VOLUME 2

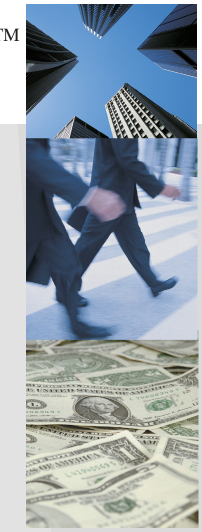
ISSUE 11

JANUARY 2006

Optica Software™

ADDRESSING THE OPTICAL DESIGN AND ANALYSIS NEEDS OF CORPORATE, BUSINESS, EDUCATIONAL, GOVERNMENTAL AND INDIVIDUAL USERS.

www.opticasoftware.com



Optica Software News

Wavica models Physical Optics

Wavica™ builds on the functionality of *Rayica*™ and *Mathematica*® to calculate wavefront interference and diffraction, Gaussian beam propagation, ABCD matrix models, and analytic representations of optical systems. Learn more about Wavica: Click Here

Visit the Optica Support page for help with a question or to gather further information about our software products, take some time to review the documentation available from this page, which contains an ever-growing collection of examples and on-line documentation to assist our users with their project development needs. We encourage you to visit this section regularly for its frequent updates.

We are now accepting requests to become an alpha tester for our GUI interface, ask us how.

Our online survey recipient for **January 2006** is **Simon Livson, of Rockwell**. Please continue to fill out the survey for your chance to win. For more details on how to participate visit our homepage at: www.opticasoftware.com.

We are offering a discount of **30%** for previous *Optica*™ users upgrading to *Rayica*™ or *Wavica*™ - now through February 15, 2006. Contact us for your discount prior to placing your order.

Rayica™ does geometric ray-tracing and replaces the original *Optica*™ product. *Wavica*™ does symbolic analysis of optical systems, Gaussian beam propagation, as well as diffractive effects in imaging systems, interference, and wavefront calculations. To learn more about the differences between *Rayica*™ and *Wavica*™, please examine our Product Comparison Matrix.

Site Licenses

Optica Software site licenses are attractively priced and eliminate the hassle of complicated site license administration. Whether you are interested in licensing Optica Software products for use within an academic institution, commercial, government or non-profit organization, we have designed a site license to fit your needs and your budget. Pricing is determined by the number of users you specify. You can always purchase additional user packs as you increase the number of users.

Select your type of organization from the list below to request information on pricing and policies:

Schools: for a single department within a college or university or for use throughout the entire college or university campus.

Commercial

Government

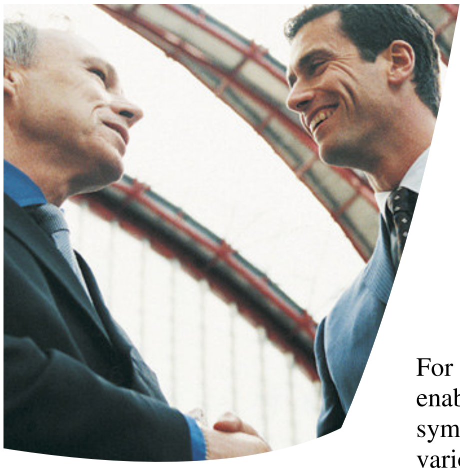
Non-profit organizations

Photonics WEST

PRESENTATION ANNOUNCEMENT

Principles of *Rayica*™ and *Wavica*™

Dr. Donald Barnhart**,** Optica Software Lead Developer
Wednesday, January 25th from 11:00am-12:00pm in Show Office 1.



Q&A Mailbox

Q: What are the chief advantages of using your products over other packages?

A: Our products exhibit a complete language for modeling optical systems in three-dimensional space. This gives you the most control possible over the entire design and analysis process. Built upon the enormous repertoire of symbolic, numeric, and graphic capabilities of *Mathematica*®, our *Rayica*™ and *Wavica*™ packages are unprecedented in their ability to flexibility model novel and innovative optical systems.

For example, our packages enable you to specify symbolic parameters for the various positions, optical properties, and curvatures of system elements. You can also describe the shapes of optical surfaces with your own symbolic equations. In addition, you can directly perform higher-level analysis of your own in *Mathematica*® from the results of *Rayica*™ and *Wavica*™ without switching to a different software environment.

