Issue No. 4 July 2005

## Optica News

***LensLab™* Update:** As a service to you, we have delayed LensLab to put the finishing touches on the documentation. We are seeking examples of telescope designs and optical modeling needs encountered by amateur astronomers. We will publish a selection of your responses on our website and in an upcoming newsletter with LensLab solutions.

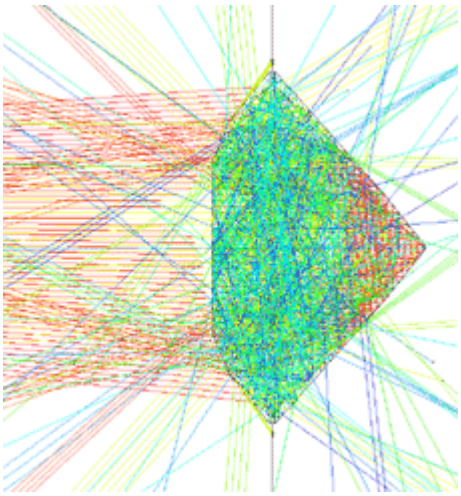
Optica Software is being featured in Photonics.com: http://www.photonics.com/XQ/ASP/url.readprod/prodid.774/QX/readprod.html.

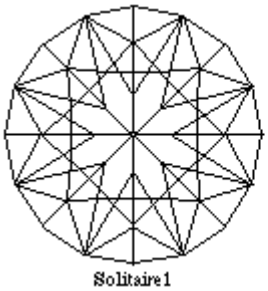
Developer Donald Barnhart recently wrote an article that was published in the June 2005 SPIE newsletter *Holography*. The article discusses using our software to build holographic systems, and can be downloaded at: http://spie.org/membership/pdfs/holography/holography16-1.pdf

We recently asked for your assistance in completing our website survey. As our way of saying thank you we are selecting one completed survey each month and awarding a copy of our software to the person who completed it. Our recipient for June 2005 is **Thomas Sure**, of Leica Microsystems. Please continue to fill out this survey for your chance to win.

## User Tips

"Our software has many features that don't exist in ZEMAX®. Our software is a full-fledged language for modeling optical systems. This gives you enormous control over your design process. Because our software is written in the symbolic programming environment of *Mathematica*®, you can use your own symbolic equations to describe optical surfaces. Unlike ZEMAX®, our software was written to be non-sequential from its conception. You can perform both geometric ray-tracing as well as determine analytic solutions to your optical system including Gaussian beam propagation, Fourier optics, symbolic global optimization, diffraction and interference calculations. Such things are not possible in ZEMAX®."
**(Optica Software Developer – Donald Barnhart)**





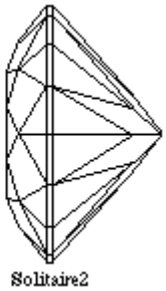




Figure 1 - This models the optical behavior of a diamond solitaire gem with 58 facets as it reflects and refracts the rays of light in *Rayica™*. The colors indicate the amount of energy present in each ray on a logarithmic scale.

# Notes from the Developer

**Custom Surface Shapes**

With *Rayica™* and *Wavica™*, you can define new optical surface shapes without being constrained to a predetermined set of shape formats. This can be accomplished by several different methods. The first method is with a symbolic equation. Unlike other commercial optical design/modeling packages, you are not constrained to a predefined family of shapes, such as conic sections; you can use any arbitrary equation of your own choosing to define the shape of an optical surface. For example, you can simulate the effects of a manufactured ripple defect on a spherical lens by adding a sinusoid equation to a spherical equation (See "Section 4.3.8" of the Mathematica Help Browser).

As a second approach, you can model an optical surface shape from experimental data points. In particular, you can build an interpolation function from a table of numbers to define the surface shape (See "Section 4.3.9" of the Help Browser). Finally, you can import an existing three-dimensional Mathematica graphic or a CAD file to create a multi-faceted three-dimensional surface using the CustomPrism function (See "Using CustomPrism" in the Help Browser).

