned to surface 1. You can change the data if you wish and click Update, or move one of the sliders to vary a parameter smoothly while you watch the picture change. (SYNOPTIS™ has the most sophisticated sliders in the business.) If you prefer a spreadsheet interface, you can get there by typing **SPS**, by clicking that button on the WS, or the button .



The screenshot shows the SYNOPSIS Spreadsheet interface. At the top, there are various control buttons and a status bar indicating 'Current surface is 3'. Below this is a table with columns for S.N., Radius, Conic Constant, Thickness, GlassType, N1, N2, N3, N4, and N5. The table contains data for surfaces 0 through 10. Surface 3 is highlighted in cyan, indicating it is the current surface. The data for surface 3 is as follows:

S.N.	Radius	Conic Constant	Thickness	GlassType	N1	N2	N3	N4	N5
0	infinite		0		1	1	1		
1	86.72		4	ZNS	2.26522	2.27174	2.28824		
2	256.16		1.9092155		1	1	1		
3	23.32		7.6487143		2.26522	2.27174	2.28824		
4	46.09		1		1	1	1		
5	50.8		3	AS2S3	2.42681	2.43804	2.46973		
6	17.387		28.717388		1	1	1		
7	27.14		3.5		2.26522	2.27174	2.28824		
8	65.226		16.2997815		1	1	1		
9	infinite		0		1	1	1		
10									

You can edit your data here, if you wish, and jump back and forth from WorkSheet to SpreadSheet by clicking the appropriate buttons.

The Input File

When you use dialogs, the program is creating and running commands for you in the background. That means you only have to type commands yourself when you choose to. That’s powerful and friendly.

Some features can be run with a single line of input, as you have already seen. Others, including some of the most powerful features, require several lines of input. This leads to the concept of an *input file*, which you will usually create in a macro editor. Here’s an example: Type