Finally, unlike any other product on the market, we openly publish our source code for your inspection and our products work with every major computer operating system, including but not limited to: Windows, Macintosh, and Unix/Linux systems. Such features make our products unlike any other commercial package.

Submit your questions to our Optica Software [Development Team]

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Just In…Optica Software mini frisbees. Stop by **booth 3034 at Photonics West** and be the first to receive your frisbee. You will also receive a frisbee with each order you place.

Exhibit Event Schedule

Phototonics West
San Jose, CA
January 24-26, 2006
Booth#3034
Photonics West Exhibit

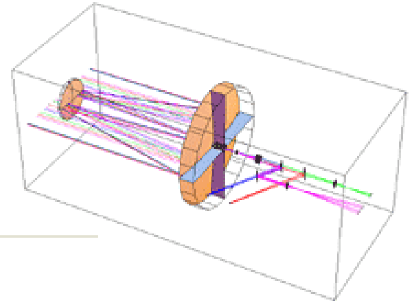
CLEO/QELS Conference
Long Beach, CA
May 21-26, 2006
CLEO/QELS Exhibit

International Optical Design Conference
Vancouver, BC Canada
June 4-8, 2006-01-18
International Optical Design Conference Exhibit

Optics & Photonics
San Diego, CA
August 13-17, 2006
Optics & Photonics Exhibit

Notes from the Developer

Donald Barnhart, Ph.D. – Optica Software Lead Developer
donald@opticasoftware.com



"Will it play in Peoria?"

When it comes to designing and modeling a new type of optical component, *Rayica* and *Wavica* offer unparalleled flexibility. As an example, the ray-trace model shown above has taken the printed "*Optica*" text and turned it into a complex arrangement of lens shapes. This same technique can be used to convert to any spatial image pattern into an optical system. With such flexibility, you really are limited only by your imagination!

In other instances, however, *Rayica* and *Wavica* can answer whether an ordinary optic may be used to produce extraordinary results. In particular, all simple optical elements have limitations in their performance, but custom fabricated elements are often prohibitively expensive. With *Rayica* and *Wavica's* ability to model the precise behavior of standard optical elements, you can search through *Rayica's* built-in database of stock catalog components and select an optical part that gives the best optical performance for your application.