**Parametric Surface Functions**

*Rayica* and *Wavica* use a parametric format to describe the shapes of all its optical surfaces. Each optical surface is defined by a three-dimensional parametric vector function given in the following format: {X[s,t], Y[s,t], Z[s,t]} where {X, Y, Z} are three-dimensional coordinate functions and {s,t} are parametric parameters for each coordinate direction. This allows you to construct optical surface shapes that can wrap around themselves and even be folded or twisted.

For example, you can construct a enclosed cylinder shape with the following parametric surface function: Function[{s,t}, {Sin[s],Cos[s],t}]. Here, the t parameter gives the vertical component of the surface while s specifies an angle around the cylinder wall.

(You can learn more about custom surface shapes in "Section 4.3" of the Help Browser for Principles of *Rayica*).

# Upcoming Issue

*Did you know that you can model lasers and pulse-shaping systems using* Rayica *and* Wavica*?* (See figure below). We will be discussing this in an upcoming issue of this newsletter as well as presenting examples on our website. If you have designed or are planning to model such a system using our software please let us know.

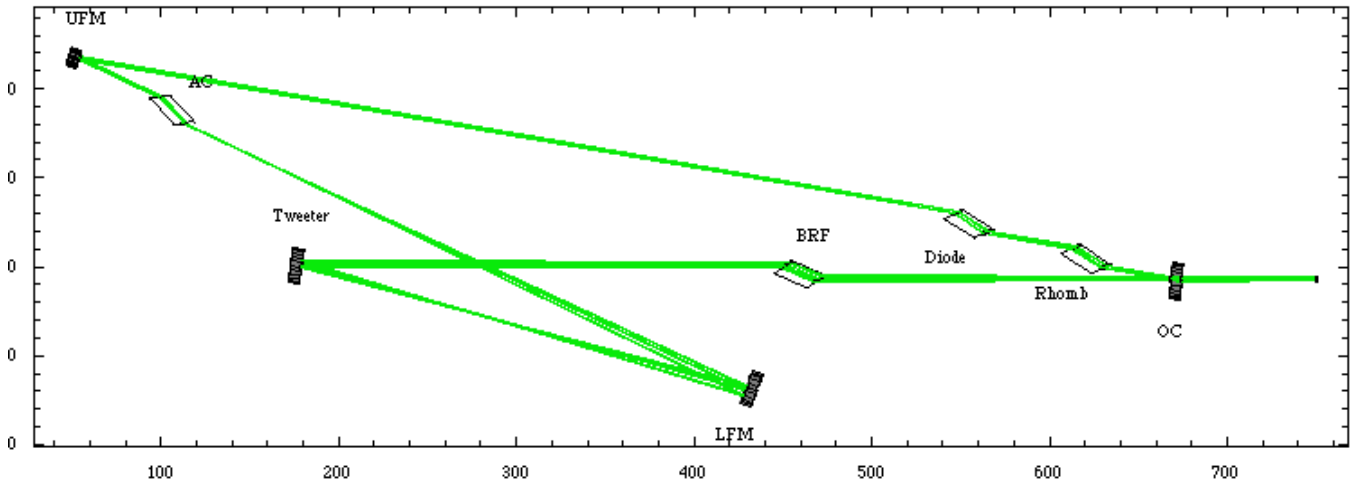



Figure 2 - A laser modeled in Rayica.

# Events

Please visit us at **booth #216** at Optics & Photonics 2005 in San Diego. You can register online through the following link: http://www.spie.org/events/opexhibit. Don will be hosting a presentation Tuesday, August 2nd at 12:30pm entitled "An Overview of Rayica and Wavica for Optical Design." For more information you can visit the SPIE link below for details: http://spie.org/app/exhibition/index.cfm?fuseaction=exhibitordetail&meeting_id=84&exhibitor_id=10636&CFID=27232449&CFTOKEN=84897990

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We are an integrated source for systems design, modeling, and manufacturing. We have in-house expertise specializing in designing optical systems, mechanical systems, electronic systems, prototype assembly and product fabrication. Please visit our website at www.opticasoftware.com/news/ for more details.

Dr. Donald Barnhart received the highly competitive Rank Prize for the best electro-optics Ph.D. dissertation in the United Kingdom, and he traveled to Buckingham Palace and personally met the Queen of England. See our website **About Us** page for biographies.

(Donald pictured 2nd from right)