EE

in the CW. This opens the Excellent Editor. Copy and paste the following lines into the window that opens:

```
RLE
ID F/5 DOUBLET          5547
FNAME 'DOUBLET.RLE
WAVL .6562700 .5875600 .4861300
APS      1
```

```

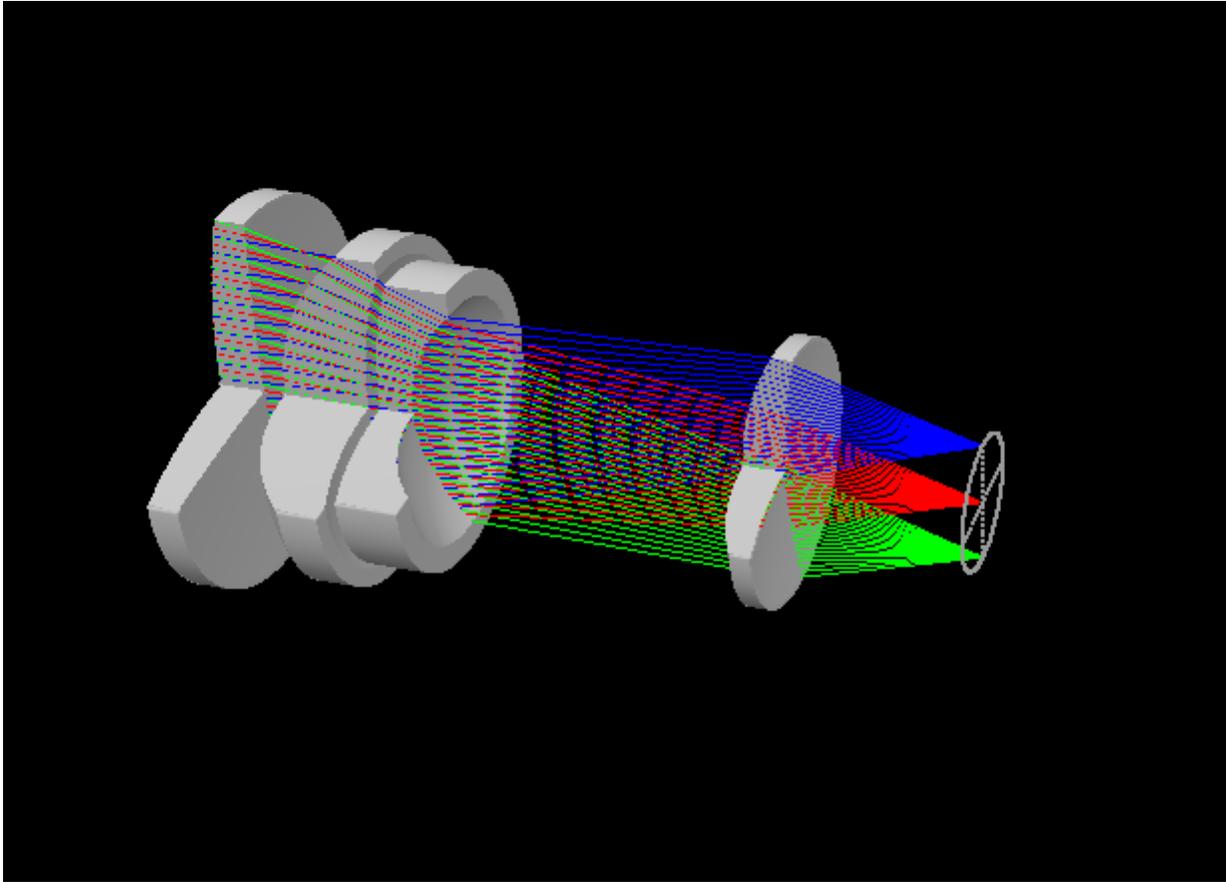
UNITS INCH
OBB 0.000000 1.00000 6.00000 0.00000 0.00000 0.00000 6.00000
0 AIR
1 CV 0.0294371152971 TH 1.55999994
1 N1 1.51431703 N2 1.51679441 N3 1.52237006
1 GTB S 'BK7 '
2 RAD -22.1363355597437 TH 0.28766930 AIR
2 AIR
3 RAD -21.9421336816345 TH 1.00000001
3 N1 1.61502503 N2 1.62003267 N3 1.63207204
3 GTB S 'F2 '
4 RAD -100.2738957807268 TH 58.00665650 AIR
4 AIR
4 TH 58.00665650
4 YMT 0.00000000
5 CV 0.0000000000000 TH 0.00000000 AIR
5 AIR
END

```

Then click the Run button, . The PAD display changes, showing an F/5 doublet. Note that the above file started with the line **RLE** and ended with **END**. Many of the features of SYNOPSIS™ can be run with a file enclosed with lines of this kind. Here, too, you usually have a choice of whether to type the data yourself or let the program create it for you. The latter is a big time saver. If you go to the MPE dialog (Menu, Perspective drawings), make your selection between wire-frame, rotating wire-frame, solid drawing, rotating solid drawing, and so on, the program creates and runs the appropriate input file. To illustrate, get out the lens in library location 1 again, and type

MPE

and select the Rotating Solid Model, Cutaway view, TFAN at fields 0.0, 1.0, -1.0. Then click Execute. Drag with the mouse on the picture, and it will rotate about.



Now type **LMM** in the CW, or use the menu items **MACro | Load the last menu sequence**. A new editor window opens, containing the input file for the above picture:

```
RSOLID 0 0 0 0 0
CUTAWAY
PLOT
RED
PUP 2 1 21
TRACE P 0 0 21
BLUE
TRACE P 1 0 21
GREEN
TRACE P -1 0 21
END
```

You can save, edit, and run this file yourself, to make a similar picture for a different lens, for example, without wading through the dialog all over again. That's a time-saver for sure.

Let us finish this orientation chapter by mentioning that, for optimization, you will define your variables with a file

PANT

...

END

and the merit function with a file

AANT

...

END .

The following chapters will show many examples of how you use these formats.

Oh ... we almost forgot: Try the Video Tutorial, which you can download from our website. That tutorial covers many topics in greater detail. And be aware that when you install the program you have a very friendly Tutorial Manual available. Just type

HELP TM.

P.S. And don't neglect to read about the **Artificial Intelligence** feature in the User's Manual. No other optics code has anything like it.