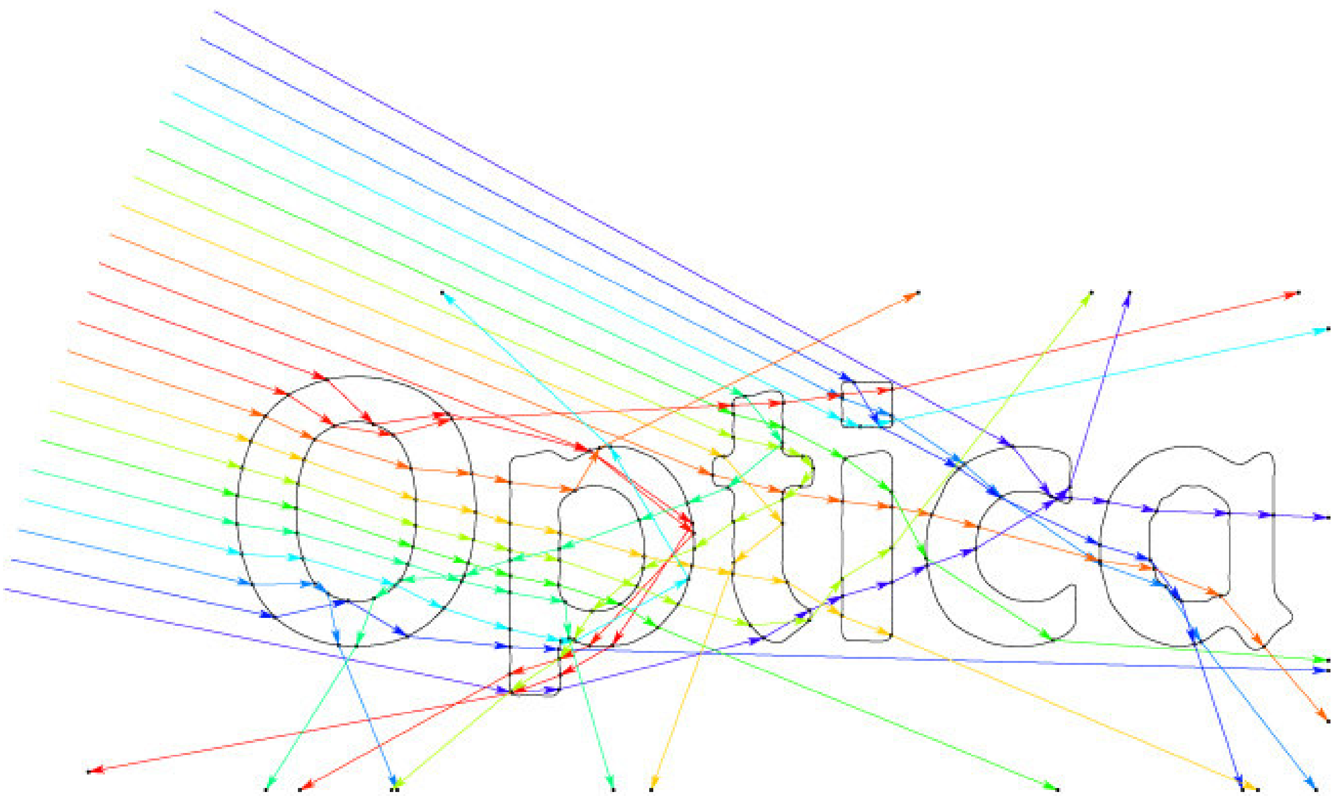


Figure 1. With *Rayica* and *Wavica* you can turn letters into lenses.

User Tip Submitted by user Wolfgang Wagner, (Post-Doc - Free Electron Laser facility, Duke University)

This notebook models an acousto-optic scanner. It consists of a light source with collimated rays, two acousto-optic deflectors, and a screen. Acousto-optic deflectors are essentially transparent solids which support piezo-electrically induced pressure waves. These pressure waves are sensed as diffractive index waves by orthogonally traveling light rays. Much like in a diffraction grating, the light rays destructively interfere in all directions but at one, called the Bragg diffraction angle. It is important to note that, each time a light ray is diffracted at a different angle, the deflector index waveform has to be completely re-loaded. Typically, this takes a few microseconds. The scanning modulator uses a uniform index variation to displace the incoming rays on the focusing deflector. The focusing deflector has a more complicated index variation which deflects each incoming ray toward the intended focus. Real scanning systems tend to have many lenses. For instance, it makes sense to focus on and collimate after the scanning deflector for better diffraction efficiency. Also, lenses can be used to produce a much tighter focus on the scanning plane. The acousto-optic diffraction angles shown here are greatly exaggerated for illustration. Typical angles extend only up to a few degrees.

Definitions: The acousto-optic deflectors are defined by gratings with user-defined line spacing

```
difford1={{-1,0},{0,0},{1,1}};
difford2={{-1,1},{0,0},{1,0}};
gratSep=300;
minLines=50;
maxLines=100;
stepLines=10;
waveLen=.5;
```

This function yields the position of the center ray on the focusing deflector, and is used to define the center of its 'virtual lens'

```
focPos[gratLin_]:= gratSep Tan[ArcSin[(waveLen 10^6)/(.001/gratLin)]];
```

This function retrieves the line spacing required in the focusing deflector to deflect rays towards the desired focal spot. Note that the focal point is purely geometrically derived, so the function will only work exactly for collimated input rays.

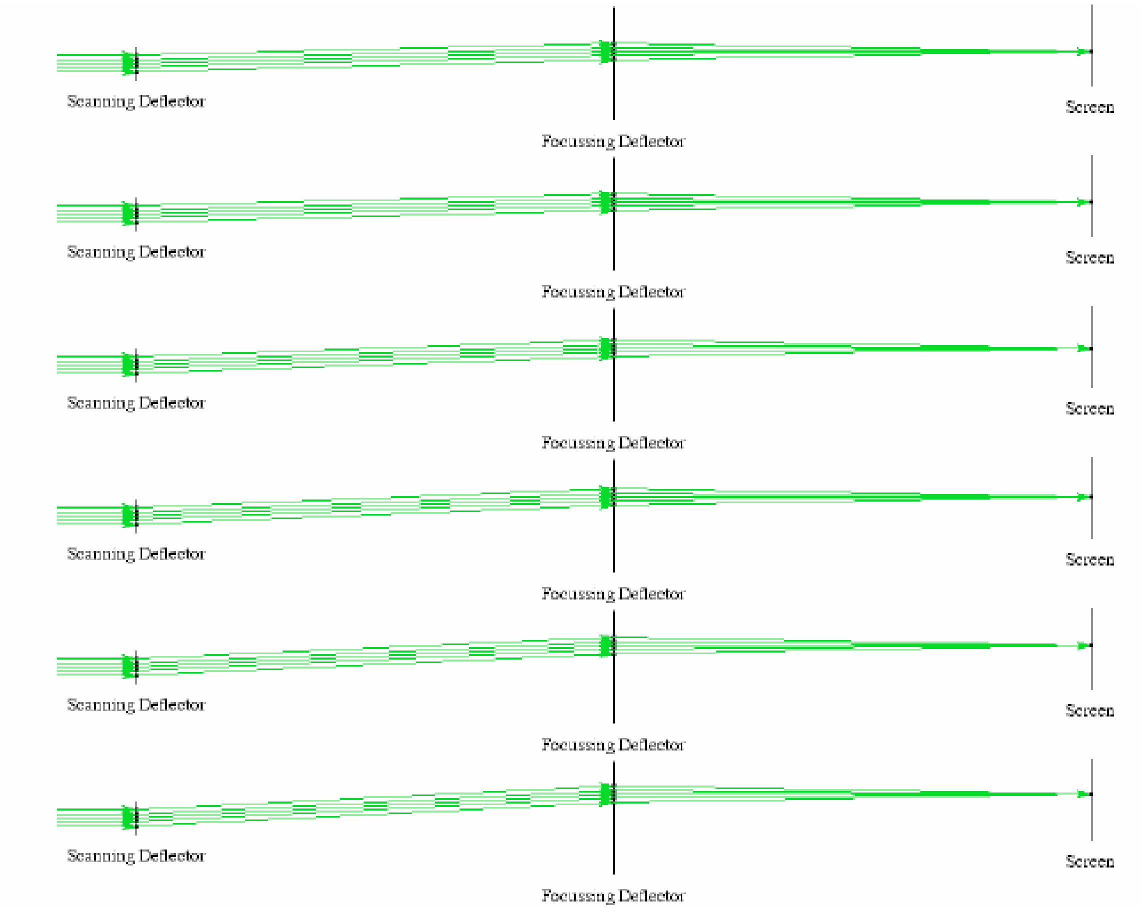
```
focLensLine[pos_]:=Abs[0.001 Sin[ArcTan[pos/gratSep]]/(waveLen 10^-6)];
```

The system:

```
Table[AnalyzeSystem[{LineOfRays[10,NumberOfRays->5,WaveLength->waveLen],
Move[Grating[{0,lineVar,0}&,20,DiffractedOrders->difford1,Labels->{"Scanning Deflector"}],50],

Move[Grating[Function[RSy,{0,lineVar + Sign[RSy-focPos[lineVar]]focLensLine[RSy-
focPos[lineVar]],0}],70,DiffractedOrders->difford2,Labels->{"Focussing Deflector"}],gratSep+50],

Move[Screen[50,Labels->{Screen}],
{2 gratSep+50,focPos[(minLines+maxLines)/2]}]},
PlotType->TopView],
{lineVar,minLines,maxLines,stepLines}];
```



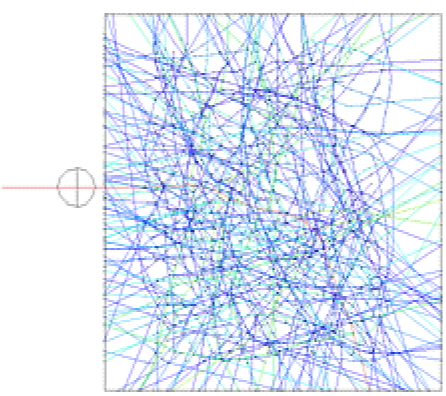


Figure 2. This shows a single ray traced through a diffusely scattered field of partially reflecting and refracting spherical lenses. The color represents the energy present in the scattered rays on a logarithmic scale.

USER TESTIMONIAL

"I am a daily user of Mathematica with a background in physics doing various research and optical designs. We also have a parallel computing project here using gridMathematica. One of the interesting parts of simulation systems like optical ray tracing is that it can benefit greatly from parallelization, in non-interacting cases. My experience with Mathematica, the Parallel Computing Toolkit and Rayica leads me to believe that large-scale imaging calculations could be developed involving millions of rays that would be competitive with other specialized industry specific software".

Chris French